MICHIGAN STATE UNIVERSITY

Northern Michigan and Eastern Upper Peninsula Knowledge Economy Strategies Project

An Assessment of the Knowledge Economy in Northern Michigan and the Eastern Upper Peninsula

Michigan State University
Center for Community and Economic Development

in cooperation with the

Northeast Michigan Council of Governments
Alcona, Alpena, Cheboygan, Crawford,
Montmorency, Oscoda, Otsego, Presque Isle

Northwest Michigan Council of Governments
Antrim, Benzie, Charlevoix, Emmet, Grand Traverse,
Kalkaska, Leelanau, Manistee, Missaukee, Wexford

Eastern Upper Peninsula
Regional Planning & Development Commission
Chippewa, Luce, Mackinac

July 2009

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U.S. Department of Commerce, Economic Development Administration
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Office of the Provost, College of Agriculture and Natural Resources, and MSU Extension.

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A digital version of this report, including expanded and updated datasets and sources, is available at

KnowledgePlanning.org

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Background

In October 2008, the **Michigan State University** **Center for Community and Economic Development** (CCED) initiated a project with the support of the U.S. Economic Development Administration to develop innovative economic development strategies with three Northern Michigan regional planning partners—the **Eastern Upper Peninsula Regional Planning and Development Commission** (EUPRPDC), **Northeast Michigan Council of Governments** (NEMCOG), and **Northwest Michigan Council of Governments** (NWMCOG). The three regional planning agencies cover 21 counties, 18 in Michigan's northern Lower Peninsula and three in the Eastern Upper Peninsula:

- **Northwest Michigan Council of Governments**, including Antrim, Benzie, Charlevoix, Emmet, Grand Traverse, Kalkaska, Leelanau, Manistee, Missaukee, and Wexford counties.

- **Northeast Michigan Council of Governments**, including Alcona, Alpena, Cheboygan, Crawford, Montmorency, Oscoda, Otsego, and Presque Isle counties.

- **Eastern Upper Peninsula Regional Planning and Development Commission**, including Chippewa, Luce, and Mackinac counties.

The goal of the project is to create new knowledge-based jobs and businesses in the regions by competing more successfully in the global knowledge economy. By understanding the dynamics and demands of global knowledge economy forces, regional leaders can better align their regional investment priorities with those demands.

The three regional planning agency partners are also designated economic development districts (EDDs) by the U.S. Economic Development Administration (EDA). Each partner is participating in assessing their current regional Comprehensive Economic Development Strategy (CEDS), and developing and implementing collaborative learning (co-learning) plans.

A Comprehensive Economic Development Strategy is a continuous planning process that is designed to promote sustainable economic development and opportunities. This strategy is used to analyze local conditions and identify problems and opportunities so that the goals and visions of the community can be met. A successful CEDS process is logical and leads to high-skill job creation. Each CEDS is unique to its region, so criteria and performance measures will be different for each one.

In order to prepare a CEDS, a committee of community stakeholders is formed to oversee the CEDS process and ensure that a broad range of

viewpoints are represented. The committee adopts a work plan describing each task and oversees timely implementation.

The CEDS must describe the background of the region, including a demographic profile, major economic sectors and their employment, income, and revenues as well as other factors affecting economic performance. Economic strengths and weaknesses must be addressed as well as external trends and forces affecting economic development.

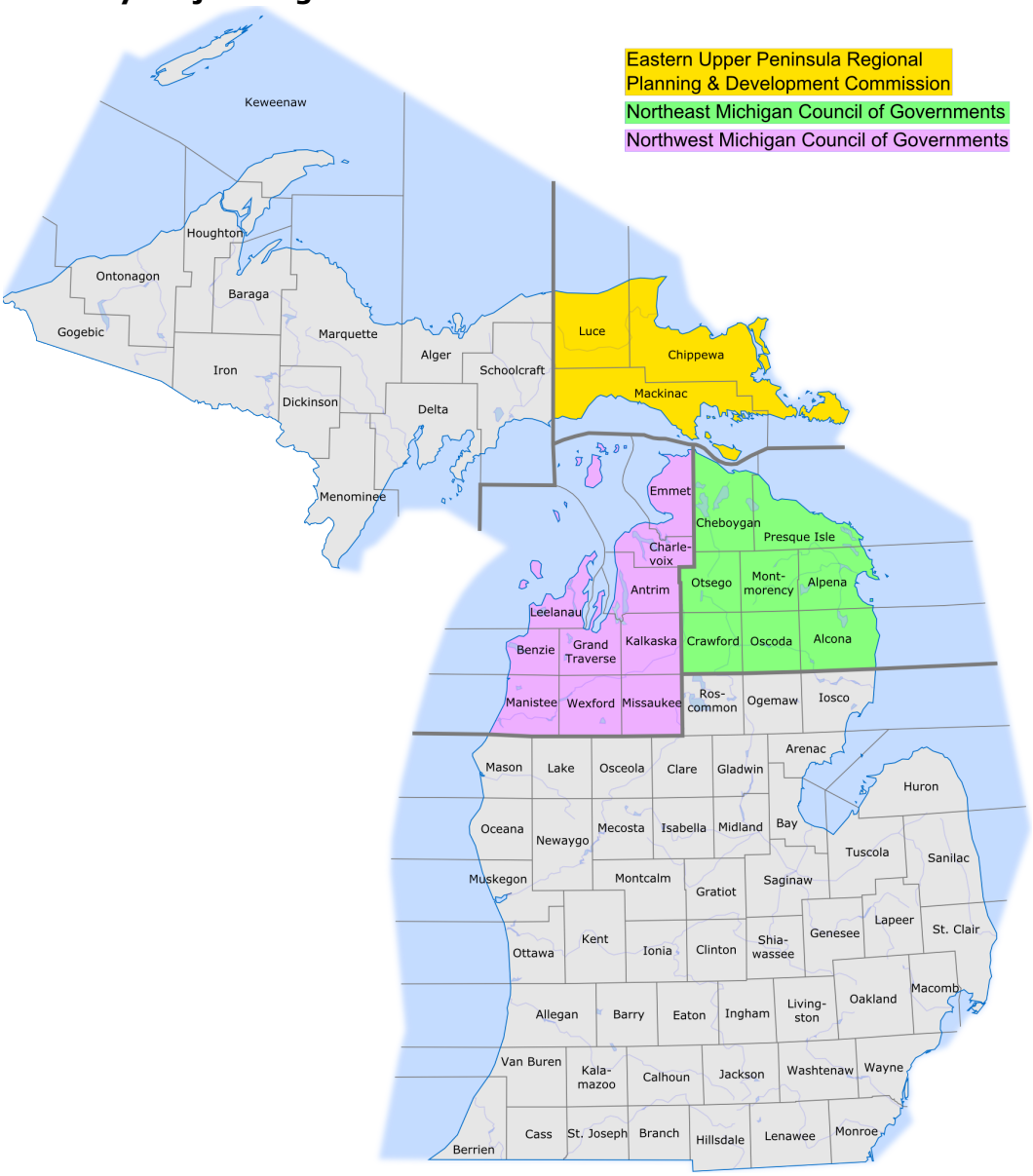
Visions, goals, and objectives should provide a focus for the region's development for the next 10 to 20 years and respond to challenges and problems. They serve as a framework for future decision-making and prioritizing regional actions.

Finally, the CEDS contains an evaluation of how well the planning process is working and what can be done better. The document serves as a record of all the steps of the process followed and of the broad and diverse participation of the community in developing the strategy.

After the EDA approves the CEDS, EDA-funded planning grantees are required to document their progress achieved in their economic development activities. The CEDS can be adjusted to accommodate unforeseen opportunities or problems, and changes must be documented in annual reports. A new, updated, or revised CEDS is required every five years, or sooner, if deemed necessary by the EDA due to changed circumstances. The document must be available to the public.

Implementation of the co-learning plans will provide regional planners and their stakeholders with new knowledge and greater capacity. This new knowledge and capacity, then, will serve as a platform for regional planners and stakeholders to create innovative regional economic development strategies to compete successfully in the global knowledge economy.

Figure 1. **Northern Michigan and Eastern Upper Peninsula Knowledge Economy Project Regions**



Source: *Michigan Association of Regions (2009); State of Michigan (2009).*

Introduction

To assess and measure the progress of the three Northern Michigan regions in the knowledge economy, the Michigan State University Center for Community and Economic Development (CCED) project team and its three regional partners—the Eastern Upper Peninsula Regional Planning and Development Commission (EUPRPDC), Northeast Michigan Council of Governments (NEMCOG), and Northwest Michigan Council of Governments (NWMCOG)—developed a set of 27 knowledge economy Indicators.

In collaboration with the three partners, the project team examined the MSU CCED's 2006 Michigan Knowledge Economy Index: A County-Level Assessment of Michigan's Knowledge Economy (LaMore, Melcher, Supanich-Goldner, & Wilkes, 2006) to commence development of this set of regional knowledge economy indicators. The 2006 CCED county assessment was based on the national 2002 State New Economy Index published by Robert D. Atkinson (2002) of the Progressive Policy Institute (now with the Information Technology and Innovation Foundation [ITIF]). The project team also reviewed the current State New Economy Index, published in November, 2008 by the ITIF and Kauffman Foundation (Atkinson & Andes, 2008).

The principal objective of this collaborative process between MSU CCED and its three regional planning partners was to identify meaningful and useful knowledge economy strategies derived from reliable indicators for the three predominantly rural regions. The use of clear indicators can empower planners and stakeholders to understand current conditions, prioritize strategic actions, and track quantifiable changes associated with the transformation of economic development strategies from a traditional manufacturing-based model to one consistent with the dynamics of the global knowledge economy.

The 2006 CCED assessment consisted of 16 knowledge economy indicators in five categories—1) Knowledge Jobs, 2) Digital Economy, 3) Innovation Capacity, 4) Globalization, and 5) Economic Dynamism. The MSU CCED-regional partner team selected seven of those 16 indicators and added one new category—talent. The collaborative team also added five new measures to describe the regional context and 20 new indicators for a total of 32 measures.

This robust collaborative process between the MSU-based project team and the three regional partners was grounded in thorough research and analysis as well as feedback from state agency technical experts and business and economic leaders in the regions. The overarching goal is to provide a practical set of knowledge economy indicators that will assist regional planners and stakeholders in aligning their economic development strategies with the demands and requirements of the global knowledge economy.

The Current Lenses to the Emerging Knowledge Economy in Northern Michigan

On balance, what the CCED-regional partner team has done is to create a new set of lenses through which economic development-related activity in the knowledge economy can be prioritized, tracked, measured, and assessed by the regional planning partners and their stakeholders.

This report consists of eight sections. In Section 1, the five measures that provide a demographic and overall economic context for the three regions are described. In Sections 2-7, the six knowledge economy categories and 27 indicators developed for this assessment are presented and discussed. Section 8 provides the conclusion of our regional assessment. The eight sections of the assessment, then, consist of the following:

1) **Regional Context**
2) **Talent**
3) **Innovation Capacity**
4) **Knowledge Jobs**
5) **Digital Economy**
6) **Globalization**
7) **Economic Dynamism**
8) **Conclusion**

In describing the 27 regional knowledge economy indicators, state, Great Lakes Midwest, and U.S. data provide a comparative context to illuminate what a particular measure means compared to state, regional (multi-state), or national performance levels. As most economic data is collected and aggregated at statewide or national levels, discerning any meaning from breakouts of regional (i.e., sub-state) data can be problematic. In many cases, generating primary data would have been preferable to using existing data sets, but such data collection was beyond the scope and resources of this project.

The primary intent underlying our data collection and analysis is to provide a topical and relevant set of lenses to understand where the regions currently stand in what we currently understand about the knowledge economy. In this respect, these knowledge economy indicators represent an initial economic development planning methodology that seeks to capture a very fast-moving target. The world of ubiquitous email, Google, Youtube, wireless communications, Blackberries, hybrid vehicles, and broadband access issues didn't even exist just 11 years ago. Google was founded September 7, 1998. Youtube started up in 2005. Over 21 million people now use BlackBerry smartphones on over 375 wireless networks in 140 countries around the world, according to Research in Motion (n.d.), the BlackBerry maker. Rapid change is the new routine. Innovation is the major economic imperative.

But we can't make progress in the knowledge economy if we don't know what indicators to use to assist in prioritizing strategies and measuring that progress. **Put another way, we can't make progress if we don't know where we're going.** The indicators identified in this report, then, represent an attempt to get our bearings in a stormy sea of economic changes. The sustainable recovery and reinvention of our regional economies must be informed by new learning and understanding of the transformation of the surging knowledge economy. Restarting our state economy depends on innovative regional economic development planning and strategies that will wisely allocate scarce resources and make smart investments in job-creating projects and sustainable economic growth.

From World War II until the final decades of the last century, Michigan and other industrial states in the U.S. enjoyed virtually unchallenged global leadership in its unparalleled manufacturing capacity and corresponding high income levels and quality of life that were the envy of the world. That position has been eroding. Michigan must now deeply commit itself to re-establishing its economic leadership based once again on ingenuity, innovation, and resilience that typified historic Michigan economic success stories like Ford, Olds, Chrysler, Dodge, Dow, and many others. These are the same qualities that made the state the Arsenal of Democracy in World War II. As that Arsenal, we equipped the Allied forces to defeat the threat of global totalitarianism.

This time we must equip ourselves to defeat the cancerous threat of a mind-set clinging to replicating economic models that clearly no longer produce the desired results. We must reject a catastrophic retreat to mind-sets that don't work. We must act boldly and pioneer innovative planning and economic development tools and methods to pursue advanced manufacturing in green technology and other knowledge-based sectors to create a truly sustainable and equitable economy. These indicators are intended to assist navigating those innovative paths.

Data Collection Methodology and Constraints

The collaborative team tackled significant methodological issues to identify useful and meaningful knowledge economy indicators: What are the characteristics of the knowledge economy in predominantly rural Northern Michigan? What are useful and accurate indicators in this context? What are meaningful measures in this context? What data sets are available to provide measurements of identified indicators? Are data sets readily accessible? Will those data sets be available in the future? What proxy measures are reasonable and acceptable when the desired primary data is inaccessible or absent? These are the major questions we addressed in deciding on which data sets to select as indicator measures.

A thorough Web-based literature review was conducted by the project team to identify knowledge economy indicators and measures that could be applied to

Northern Michigan and Eastern Upper Peninsula regions. The project team also met with Kenneth Darga, the State Demographer, and Mark Reffitt, a state Department of Energy, Labor, and Economic Growth (DELEG) labor market data analyst, to identify and evaluate available data sets that could serve as useful and meaningful measures.

Five teleconference meetings were held with the regional planner partners to review and discuss the results of the team's literature review, data collection, and discussions with external experts. NAICS (North American Industrial Classification System) code categories were thoroughly examined by the project team and partners to identify those codes that provide accurate indicators of knowledge jobs. Regional planners also consulted with local business leaders and experts to identify NAICS industry sectors that were relevant to their regions.

Constraints and limitations on regional data sets were encountered that constrict regional planners' efforts to develop their knowledge economies. These constraints can interfere with successful planning because they make it difficult, if not impossible, to quantify the results of economic development strategies.

For some potential indicators, no accurate data has been collected by any agency, or the project team lacked the resources (or authority) to collect or generate the data. For other indicators, data was available at the aggregate state level but not at regional or county levels. On the other hand, in some cases where local area datasets were generated, specific data was either suppressed by the data collection agency to protect privacy or riddled with unacceptably high margins of error. Data suppression and high error rates both result from thin population densities. For example, publicly available data on the number of full-time engineers in the NWMCOG region has a 29% margin of error for males (328 +/- 96) and a 77% margin of error for females (75 +/- 58).

Practically speaking, selection of accurate measures was restricted to the availability of data sets as the project lacked the resources to generate significant new primary data. The project team determined that some data sources previously used for knowledge economy indicators no longer existed. For example, the cyber-state.org Web site that had supplied data for measuring digital government had vanished. As data sets on "workforce education" and "management and professional jobs" are no longer available, these indicators were eliminated. These data sets were previously generated by U.S. Census Bureau "Long Forms" that have been replaced by the American Community Survey (ACS). The ACS sampling technique precludes the generation of meaningful data from rural areas for the most part because the number of data points is far too small to rely on for accurate data.

We welcome your feedback

The project team welcomes feedback and suggestions for improving the indicators and measures described below. The rapid ongoing development and frequent disruptiveness of the knowledge economy creates a fluid and often difficult environment in which numerous questions can be raised about the meaningfulness of selected indicators and the accuracy of available measures. The project team could not answer all of these questions definitively and certainly cannot anticipate all of the future questions that will come up. We look forward to any feedback that can help create a better set of regional knowledge economy indicators to support the development of innovative regional economic strategies that help communities compete and succeed in the knowledge economy. Readers may visit our Web site (KnowledgePlanning.org) to provide direct feedback to our project team.

I. Regional Characteristics

Five types of data provide a demographic, physical, and economic context for understanding the knowledge economy Indicators developed for the three Northern Michigan regions, including: 1) population 2) land area, 3) population density, 4) unemployment rates, and 5) per capita income.

Population (2008)

	Northeast MI[1]	Northwest MI[2]	Eastern UP[3]	Total[4]	Michigan
Population	138,522	297,210	56,209	491,941	10,003,422
% of Michigan	1.38%	2.97%	0.56%	4.92%	100.00%

Source: *U.S. Census Bureau (2009).*

1. **Northeast Michigan** corresponds to the Northeast Michigan Council of Governments (NEMCOG) region of eight counties in the Lower Peninsula: Alcona, Alpena, Cheboygan, Crawford, Montmorency, Oscoda, Otsego, and Presque Isle.
2. **Northwest Michigan** corresponds to the Northwest Michigan Council of Governments (NWMCOG) region of ten counties in the Lower Peninsula: Antrim, Benzie, Charlevoix, Emmet, Grand Traverse, Kalkaska, Leelanau, Manistee, Missaukee, and Wexford.
3. The **Eastern Upper Peninsula** corresponds to the Eastern Upper Peninsula Regional Planning and Development Commission (EUPRPDC) region of three counties: Chippewa, Luce, and Mackinac.
4. The total corresponds to the sum of the three regions.

The total combined population of the three regions was less than 5% of the state's population of 10,003,422. (See Appendices A and B for county and city/village population data, respectively.)

Land Area (Sq Mi, 2007)

	Northeast MI	Northwest MI	Eastern UP	Total	Michigan
Land Area	4,810	4,733	3,486	13,029	56,804
% of Michigan	8.47%	8.33%	6.14%	22.94%	100.00%

Source: *U.S. Census Bureau (2009).*

The 13,029 square miles of the three regions account for nearly one-quarter of the state's total land area.

Population Density (Population/Square Mile, 2008)

	Northeast MI	Northwest MI	Eastern UP	Regional Avg	Michigan
Population Density	28.80	62.79	16.13	37.76	176.10

Source: *U.S. Census Bureau (2009).*

The population density of the three predominantly rural regions is less than 40 persons/sq. mi. The state's population density of 176.10 persons/sq. mi. is over four times greater.

Unemployment Rates (2008)

	Northeast MI	Northwest MI	Eastern UP	Michigan	Midwest[5]	U.S.
Unemployment Rate	11.23%	9.00%	10.33%	8.43%	6.47%	6.11%

Source: *Bureau of Labor Statistics, U.S. Department of Labor (2009).*

5. Midwest is defined as the EDA Chicago Region: Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin

Unemployment rates were higher for all three regions than the state of Michigan. Two regions' rates reached double-digits and far exceeded the national rate of 6.11% and the Midwest Region's rate of 6.47%

Per Capita Personal Income (2007)

	Northeast MI	Northwest MI	Eastern UP	Michigan	Midwest	U.S.
Per Capita Income	$24,529	$30,105	$22,996	$32,985	$36,696	$38,615

Source: *Bureau of Economic Analysis, U.S. Department of Commerce (2009).*

Per capita personal income for all three regions was significantly below the average Michigan per capita personal income in 2007. The Northeast and Eastern Upper Peninsula regions were 25-30% lower. The per capita personal income for all three regions was 22-40% lower than the national per capita personal income of $38,615.

II. Talent

Cultivation, retention and attraction of talent poses a critical challenge to Northern Michigan communities as talented residents are needed to become local entrepreneurs and provide leaders and skilled workers in the knowledge economy.

Talent indicators include seven measures of **High School Performance** and **Higher Education Attainment**. High school graduation rates and ACT composite scores were obtained for the over 60 public high schools in the three regions. Data on the number of certificates and degrees conferred by public colleges and universities in or near the three regions, including Northwestern Michigan College (Traverse City), North Central Community College (Petoskey), West Shore Community College (Ludington-Scottville), Alpena Community College (Alpena), Kirtland Community College (Roscommon), Bay Mills Community College (Brimley), and Lake Superior State University (Sault Ste. Marie), was also obtained.

Higher education, as pointed out by the Cherry Commission Report on Higher Education and Economic Growth (Lt. Governor's Commission on Higher Education and Economic Growth, 2004), "fosters the discovery of new ideas that create new goods, services, and whole industries" and builds "dynamic communities where creativity and culture create the quality of place that is critical to attracting (and retaining) knowledge jobs."

Moreover, no factor other than educational attainment has a statistically-significant impact on the expansion of the regional job or wage base, according to the U.S. Department of Commerce Economic Development Administration's 2003 report on Technology Transfer and Commercialization.

Certificates are defined here as 2-4 years, 1-2 years, less than 1 year, post baccalaureate, post-master's, and first-professional certificates. Degrees are defined as Associate's, Bachelor's, Master's, Doctor's, and professional. In addition, data on undergraduate, graduate, and professional student enrollments of northern Michigan residents at the 15 state universities was obtained.

Although formal education and training capacity are extremely important in the knowledge economy, communities should also keep in mind that non-traditional learning avenues can also be created for residents to acquire valuable skills and knowledge. On-the-job training

(OJT), for example, can be highly instrumental in providing specialized training to niche industry workers. Innovative mentoring arrangements, high school students taking college courses, and other options can be also used to cultivate, retain, and attract talent to local communities.

Specific talent attributes as identified by a recent Canadian report on science, technology, and innovation include leading-edge research skills; complex problem-solving skills; commitment to lifelong training and updating skills; ability to put new technology to work; leadership and entrepreneurship; ability to bring products, processes, and services to markets; and the ability to engage and cooperate at the international level.

As the regions re-design their EDA-required Comprehensive Economic Development Strategies (CEDS) to better align their priorities with the demands of the global knowledge economy, regional planners and stakeholders may want to evaluate these talent indicators and identify strategies to elevate education performance and attainment. This is an appropriate time to do that.

Talent: High School Performance

To compete successfully in the knowledge economy, a region must have the ability to cultivate a base of high school graduates. Indeed, President Barack Obama took this performance criteria to the next level. In an interview with the New York Times, the President stated "everybody should have at least one year of post-high-school training" while emphasizing "that part of the challenge is making sure that folks are getting in high school what they need as well" (Leonhardt, 2009).

The economic results of educational achievement are dramatic. The national average annual earnings for high school graduates ages 25-34 were $6,000 greater than those without a high school diploma in 2007. High school graduates ages 25-34 earned $29,000 per year (Planty, Kena, & Hannes, 2009).

Nationally, May, 2009 unemployment rates for those without a high school diploma climbed to 15.5% compared to 10.0% for those with high school diplomas and 4.8% for college graduates (Alini, & Lahart, 2009).

Public High School Graduation Rates (2007)

Public high school graduation rates are calculated by the Michigan Department of Education based on "tracking individual students from the time they were enrolled as first-time ninth-graders" (Center for Educational Performance and Information, n.d.). This tracking system accounts for students who complete high school in four years, transfer, are held back, or leave school and later return.

	Northeast MI	Northwest MI	Eastern UP	Michigan
H. S. Graduation Rate	80.67%	85.67%	75.17%	76.73%

Source: *Four-Year Cohort Graduation and Dropout Reports, Michigan Center for Educational Performance and Information (2009).*

With both the Northwest and Northeast regions' graduation rates reaching 80% or greater, these regions are competitive with the top rates in the country. Wisconsin has the highest reported rate at 87.5% (just thirteen other states have rates of 80% or better). The Northwest's 86% outperforms the statewide rate by nearly nine percentage points and the Northeast's rate of 80.7% is four percentage points better. The Eastern Upper Peninsula's rate of 75.2% is just one and a half percentage points below the statewide rate.

The regions, even with these commendable rates, may want to consider increasing high school graduation rates as a strategic objective.

ACT Scores (2008)

All 11th-grade public school students in the state are required to take the Michigan Merit Examination that includes the ACT Plus Writing. Only two other states (Colorado and Illinois) require all public high school students to take the

ACT. The ACT Plus Writing test is used by many U.S. college admissions offices to evaluate applicants.

ACT Composite Scores (Range: 1-36)

	Northeast MI	Northwest MI	Eastern UP	Michigan
ACT Composite Score	18.8	19.5	18.4	18.8

Source: *Michigan Merit Examination Data Files, Michigan Office of Educational Assessment and Accountability (2009).*

The regions compare well with the overall state ACT scores. Northeast Michigan's ACT composite scores equal the statewide scores and Northwest Michigan's scores exceed the statewide scores. The Eastern Upper Peninsula's scores lagged slightly behind the statewide scores.

ACT Writing Scores (Range: 2-12)

	Northeast MI	Northwest MI	Eastern UP	Michigan
ACT Writing Score	6.5	6.6	6.3	6.6

Source: *Michigan Merit Examination Data Files, Michigan Office of Educational Assessment and Accountability (2009).*

The regions also compare well with the overall state ACT Writing scores. Northwest Michigan's writing scores are equal to the average state score. Northeast Michigan and the Eastern Upper Peninsula lag slightly behind the statewide average, by 0.1 and 0.3, respectively.

Talent: Higher Education Attainment

The knowledge economy relies heavily on a college-educated workforce. Reliance on college-educated workers can only be expected to increase in the future as knowledge and learning skills assume an increasingly greater economic role. The current Administration has set a goal that by 2020 the U.S. will have the highest proportion of college graduates to compete for high-tech, high-wage jobs. Community colleges, universities, and other higher education institutions, then, are an important source and gauge of talent.

The number of students from each region receiving degrees, independent of where they earn those degrees, is an important talent indicator. A key concern, however, is that many students do not return to their home communities after obtaining their college degrees. Those who do return bring critical knowledge skills that can be used to contribute to their regional economies and communities.

Michigan ranked 31st in the nation for the percentage of 25-34 year-olds with a bachelors degree or higher. That is 2 percentage points below the national average (27.1% vs. 29.1%), according to the 2007 U.S. Census Bureau American Community Survey. In the 2000 Census, Michigan ranked 30th in that category. That was 1.5 percentage points below the national average (26.0% vs. 27.5%). This lag in higher education performance challenges the state to ramp up its educational opportunities so that all Michigan residents can attain higher levels of achievement.

It should be noted that comparing the regions' performances to statewide higher education data may be misleading in that the state's performance is below the national average. Michigan ranks in the bottom 25. That is, regional performance levels at or lower than state performance levels put those regions at a disadvantage relative to other areas in the U.S. and the world.

Certificates Conferred in the Regions (2006)

Certificates are conferred for completing programs of up to four years. First-professional certificates, post-baccalaureate, and post-master's are granted by colleges and universities. Certificates for completing vocational training programs typically lack general requirements (e.g., English or Math courses) and take less time to complete. The data reported here includes certificates conferred on students who reside outside the respective regions.

	Northeast MI	Northwest MI	Eastern UP	Michigan
Certificates	304	162	56	20,922
Per 1,000 population	2.19	0.55	1.00	2.09

Source: *National Center for Education Statistics, U.S. Department of Education (2009).*

Community and private colleges offering various certificate programs play an important role in Northern Michigan's knowledge economy. Northeast Michigan's level of certificates adjusted for population exceeds the statewide level. The Eastern Upper Peninsula and Northwest Michigan levels of conferred certificates are significantly below the statewide level. Regions may want to further investigate these performance levels to identify specific issues associated with improving these levels that can be addressed through targeted strategies.

College Degrees Conferred in the Regions (2006)

Degrees include Associate's, Bachelor's, Master's, Doctor's, and professional degrees conferred by colleges and universities. As above, this data includes degrees conferred on students who reside outside the respective regions.

	Northeast MI	Northwest MI	Eastern UP	Michigan
Degrees	633	1,035	680	103,183
Per 1,000 population	4.57	3.48	12.03	10.31

Source: *National Center for Education Statistics, U.S. Department of Education (2009).*

Neither Northeast nor Northwest Michigan has a four-year state university, which may account for their lower numbers of college degrees conferred per 1,000 compared to the Eastern Upper Peninsula. The Eastern UP, on the other hand, has Lake Superior State University in Sault Ste. Marie. Northeast and Northwest Michigan lag significantly below the statewide level of college degrees conferred while the Eastern UP exceeds it. Given the regions' quality levels of high school performance, regions may want to consider strategies to improve their performance in the conferring of college degrees.

Student Enrollment by Region at Michigan Public Universities

Michigan's 15 public universities report their undergraduate and graduate student enrollments for each county (based on students' home addresses prior to enrollment).

Undergraduate Enrollment in MI Public Universities (2008)

	Northeast MI	Northwest MI	Eastern UP	Michigan
Enrollment	2,230	6,247	1,610	234,780
Per 1,000 population	16.10	21.02	28.64	23.47

Source: *Grand Valley State University, Office of Institutional Analysis (2009).*

The higher Eastern UP undergraduate enrollment corresponds to being the only region of the three that is home to a four-year state university, Lake Superior State University, in Sault Ste. Marie. Northwest Michigan lags slightly; Northeast Michigan lags significantly behind.

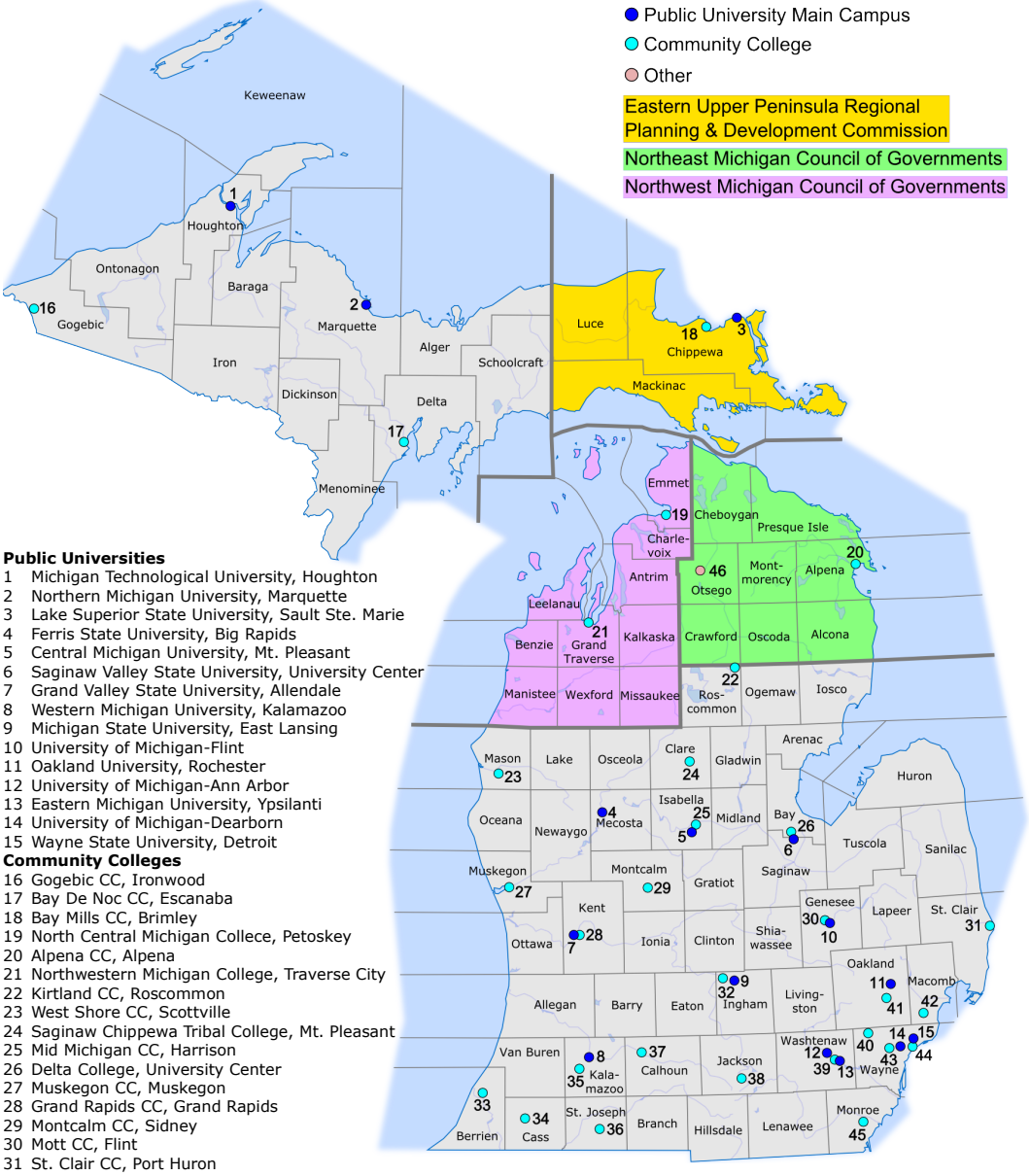
Graduate/Professional Enrollment in MI Public Universities (2008)

	Northeast MI	Northwest MI	Eastern UP	Michigan
Enrollment	342	1,106	214	55,113
Per 1,000 population	2.47	3.72	3.81	5.51

Source: *Grand Valley State University, Office of Institutional Analysis (2009).*

All three regions lag behind the statewide level of graduate/professional enrollments in state public universities with Northeast Michigan lagging most seriously.

Figure 2. **Public Universities and Community Colleges in Michigan**



Public Universities
1 Michigan Technological University, Houghton
2 Northern Michigan University, Marquette
3 Lake Superior State University, Sault Ste. Marie
4 Ferris State University, Big Rapids
5 Central Michigan University, Mt. Pleasant
6 Saginaw Valley State University, University Center
7 Grand Valley State University, Allendale
8 Western Michigan University, Kalamazoo
9 Michigan State University, East Lansing
10 University of Michigan-Flint
11 Oakland University, Rochester
12 University of Michigan-Ann Arbor
13 Eastern Michigan University, Ypsilanti
14 University of Michigan-Dearborn
15 Wayne State University, Detroit

Community Colleges
16 Gogebic CC, Ironwood
17 Bay De Noc CC, Escanaba
18 Bay Mills CC, Brimley
19 North Central Michigan Collece, Petoskey
20 Alpena CC, Alpena
21 Northwestern Michigan College, Traverse City
22 Kirtland CC, Roscommon
23 West Shore CC, Scottville
24 Saginaw Chippewa Tribal College, Mt. Pleasant
25 Mid Michigan CC, Harrison
26 Delta College, University Center
27 Muskegon CC, Muskegon
28 Grand Rapids CC, Grand Rapids
29 Montcalm CC, Sidney
30 Mott CC, Flint
31 St. Clair CC, Port Huron
32 Lansing CC, Lansing
33 Lake Michigan College, Benton Harbor
34 Southwestern Michigan College, Dowagiac
35 Kalamazoo Valley CC, Kalamazoo
36 Glen Oaks CC, Centreville
37 Kellogg CC, Battle Creek
38 Jackson CC, Jackson
39 Washtenaw CC, Ann Arbor
40 Schoolcraft College, Livonia
41 Oakland CC, Bloomfield Hills
42 Macomb CC, Warren
43 Henry Ford CC, Dearborn
44 Wayne County CC, Detroit
45 Monroe County CC, Monroe

Other
46 University Center at Gaylord & Kirtland CC M-TEC

Source: *Longitudinal Employer-Household Dynamics, U.S. Census Bureau (2009).*

III. Innovation Capacity

Innovation drives the knowledge economy. Innovation provides the competitive advantage to those firms and entrepreneurs who act boldly and imaginatively with diligent purpose and focus. An innovation is the implementation of a new or significantly-improved product, process, marketing approach, or organizational method. It requires careful analysis of the needs and capabilities of the intended users (Drucker, 1985). Innovations may be grouped in four ways:

1. **Product innovations** are those introductions of new or significantly-improved goods or services, and may include significant improvements in technical specifications, components and materials, software, user friendliness, or other functional characteristics. Product innovations can be based on new uses or combinations of existing knowledge or technologies.

2. **Process innovations** implement improved production or delivery methods, and include changes in techniques, equipment, and/or software.

3. **Marketing innovations** involve changes in product design or packaging, promotion, or pricing. Such innovations are aimed at opening up new markets and/or new positioning of a firm's product to increase sales.

4. **Organizational innovations** are new methods in a firm's business practices, workplace organization, or external relations. Such innovations are intended to increase a firm's performance by reducing transaction costs, gaining access to non-tradable assets, or reducing supply costs.

This innovation typology (product, process, marketing, and organizational) was compiled by Rajnish Tiwari (2008) of the Hamburg University of Technology and based on the **Organisation for Economic Co-operation and Development**'s (OECD) 2005 Oslo Manual on The Measurement of Scientific and Technological Activities.

It is important to note that innovation is increasingly a function of collaboration as pointed out in a 2008 Information Technology and Innovation Foundation report (Block & Keller, 2008). In today's world, collaboration is critical to private sector innovation. Such collaboration underscores the critical role of government agencies, federal labs, and

research universities. Public agencies and institutions of higher learning can act as critical partners and/or catalysts in the innovation process. Innovation is fundamental to future economic productivity and community prosperity. Meaningful measures of collaboration on a regional level need to be developed. National indicators that measure innovations do not lend themselves to regional aggregation.

A Toronto newspaper declared "Innovate or Perish" in reporting on the recent release of a Canadian government report on the state of science, technology, and innovation in Canada (Campion-Smith, 2009). This succinctly sums up the pivotal position of innovation in the global knowledge economy. And innovation is indeed a global economic phenomenon. South Korea, for example, may be a relatively small country with limited natural assets but its leadership fully understands the innovation imperative. The Boston Consulting Group ranks South Korea first in its 2009 International Innovation Index (Andrew, DeRocco, & Tayor, 2009). The U.S. ranks eighth in the overall Index behind Finland, Hong Kong, Switzerland, among others, but second in the large-country ranking.

A community's capacity to nurture and support innovation is a key indicator of its competitive position in the global knowledge economy.

The indicators of Innovation Capacity include **Patents**, **Venture Capital**, and **High-Tech Sector Performance**.

Innovation Capacity: Patents

Patents provide a direct but imprecise measurement of innovation as many of the patents issued do not result in new business applications. Innovation in its economic context refers to business applications of new inventions, processes, and ideas.

Patents Issued (2007)

	Northeast MI	Northwest MI	Eastern UP	Michigan
Patents Issued	5	41	2	3,695
Per 1,000 population	0.04	0.14	0.04	0.37

Source: *U.S. Patent and Trademark Office (2009).*

The absence of a major research university or large private sector R & D facilities in the regions accounts, at least in part, for the lagging numbers of patents issued. Again, this is an imprecise measurement of innovation.

Innovation Capacity: Venture Capital

Venture capital provides private-sector funding for innovative company start-ups and product development. Venture capital investments represent high-risk, high-reward financial activities aimed at making profits when companies go public (IPOs, or initial public offerings) or are acquired. There are currently 882 venture capital firms in the U.S., down from 1,019 in 2007, according to the National Venture Capital Association (Tam, 2009).

In 2008, venture capitalists invested $244.0 million in Michigan firms and $1.4 billion in the Midwest (compared to $10.9 billion in Silicon Valley and $3.3 billion in New England). The Midwest includes Illinois, Missouri, Indiana, Kentucky, Ohio, Michigan, and western Pennsylvania in this report. For the first quarter of 2009, the level of investment in the Midwest dropped to $121.6 million from $228.8 million in the first quarter of 2008 (PricewaterhouseCoopers, 2009). There were no venture capital investments made in the three Northern Michigan regions in 2008, according to PricewaterhouseCoopers MoneyTree data.

In addition to funding, "management expertise provided by venture capitalists can assist the growth and development of small companies and new products and technologies," according to the National Science Foundation's Science and Engineering Indicators 2006 (National Science Board, 2006) report, "especially in the formation and expansion of small high-technology companies."

Venture Capital Firms (2008)

Data on the number of venture capital firms located in the respective regions is not one of the stronger indicators. For one, venture capital is one of several types of risk capital, that also include R&D, pre-seed, seed, and mezzanine capital. These types of capital can be delivered by universities and federal labs, pre-seed and seed funds, angel investors, venture funds, or mezzanine funds. Angel investors are particularly important in the earliest stages of a firm's development.

	Northeast MI	Northwest MI	Eastern UP	Michigan
Venture Capital Firms	0	3	0	54
Per 1,000 population	0.00	0.01	0.00	0.01

Source: *Michigan Business/Organization Directory (Venture Capital specialty), Michigan Economic Development Corporation (2009).*

Limited access to capital represents one of the key barriers to economic development in rural regions. This table amply illustrates this difficulty.

Innovation Capacity: High-Tech Sector

The high-tech sector is at the core of the knowledge economy. The National Science Foundation relies on the Organisation for Economic Co-operation and Development (2005) definition of the high-technology sector. The sector "includes those science-based industries that manufacture products while performing above-average levels of R&D—aerospace, pharmaceuticals, computers and office machinery, communication equipment, and scientific (medical, precision, and optical) instruments." The high-tech sector frequently provides products and services used by other knowledge economy businesses. High-tech jobs are typically higher-paying, and often require college degrees or other types of formal training to assure that workers can apply advanced skills and knowledge to innovate new products, processes, and marketing approaches.

Defining the High-Tech Sector

Defining the scope of high-technology industries is challenging. To meet this challenge, extensive data from multiple sources was reviewed and evaluated: the 2008 State New Economy Index (Atkinson & Andes, 2008); 2007 Index of the Massachusetts Innovation Economy (Larkin, Tavilla, & Krispert, 2007); Information Technology in Minnesota: From Big Iron to Blue Gene and Xbox 360 (Fendos, 2008); Michigan's Transition to a Knowledge-Based Economy (Glazer & Grimes, 2008); and High-technology employment: a NAICS-based update (Hecker, 2005).

The North American Industrial Classification System (NAICS) was developed in 1997 and focuses on how products and services are created rather than on what is produced as the Standard Industrial Classification (SIC) does. NAICS codes were revised in 2002 and 2007. (See Appendix D for two-digit NAICS codes.)

As a practical matter for purposes of this project, high-tech categories include computing services, telecommunications, research, a number of manufacturing industries, and the sciences. The following NAICS codes were identified as high-tech: 1131, 1132, 211, 2211, 324, 3251, 3252, 3253, 3254, 3255, 3259, 3332, 3333, 3336, 3339, 334, 3353, 3364, 3369, 4234, 486, 5112, 5152, 517, 518, 519, 521, 5232, 5413, 5415, 5416, 5417, 55, 5612, 8112, and federal government excluding postal services.

The following three indicators are among the strongest performance indicators in the knowledge economy developed for this assessment. More time and resources were expended in developing this set of indicators than any other indicators in this assessment.

High-Tech Firms (2008)

	Northeast MI	Northwest MI	Eastern UP	Michigan
High-Tech Firms	162	598	55	18,177
Per 1,000 population	1.17	2.01	0.98	1.82

Source: *Custom data tabulation provided by the Labor Market Information, Michigan Department of Energy, Labor, & Economic Growth (2009).*

Northwest Michigan exceeds the statewide level of high-tech firms per 1,000 population while Northeast Michigan and the Eastern Upper Peninsula lag significantly.

High-Tech Jobs (2008)

	Northeast MI	Northwest MI	Eastern UP	Michigan
High-Tech Jobs	1,556	5,452	496	353,842
Per 1,000 workers	24.36	34.92	18.63	71.69

Source: *Custom data tabulation provided by the Labor Market Information, Michigan Department of Energy, Labor, & Economic Growth (2009).*

All three regions lag below the statewide level of high-tech jobs per 1,000 workers, with Northwest Michigan performing at a higher level than the other two regions.

Annual High-Tech Wages (2008)

	Northeast MI	Northwest MI	Eastern UP	Michigan	All Jobs (MI)
Annual High-Tech Wage	$50,587	$54,013	$56,611	$76,216	$43,896

Source: *Custom data tabulation provided by the Labor Market Information, Michigan Department of Energy, Labor, & Economic Growth (2009).*

This indicator illustrates the high value of high-tech jobs with statewide high-tech wages exceeding all types of wages by over $32,000. Although regional high-tech wages are less than the statewide high-tech wages, they clearly provide a substantial living wage of over $50,000 per year in each region.

IV. Knowledge Sector Jobs

The effective deployment of knowledge-based jobs results in productivity gains and competitive market advantage. Clustering of firms that take advantage of networking and innovation platforms can advance regional economies. Creating new knowledge jobs will result from nurturing strong networks and clusters based on the existing economic, social, and natural assets of the regions. Indicators of Knowledge Jobs include **Information and Communications Technology (ICT) Jobs** and **Health Care Jobs**.

The Information and Communications Technology (ICT) sector has emerged from the rapid transformation of the Information Technology (IT) sector since 2000. This transformation reflects, in part, the huge role of the Internet in the creation and functionality of the knowledge and network economy that is replacing the traditional economy. The ICT world is primarily one of Web sites and URLs in addition to streets and roads and postal ZIP codes. It is a world of instantaneous communications and dynamic 24/7 networks.

Health care jobs, too, require significant levels of knowledge and education and the demand for health care workers is expanding. This growth sector is vital to the future of the Northern Michigan economy.

The shift toward jobs that require workers with greater analytical and interactive skills will intensify, and as a result, the need for some post-secondary education will also intensify (Council of Economic Advisers, 2009).

Knowledge Sector Jobs: ICT Jobs

Information and communications technology (ICT) provides the circulatory system which knowledge economy businesses must have to breathe and function. Providing vital services like high-speed Internet access, telecommunications services, data networks, and computer software development and support is critical. The ICT sector can serve as a bellwether in spite of its relatively small workforce. Beyond actual numbers of jobs, this indicator may also suggest the extent of connectivity between local businesses and the global networking of the knowledge economy. It is this networking that fuels the exponential rates of innovation diffusion and results in the vast economic power of instantaneous 24/7 global communication.

Defining Information & Communications Technology Jobs

The information and communications technology (ICT) cluster consists of cable television, telecommunications (including Internet service providers), computer services and design, and information services (NAICS codes 5152, 517, 518, 519, and 5415).

ICT Jobs (2008)

	Northeast MI	Northwest MI	Eastern UP	Michigan
ICT Jobs	170	866	49	68,742
Per 1,000 workers	2.66	5.55	1.84	13.93

Source: *Custom data tabulations provided by Labor Market Information, Michigan Department of Energy, Labor, & Economic Growth (March, 2008).*

All three regions lag behind the state level of ICT jobs. Northwest Michigan leads the other two regions in ICT jobs but has proportionately 60% less than the state level.

Annual ICT Wages (2008)

	Northeast MI	Northwest MI	Eastern UP	Michigan	All Jobs (MI)
Annual ICT Wage	$55,214	$55,127	$57,162	$67,724	$43,896

Source: *Custom data tabulations provided by Labor Market Information, Michigan Department of Energy, Labor, & Economic Growth (March, 2008).*

ICT wages in the three regions are significantly higher than the average statewide wage. The highest average ICT wage is in the Eastern Upper Peninsula followed by Northeast and Northwest Michigan, respectively.

Knowledge Sector Jobs: Health Care Jobs

Health care, with over 463,000 jobs, is currently the largest knowledge economy sector in Michigan's workforce of 4.8 million. In the overall state economy, only the manufacturing (NAICS codes 31-33) and retail industry sectors (NAICS codes 44-45) account for a greater proportion of employment. Health care providers in the three regions have expressed concern about their ability to attract sufficient numbers of skilled professionals to fill open positions. Moreover, health care practitioners and technicians on the national level are expected to be in increasing demand as are medical records and health information technicians (Council of Economic Advisers, 2009).

Defining Health Care Jobs

Health care is grouped with social assistance at the broadest NAICS code level (62). However, Health Care is defined more specifically here by using NAICS codes 621-623 (ambulatory health care services, hospitals, and nursing and residential care facilities).

Health Care Jobs (2007)

	Northeast MI	Northwest MI	Eastern UP	Michigan
Health Care Jobs	5,614	15,900	1,491	463,863
Per 1,000 workers	87.91	101.84	55.99	104.97

Source: *Local Employment Dynamics, U.S. Census Bureau (2009).*

Northwest Michigan has the greatest number of health care jobs and approaches the state average per 1,000 workers.

Annual Health Care Wages (2007)

	Northeast	Northwest	Eastern UP	Michigan	All Jobs (MI)
Annual Health Care Wage	$40,171	$44,708	$36,389	$41,606	$43,896

Source: *Local Employment Dynamics, U.S. Census Bureau (2009).*

Annual average health care wages in all three regions lag behind the average state health care wage. Health care job wages are also lower than the overall average job wage in the state. Health care job wages in Northwest Michigan are the highest and exceed the state average for this indicator. Eastern Upper Peninsula and Northeast Michigan health care wages lag significantly behind the state average for this industry sector.

V. Digital Economy

The Digital Economy refers to those economic and other activities "enabled by" the Internet and information technology (IT). Direct measures of the digital economy, then, would include retail sales via e-commerce and business-to-business (B2B) e-commerce. Such data is not available at the state or sub-state level. Measures of IT adoption by economic sector would be an extremely useful indicator of the extent of transformation to the digital economy. The adoption of IT in the health care sector or the extent of public sector use of IT would provide ideal indicator measures. Again, this data is not available.

In the 21st century global knowledge economy, access to the global information network is critical to a region's economic success. According to the Committee for Economic Development (2001), "the commercial use of the Internet and associated technologies is a major factor in raising productivity growth, which is the key to raising incomes. Higher productivity growth produces large economic and social benefits when sustained over a long period." The use of the Internet in many service sectors improves efficiency by cutting out the "middle-man" in most transactions, and by allowing firms to provide products and services to customers much farther away.

The importance of the digital economy is unquestionable. Nationally, venture investment of $4.9 billion in Internet-specific companies (those fundamentally dependent on the Internet) represented 17% of all venture capital dollars in 2008, according to the National Venture Capital Association. The digital economy cuts across all traditional economic sectors, including retail, manufacturing, tourism, finance, and others.

Indicators of the Digital Economy that are used here include surrogate measures, **High-Speed Internet Access** and **Wireless Hotspots**.

Digital Economy: High-Speed Internet Access

High-speed Internet, or broadband, access provides critical knowledge economy infrastructure. It is estimated that for each percentage point increase in broadband penetration, employment willincrease 0.2-0.3% per year. This suggests an increase of 300,000 jobs on the national level (Crandall, Litan, & Lehr, 2007). A 10% increase in broadband coverage, then, could result in an increase of 290-440 jobs in the 21 counties of Northern Michigan based on a current workforce of 14,500.

An ideal indicator of the digital economy would be the current number of actual broadband subscribers by location. However, service providers refuse to disclose this data (although this may change with the data collection mandates included in the 2009 American Recovery and Reinvestment Act). Not knowing the extent of broadband penetration is a severe problem that undermines efforts in numerous rural areas across the country to provide broadband service. As broadband is the backbone of the knowledge economy, this is a hugely significant area to measure. To provide surrogate measures of the digital economy, the project team obtained data on high-speed Internet providers and wireless hotspots.

High-Speed Internet Access Providers (By Zip Code, 2007)

Federal Communications Commission (FCC) data on the number of high-speed Internet service provider holding companies with at least one subscriber in a zip code was obtained.

	Northeast MI	Northwest MI	Eastern UP	Michigan
High-Speed Internet Access Providers	6.36	6.67	4.36	8.01

Source: *Zip Codes by Number of High-Speed Service Providers, Federal Communications Commission (2009).*

This measure clearly does not provide meaningful subscriber data. However, the data suggests, as limited as it is, that high-speed Internet service providers are not as active in the three regions as they are in other parts of the state.

Digital Economy: Wireless Hotspots

Wireless Hotspots (2008)

Providers of wireless hotspots (locations with wireless Internet access) want the public to access their service locations to increase their business. Two wireless providers, AT&T and T-Mobile, provide complete listings of their wireless hotspots on their Websites. This data was obtained from those Web sites. However, other businesses (commercial networks and independent establishments) also provide wireless services.

	Northeast MI	Northwest MI	Eastern UP	Michigan
Wireless Hotspots	12	32	8	864
Per 1,000 sq mi	2.50	6.76	2.30	15.21

Source: *AT&T and T-Mobile Websites (2009).*

The data in this table represents only a fraction of the actual number of wireless hotspots. Wireless hotspots provide an important service to consumers and businesses in the digital economy. Hotspots may be particularly important in the three regions where broadband penetration is spotty.

VI. Globalization

The global economy refers to the phenomenon of information, money, capital markets, production systems, and management systems working as an integrated unit on a global scale in real time (Castells, 2001). Globalization, then, refers to more than traditional trade. Interconnectedness and interdependence across national borders creates demand for services and information as well as goods. Globalization implies opening local or nationalistic perspectives to embrace a broader outlook on this vital interconnectedness and inter-dependence.

In his seminal book, The World is Flat, Thomas Friedman (2005) portrays the world as having become a level playing field as a result of instantaneous communication via the Internet, the pervasiveness of computers, and Moore's Law where computer technology is outmoded every 18 months. Anyone, anywhere on the planet can compete as long as they have a computer and Web access. Where vertical organization served the traditional economy, successful companies now operate and collaborate horizontally. Collaboration with other companies can add value and leverage innovations. Increased communication capacity and better access to global markets can bring a wider range of goods and services to greater numbers of consumers.

A global orientation provides one avenue to expand markets for a region's products. Local leaders may want to consider advancing the economic interests of their regions by working with companies to extend their market reach and compete in global markets. This includes companies and entrepreneurs that are creating and competing in niche markets.

Indicators of Globalization include **Air Travel Passengers**, **H-1B Visas**, **Exports**, **Foreign Trade Zones**, and **Imports**.

Globalization: Air Travel Passengers

In the knowledge economy, the ability to travel quickly and economically remains important. Most businesses prefer their facilities to be located at sites where air travel is convenient and inexpensive.

Airport Enplanements (Domestic and International, 2007)

The Federal Aviation Administration (FAA) publishes annual enplanement data (the number of passengers boarding airplanes) for all U.S. airports.

	Northeast MI	Northwest MI	Eastern UP	Michigan
Enplanements	7,657	251,408	13,879	20,084,509
Per 1,000 population	55.28	845.89	246.92	2,007.76

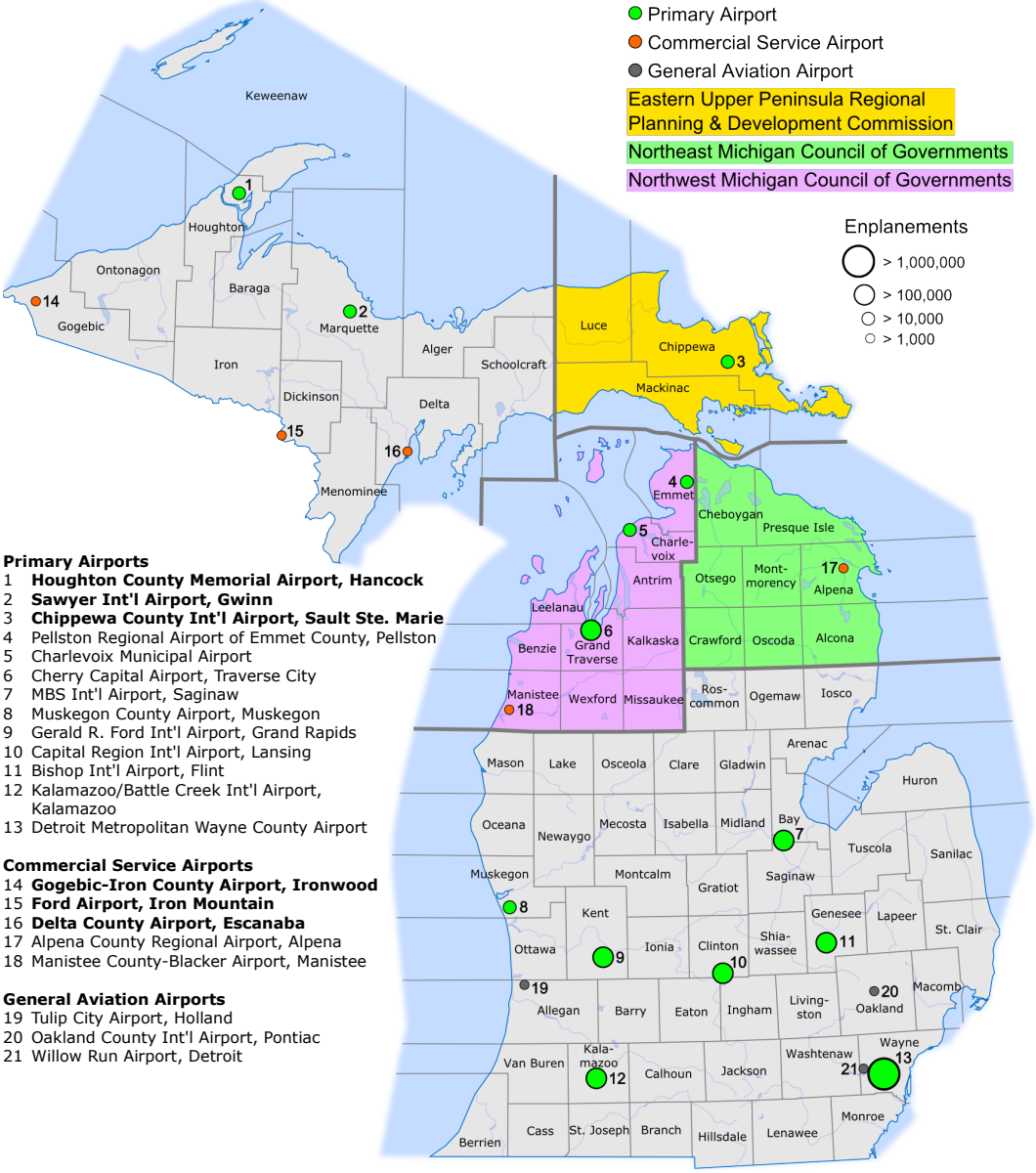
Source: *Passenger Boarding and All-Cargo Data, Federal Aviation Administration (2009).*

The number of enplanements in Northwest Michigan is significantly higher than the other two regions. In 2007, Traverse City's Cherry Capital airport ranked fifth in the number of enplanements, behind only Detroit, Grand Rapids, Flint, and Lansing, and ahead of Kalamazoo.

In 2007, 17.5 million passengers boarded planes at Detroit Metropolitan Airport, accounting for over 87% of enplanements in the state. Many of these passengers, however, do not originate from the state. As a major Delta (formerly Northwest) Airlines hub, large numbers of Metro Detroit passengers are simply transferring planes.

If the number of enplanements of passengers originating in Michigan were used, then the number of state enplanements per 1,000 would be considerably less than 2,007.76 per 1,000. Northwest Michigan's 845.89 per 1,000, then, may lag behind state-originated enplanements per 1,000 less than it appears.

Figure 3. **Airports in Michigan**



Primary Airports
1 **Houghton County Memorial Airport, Hancock**
2 **Sawyer Int'l Airport, Gwinn**
3 **Chippewa County Int'l Airport, Sault Ste. Marie**
4 Pellston Regional Airport of Emmet County, Pellston
5 Charlevoix Municipal Airport
6 Cherry Capital Airport, Traverse City
7 MBS Int'l Airport, Saginaw
8 Muskegon County Airport, Muskegon
9 Gerald R. Ford Int'l Airport, Grand Rapids
10 Capital Region Int'l Airport, Lansing
11 Bishop Int'l Airport, Flint
12 Kalamazoo/Battle Creek Int'l Airport, Kalamazoo
13 Detroit Metropolitan Wayne County Airport

Commercial Service Airports
14 **Gogebic-Iron County Airport, Ironwood**
15 **Ford Airport, Iron Mountain**
16 **Delta County Airport, Escanaba**
17 Alpena County Regional Airport, Alpena
18 Manistee County-Blacker Airport, Manistee

General Aviation Airports
19 Tulip City Airport, Holland
20 Oakland County Int'l Airport, Pontiac
21 Willow Run Airport, Detroit

Source: *Passenger Boarding and All-Cargo Data, Federal Aviation Administration (2009).*

Globalization: H-1B Visas

The ability to employ legal foreign workers (those who are not immigrating to the U.S. to establish permanent residence) in specialized job positions has become increasingly important, albeit controversial, in the knowledge economy. These workers are directly linked to knowledge economy activity as H-1B work visas are typically granted to workers in the health, technology, and science sectors and universities.

H-1B Visas Granted (2007)

To qualify for an H-1B visa, a foreign worker must have a bachelor's degree, or equivalent, and be needed to perform high-skill tasks in a technology-heavy industry. The Foreign Labor Certification Data Center maintains a database of all electronically-filed H-1B visa applications (e-applications accounted for over 90% of applications in 2004). A maximum of 65,000 H-1B visas are annually granted.

Visa locations are based on the primary location of the job opening, not the worker's place of residence. Only those visas with a primary work site that could be located are included.

	Northeast MI	Northwest MI	Eastern UP	Michigan
H-1B Visas Granted	98	10	8	7,420
Per 1,000 population	0.71	0.03	0.14	0.74

Source: *Online Wage Library, Foreign Labor Certification Data Center (2009).*

The number of Northeast Michigan's H-1B visas granted is close to the statewide level per 1,000 population. Northwest Michigan and the Eastern Upper Peninsula numbers of H-1B visas are negligible, both in absolute terms and compared to the statewide level.

Globalization: Exports

In the highly-interconnected global marketplace that characterizes the knowledge economy, import and export trade activity (measured by value) represents a key market opportunity. Bi-lateral Michigan-Canada trade amounted to $58.9 billion in 2008. Michigan's exports to Canada were valued at $19.1 billion and Michigan imported $39.8 billion worth of goods from Canada. This is a significant drop-off from 2007 when bi-lateral trade was over $77 billion. In 2007, Michigan's exports to Canada were valued at $24.9 billion, and Michigan imported $53 billion worth of goods from Canada. Canada remains Michigan's and the U.S.' leading trading partner.

Northern Michigan regions can take steps to trade in the global market place by exporting and/or importing goods to and from Canada. Michigan's high-volume land traffic connections to Canada include the International Bridge connecting Sault Ste. Marie to its sister city in Ontario. This land connection along with those at Detroit and Port Huron made the state's transport network the major entry route for Canadian goods entering any U.S. market in 2008. This transport network access provides excellent opportunities for exporting and importing firms, and logistics facility and transport firms.

Exports to Canada (in millions of dollars, 2008)

No data was available for any port of entry in Northwest Michigan. Limited data for Northeast Michigan and the Eastern Upper Peninsula was obtained.

	Northeast MI	Northwest MI	Eastern UP	Michigan
Exports to Canada	$0.04	N/A	$225.34	$18,340.17

Source: *Research and Innovative Technology Administration, Bureau of Transportation Statistics, U.S. Department of Transportation (2009).*

The Eastern Upper Peninsula exported about $225 million in goods to Canada, compared to Northeast Michigan's export value of $40,000 in 2008. Export opportunities could be substantial.

Globalization: Foreign Trade Zones

Foreign Trade Zones (FTZs) are federally-designated areas in the U.S. where merchandise is treated as being outside the country. This merchandise may be assembled, tested, relabeled, processed, mixed, or repackaged. Important economic advantages include 1) cash flow savings from deferring customs duties and excise taxes until the merchandise is shipped from the zone to a U.S. market; and 2) allowing the manufacture, manipulation, or assembly of articles using imported components and paying a lower duty rate for the finished articles than a firm would have paid on the individual components. Firms can warehouse their goods at U.S. locations near their markets or distribution centers, while keeping inventory costs down. If goods are exported from the zone, no duties or taxes are owed. These zones provide a clear advantage to a region in developing its global markets.

Foreign Trade Zones (2009)

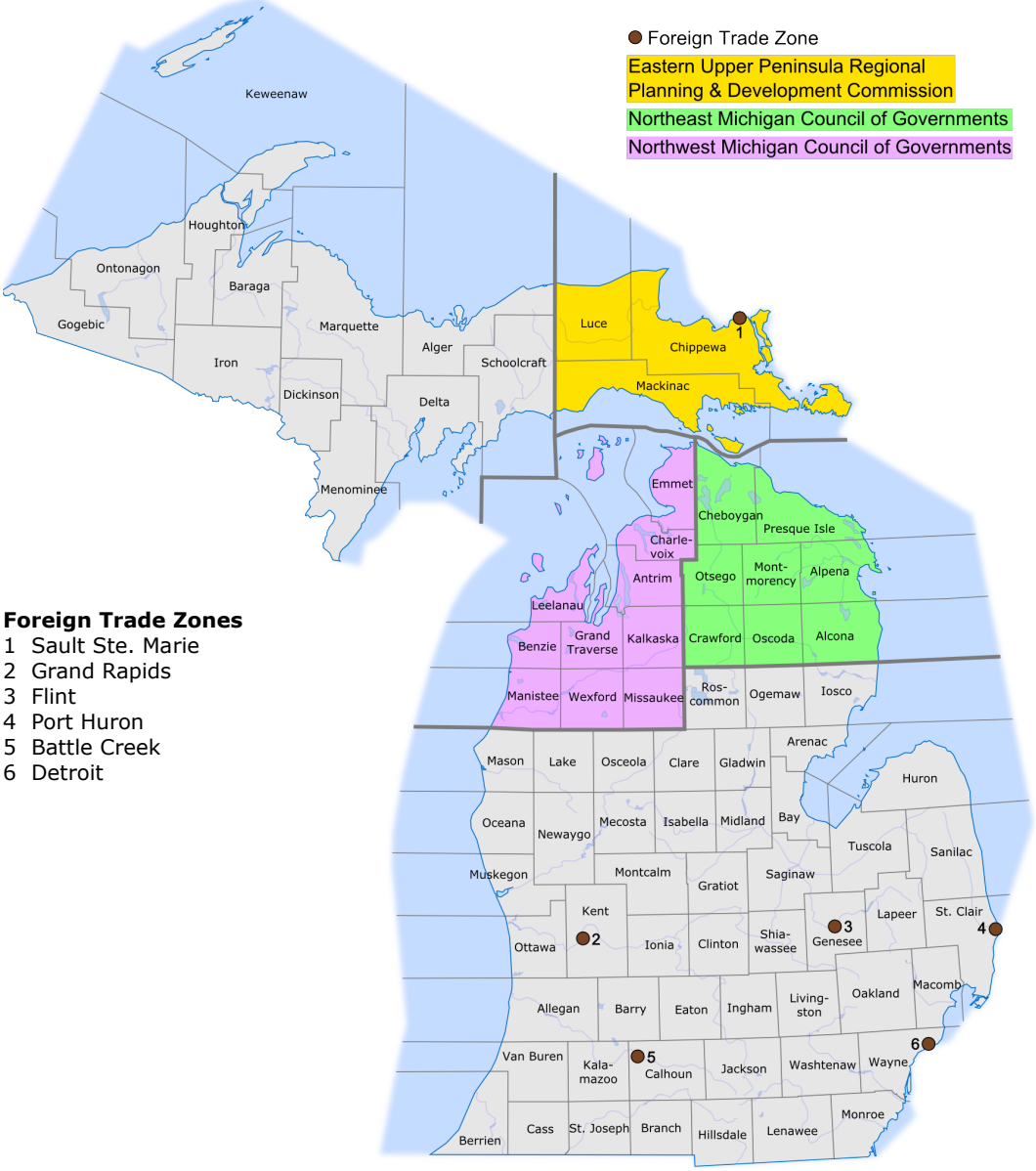
Foreign Trade Zones are licensed by the Foreign Trade Zones Board, (composed of the U.S. Secretaries of Commerce and Treasury, respectively), housed in the Import Administration of the International Trade Administration, U.S. Department of Commerce. There are approximately 250 Foreign Trade Zones in the United States.

	Northeast MI	Northwest MI	Eastern UP	Michigan
Foreign Trade Zones	0	0	1	6

Source: *List of Foreign-Trade Zones by State, Import Administration, International Trade Administration (2009).*

Michigan's six Foreign Trade Zones are located in Sault Ste. Marie, Detroit, Port Huron, Flint, Grand Rapids, and Battle Creek. Foreign Trade Zones can act as magnets to attract businesses that seek global markets. The Eastern Upper Peninsula is the only region taking advantage of this economic development tool that provides Northern Imports, LLC with FTZ advantages. The recent economic downturn forced Northern Imports into bankruptcy; however, Northern Imports plans on reopening and continuing business. The other regions may want to consider the benefits afforded by Foreign Trade Zones.

Figure 4. **Foreign Trade Zones in Michigan**



Foreign Trade Zones
1 Sault Ste. Marie
2 Grand Rapids
3 Flint
4 Port Huron
5 Battle Creek
6 Detroit

Source: *List of Foreign-Trade Zones by State, Import Administration, International Trade Administration (2009).*

Globalization: Imports

The ability to import goods represents an important regional economic advantage. Businesses trading with foreign markets may increase their efficiency by locating their facilities near ports of entry where cargo may be brought into the United States.

Ports of Entry (2009)

Ports of Entry are under the jurisdiction of U.S. Customs and Border Protection in the Department of Homeland Security.

	NEMCOG	NWMCOG	EUPRPDC	Michigan
Ports of Entry	3	1	8	40

Source: *List of Facilities and Crossings within Ports of Entry, U.S. Customs and Border Protection (2009).*

The Eastern Upper Peninsula has the most ports of entry as a result of its close proximity to Ontario, Canada.

Imports from Canada (in millions of dollars, 2008)

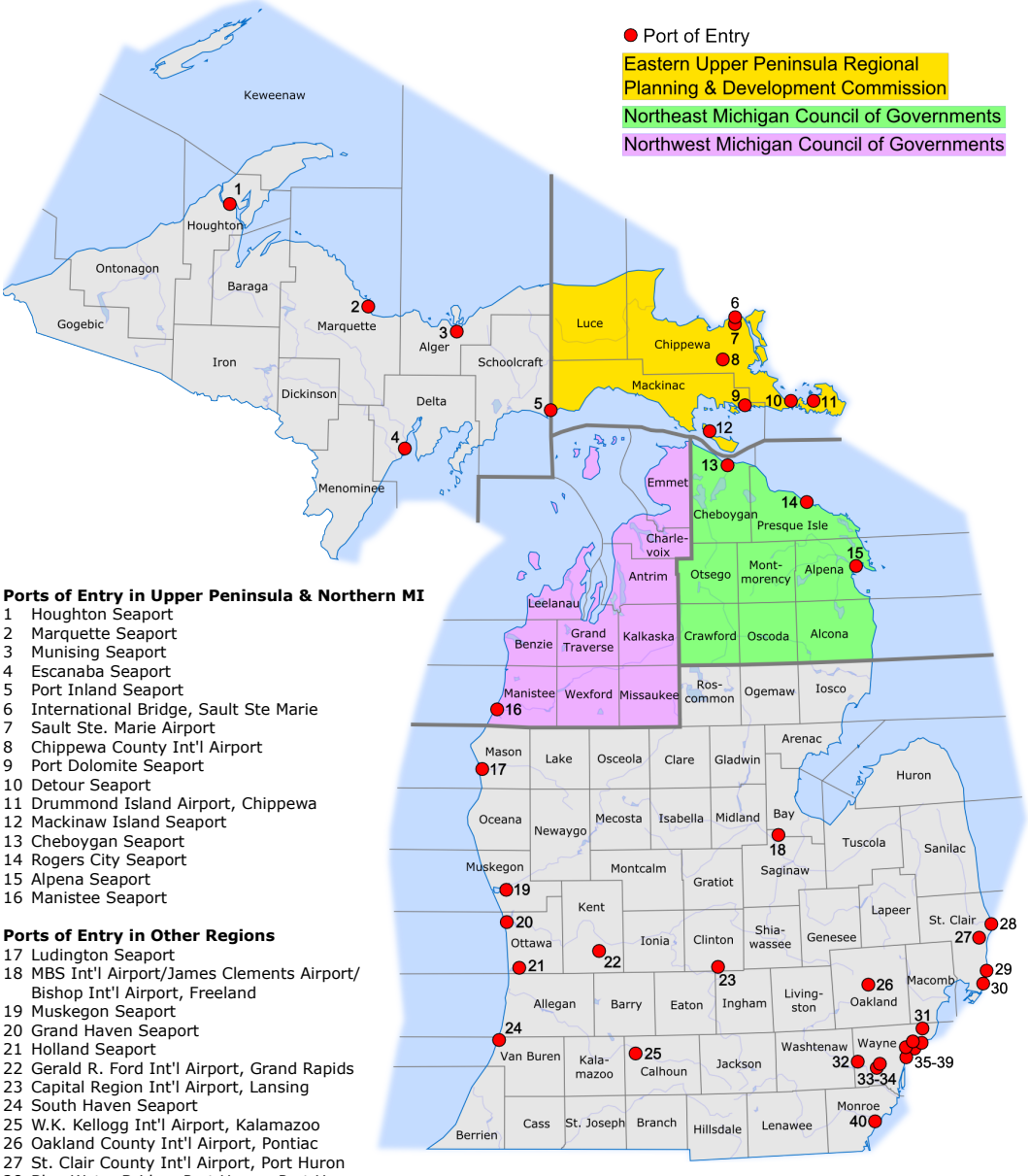
No data was available for any port of entry in Northwest Michigan. Limited data for Northeast Michigan and the Eastern Upper Peninsula was obtained.

	Northeast MI	Northwest MI	Eastern UP	Michigan
Imports from Canada	$0.00	N/A	$288.32	$39,824.97

Source: *Research and Innovative Technology Administration, Bureau of Transportation Statistics, U.S. Department of Transportation (2009).*

The value of Eastern Upper Peninsula imports from Canada was $288 million. Investigating potential bi-lateral import trade opportunities could lead to the development of new markets for Northern Michigan firms.

Figure 5. **Ports of Entry in Michigan**



Ports of Entry in Upper Peninsula & Northern MI

1 Houghton Seaport
2 Marquette Seaport
3 Munising Seaport
4 Escanaba Seaport
5 Port Inland Seaport
6 International Bridge, Sault Ste Marie
7 Sault Ste. Marie Airport
8 Chippewa County Int'l Airport
9 Port Dolomite Seaport
10 Detour Seaport
11 Drummond Island Airport, Chippewa
12 Mackinaw Island Seaport
13 Cheboygan Seaport
14 Rogers City Seaport
15 Alpena Seaport
16 Manistee Seaport

Ports of Entry in Other Regions

17 Ludington Seaport
18 MBS Int'l Airport/James Clements Airport/ Bishop Int'l Airport, Freeland
19 Muskegon Seaport
20 Grand Haven Seaport
21 Holland Seaport
22 Gerald R. Ford Int'l Airport, Grand Rapids
23 Capital Region Int'l Airport, Lansing
24 South Haven Seaport
25 W.K. Kellogg Int'l Airport, Kalamazoo
26 Oakland County Int'l Airport, Pontiac
27 St. Clair County Int'l Airport, Port Huron
28 Blue Water Bridge, Port Huron, Port Huron
29 Marine City Ferry Dock, Marine City
30 Algonac Ferry Dock
31 Coleman A Young Municipal Airport, Detroit
32 Willow Run Airport, Ypsilanti
33 McNamara Passenger Terminal, Detroit
34 North Passenger Terminal, Detroit
35 Fort Street Cargo Facility, Detroit
36 Service Port-Detroit
37 Detroit-Windsor Truck Ferry, Detroit
38 Ambassador Bridge Passenger Facility, Detroit
39 Detroit-Windsor Tunnel, Detroit
40 Monroe Seaport

Source: *List of Facilities and Crossings within Ports of Entry, U.S. Customs and Border Protection (2009).*

VII. Economic Dynamism

In an economic environment of profound structural change and deeply-distressing transformation, the capacity to adapt to change is absolutely essential. Such adaptation is often evidenced by "churn" in the workforce as new jobs replace old jobs, and new enterprises are created and aging enterprises transform themselves (or failt to survive).

The State New Economy Index developed by Rob Atkinson of the Innovation and Information Technology Foundation (Atkinson & Andes, 2008) employs six indicators of economic dynamism at the state level: 1) jobs in fast-growing firms (so-called gazelle firms defined as 20% growth per year for five consecutive years); 2) degree of job churning; 3) number of Deloitte Technology Fast 500 and Inc. 500 firms; 4) value of companies' IPOs (initial public offerings); 5) number of entrepreneurs starting businesses; and 6) number of individual inventor patents issued.

Current data for gazelle firms, Fast 500, Inc. 500, and IPOs shows no activity in Northern Michigan. Patent data is used for one of our Innovation Capacity indicators. Project resources precluded obtaining regional data from unsorted paper files in state records on entrepreneurial start-ups.

The indicators of Economic Dynamism at the regional level include **Job Turnover Rates** and **Certified Business Parks**.

Economic Dynamism: Job Turnover Rates

Given the rapid changes that characterize the knowledge economy, "job churn" provides an important indicator of Economic Dynamism. Job churn results from existing businesses downsizing or going out of business as new businesses are created and more successful businesses expand. Many factors contribute to job churn with both both positive and negative social and economic impacts on local communities.

Job Turnover Rates

One measure of churn is the change in the number of businesses (as opposed to individual jobs). However, regional data is difficult to obtain for this measure. A high rate of change in the turnover of businesses (as opposed to changes in employment) is considered beneficial in the knowledge economy. The benefit is attributed to creating greater numbers of more innovative companies as less efficient companies go under.

Regional data is available for job turnover rates. These rates are based on the number of hires and separations in the workforce. Higher rates indicate a greater number of people starting new jobs and leaving existing jobs compared to workers remaining in existing jobs.

*We define job turnover as: (1/2) * (full-quarter hires + full-quarter separations) / employment stable jobs, based on Census Bureau definitions. Job turnover rates are given as a percentage of total employment.*

Job Turnover Rates: All Industry Sectors (2007)

To obtain job turnover rates for all industry sectors in each region, data based on two-digit NAICS codes is used.

	Northeast MI	Northwest MI	Eastern UP	Michigan
Job Turnover Rate	9.6%	10.3%	11.2%	9.2%

Source: *Local Employment Dynamics, U.S. Census Bureau (2009).*

Low job turnover rates tend to be associated with high-wage jobs, and high job turnover rates with low-wage jobs. Higher job turnover rates are also associated with the positive upward movements of young workers in the labor market. High job turnover rates are also found in job sectors with seasonal hiring practices, like tourism and construction. Low turnover for young workers can also mean that job opportunities are restricted, and workers cannot gain important skills. High turnover for older workers may signify chronic unemployment.

Job Turnover Rates: Health Care Sector (2007)

As health care is an important economic sector in the three regions, that sector's turnover rate was also calculated. Health care jobs are defined as those in NAICS codes 621, 622, and 623.

	Northeast MI	Northwest MI	Eastern UP	Michigan
Job Turnover Rate	7.8%	8.0%	10.5%	7.5%

Source: *Local Employment Dynamics, U.S. Census Bureau (2009).*

Within a single industry sector, the job turnover rate measures the upward movement of workers in that sector. Higher rates, then, are positive. However, this indicator should be paired with other labor market data to provide greater clarity to the meaning of the job turnover rate.

Economic Dynamism: Certified Business Parks

Certified business parks are parcels of land or districts dedicated to manufacturing and/or high-tech industrial facilities. Business parks are "lightweight" versions of industrial parks, the latter being more associated with heavy industry. Certified parks provide basic utility services, including telephone service, parking, water and sewer lines that businesses can tap into immediately (reducing start-up lead time). They also have appropriate zoning, prior plat approval, and protective covenants to assure long-term site quality. Certified Business Parks provide certain advantages not available in other parks, including the potential to capture property taxes for public infrastructure improvements (in qualified local units of government) and being marketed by the Michigan Economic Developers Association. In the dynamics of the knowledge economy, new businesses are rapidly created on an ongoing basis. Locating a business in a business park reduces lead time and the level of capital formation necessary to get business startups "up and running" and business parks also support facility maintenance.

Certified Business Parks (2009)

This data on Certified Business Parks was obtained from the Michigan Certified Business Park Program.

	Northeast MI	Northwest MI	Eastern UP	Michigan
Certified Business Parks	0	2	0	48
Per 1,000 sq mi	0.00	0.42	0.00	0.85

Source: *Michigan Certified Business Park Program, Michigan Economic Developers Association (2009).*

Certified Business Parks represent a fraction of all business parks in the three regions as many business parks do not participate in the Certified Business Parks program.

VIII. Conclusion

Northern Michigan and Eastern Upper Peninsula Knowledge Economy Indicators	
Category	**Indicator**
Talent	Public High School Graduation Rates
	ACT Composite Scores
	ACT Writing Scores
	Certificates Conferred in the Regions
	College Degrees Conferred in the Regions
	Undergrad Enrollment in MI Public Universities
	Grad/Prof Enrollment in MI Public Universities
Innovation Capacity	Patents
	Venture Capital Firms
	High-Tech Firms
	High-Tech Jobs
	Annual High-Tech Wages
Knowledge Sector Jobs	ICT Jobs
	Annual ICT Wages
	Health Care Jobs
	Annual Health Care Wages
Digital Economy	High-Speed Internet Access Providers
	Wireless Hotspots
Globalization	Airport Enplanements
	H-1B Visas Granted
	Exports
	Foreign Trade Zones
	Ports of Entry
	Imports
Economic Dynamism	Job Turnover Rates: All Industry Sectors
	Job Turnover Rates: Health Care Sector
	Certified Business Parks

The **MSU Center for Community and Economic Development** (CCED) project team and three regional planning agency partners—**Northeast Michigan Council of Governments** (NEMCOG), **Northwest Michigan Council of Governments** (NWMCOG), and the **Eastern Upper Peninsula Regional Planning and Development Commission** (EUPRPDC)—sought to adopt a set of knowledge economy indicators to assist their stakeholders in understanding where these Northern Michigan and Eastern Upper Peninsula regions stand in the rapidly-evolving knowledge economy. The project team and partners started this six-month long process with an examination of the MSU CCED's 2006 Michigan Knowledge Economy Index: A County-Level Assessment of Michigan's Knowledge Economy (LaMore, Melcher, Supanich-Goldner, & Wilkes, 2006). It became immediately evident that a new set of knowledge economy indicators would have to be developed because of the regional focus of this project. Large regional data gaps for previously identified indicator measures were identified, as the preponderant majority of relevant public data is generated for use at the state or national levels.

After extensive review and analysis by the project team, partners, and external experts, 27 regional knowledge economy indicators were identified or developed in six categories: **Talent**, **Innovation Capacity**, **Knowledge Sector Jobs**, **Digital Economy**, **Globalization**, and **Economic Dynamism**. Five measures were also identified to provide the demographic and economic context of the three Northern Michigan regions. The indicators are designed to create a new set of lenses for this and future assessments and measurement of the regions' progress in the knowledge economy. Although some proxy indicators are distinctly less than ideal, the entire set of indicators in addition to the traditional common datasets used in the Comprehensive Economic Development Strategies process can provide regional leaders with valuable new insights to guide the creation of innovative economic development strategies and help communities succeed in the global knowledge economy of the 21st century.

Our Northern Michigan and Eastern Upper Peninsula regional assessment, then, is subject to the constraints of available relevant data and our current understanding of the knowledge economy. We do not pretend to know exactly how the knowledge economy will evolve in the future so these indicators will no doubt be supplemented and in some cases replaced by new indicators to better understand the future evolution of the global and Northern Michigan/Upper Peninsula knowledge economies.

While it is recognized that the knowledge economy is increasingly important to the future prosperity of Michigan and the Midwest, regional strategic planning focused on developing the knowledge economy has been limited. In developing CCED's 2006 Michigan Knowledge Economy Index (LaMore, Melcher, Supanich-Goldner, & Wilkes, 2006), it was found that neither predictors nor investments critical to the knowledge economy were identified in traditional regional and local economic planning.

This Regional Assessment is designed to leapfrog that error and help regional planners ramp up their Comprehensive Economic Development Strategies to create new knowledge economy jobs and businesses. This Assessment can be used by regional leaders to better prepare for high-value, innovative regional economic development in the 21st century global knowledge economy.

In spite of facing significant methodological barriers, the project team identified or developed 27 regional knowledge economy indicator measures that are readily obtained from available data sets. Planners throughout the state and Midwest can replicate this methodology and use these indicators to assess the performance of their regions in the knowledge economy. Instructions on retrieving specific data sets for these knowledge economy indicators are available on the project web site (KnowledgePlanning.org). Access to these instructions will enable planners, citizens, and leaders to obtain data and apply these knowledge economy indicators to their regions.

Major Findings of the Northern Michigan/Upper Peninsula Knowledge Economy Assessment

The three regions have substantial talent assets, as evidenced by several Talent indicators. The three regions compare extremely well with the average state public high school graduation rate and ACT scores (both composite and writing). In fact, Northeast Michigan's and Northwest Michigan's graduation rates are over 80%, exceeding the average state graduation rate by four and nine percentage points, respectively. Only 13 states have graduation rates of 80% or better. For ACT composite scores, Northwest Michigan exceeds the average state score by .7 (19.5 compared to 18.8), Northeast Michigan's score is identical to the average state score, and the Eastern UP is just .4 below the state average.

The three regions also perform well compared to the statewide average in public university undergraduate enrollments although they lag behind in graduate enrollments. Northeast Michigan exceeds the state and the other regions in certificates conferred. The Eastern Upper Peninsula, the only region of the three with a four-year public university, is also the only region that exceeds the state average in the number of college degrees conferred. The other two regions lag significantly behind the state average for this indicator.

This talent base is extremely important in the knowledge economy. Talent is needed to do the current and future work of local entrepreneurs, skilled workers, and visionary leaders in the Northern Michigan/Upper Peninsula knowledge economy. Talent and an ongoing willingness to learn are key to embracing mind-set change poised for competing successfully in the global knowledge economy.

All three regions are comparable to the state in the number of high-tech firms, but lag behind in the number of high-tech jobs and level of high-tech

wages. The number of high-tech firms in the three regions is a strong positive indicator. Job creation and talent retention and attraction will be critical in improving this measure of the knowledge economy.

For the number of venture capital firms, Northwest Michigan is equal to the statewide average. Venture capital firms are not found in the other two regions. Creating and expanding capital networks and flow is needed.

For Digital Economy indicators, all three regions lag behind the state average in the number of high-speed Internet providers and lag significantly behind in the number of wireless hotspots. As broadband is the backbone of the knowledge economy, expanding high-speed Internet or broadband coverage is an objective the regions may want to consider. The regions' long-term economic vitality in the knowledge economy may be at stake.

Economic Dynamism indicators assess a region's ability to adapt to a changing economy. Both job turnover for all industry sectors and health care job turnover were higher in Northern Michigan than the state as a whole, indicating higher numbers of people are entering new jobs and leaving or losing existing jobs. This performance is likely a positive indicator of the regions' economic resilience and adaptability. All three regions lag behind the state in the number of certified business parks, a relatively weak proxy indicator.

All three regions lag behind the state in the number of information and communications technology (ICT) jobs as well as lagging behind in annual ICT wages. Northwest Michigan compares favorably with the state level of Health Care jobs and annual Health Care wages, but the other two regions trail Northwest Michigan and the state for this indicator.

Regional Collaborative Actions to Compete Successfully in the Global Knowledge Economy

The economic development challenge to Northern Michigan and the Eastern Upper Peninsula, as with any region in the country, demands a new foundation of collaborative partners—economic development agencies, local governments, all types of private companies, community colleges, school districts, work force development agencies, civic organizations, nonprofit agencies, and universities—to work in new and perhaps even uncomfortable ways. These new networking relationships ("swarms") and candid conversations are essential to creating dynamic new collaborative models.

The use of these knowledge economy indicators coupled with the ongoing project's innovative co-learning plans is intended to facilitate constructive dialogues, innovative new networking, and strategic planning to position the regions for success in the global knowledge economy. Bold leadership is required to reject traditional economic development models that clearly no

longer work. The focus for the future must be on creating and implementing intelligent economic development strategies that will support innovation and risk-taking across the board through aggressive networking, vital collaboration, constant learning, and flexible adaptation.

Final Note

The project team welcomes your feedback and suggestions for improving the measures and indicators described in this regional assessment. Our intent is to provide the best possible information to assist our Northern Michigan and Eastern Upper Peninsula partners (and other similar regions) to align their economic development priorities to successfully compete in the global knowledge economy. The rapid ongoing evolution of the knowledge economy creates a shifting environment in which numerous new questions will arise that may challenge the meaningfulness of selected indicators and the accuracy or relevance of selected measures. The project team cannot anticipate these questions with any degree of certainty. We look forward, then, to any feedback that can help create a better set of regional knowledge economy indicators. We seek indicators and measures that will assist development of effective regional knowledge economy strategies. Finally, we invite readers outside of Northern Michigan and the Eastern UP to visit our Web site (KnowledgePlanning.org) where assistance is available to assist you in applying the indicators to other regions.

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Appendix A

Population of Northern Michigan and Eastern Upper Peninsula Counties, 2008

Region	County	Population
Northeast Michigan	Alcona	11,556
	Alpena	29,520
	Cheboygan	26,354
	Crawford	14,463
	Montmorency	10,335
	Oscoda	8,836
	Otsego	23,808
	Presque Isle	13,650
	Total	**138,522**
Northwest Michigan	Antrim	24,109
	Benzie	17,396
	Charlevoix	25,936
	Emmet	33,535
	Grand Traverse	86,071
	Kalkaska	17,066
	Leelanau	21,783
	Manistee	24,640
	Missaukee	15,001
	Wexford	31,673
	Total	**297,210**
Eastern Upper Peninsula	Chippewa	38,971
	Luce	6,614
	Mackinac	10,624
	Total	**56,209**

Source: *U.S. Census Bureau (2009).*

Appendix B

Population of Northern Michigan and Eastern Upper Peninsula Cities and Villages, 2007

Region	City/Village	County	Population
Northeast Michigan	Alpena	Alpena	10,490[1]
	Cheboygan	Cheboygan	5,027
	Gaylord	Otsego	3,664
	Grayling	Crawford	1,850[2]
	Harrisville	Alcona	491[3]
	Lincoln	Alcona	346
	Mackinaw City	Emmet, Cheboygan	843[4]
	Onaway	Presque Isle	917
	Rogers City	Presque Isle	3,081
Northwest Michigan	Cadillac	Wexford	10,313
	Charlevoix	Charlevoix	2,689[5]
	Harbor Springs	Emmet	1,546
	Kalkaska	Kalkaska	2,189[6]
	Mancelona	Antrim	1,369[7]
	Manistee	Manistee	6,517[8]
	Petoskey	Emmet	6,017
	Traverse City	Grand Traverse	14,339
Eastern Upper Peninsula	Newberry	Luce	1,553
	Sault Ste. Marie	Chippewa	14,005
	St. Ignace	Mackinac	2,384[9]

Source: *U.S. Census Bureau (2009).*

Footnoted cities and villages indicate adjacent townships of the same name with their respective populations below.

1. Alpena township: 9,534.
2. Grayling township: 7,021
3. Harrisville township: 1,376.
4. Mackinaw township: 568.
5. Charlevoix township: 1,682.
6. Kalkaska township: 4,893.
7. Mancelona township: 4,419.
8. Manistee township: 4,026.
9. St. Ignace township: 945.

Appendix C

Great Lakes Angel Firms

Name	City	State
Akron ARCH Angels (Akron Regional Change Angels)	Akron	OH
Ann Arbor Angels	Ann Arbor	MI
Aurora Angels	Petoskey	MI
Badger Agvest	Wausau	WI
Bio Angels	Chicago	IL
Blue Water Angels	Midland	MI
Bluestem Ventures	Springfield	IL
Capital Community Angels	Lansing	MI
Central Minnesota Growth & Transition Fund LLC	Willmar	MN
Central Wisconsin Business Angels	Plover	WI
Chippewa Valley Angel Investors Network	Chippewa Valley	WI
Core Network	Toledo	OH
Cornerstone Angels	Northbrook	IL
DaneVest Capital	Middleton	WI
First Angels	Kalamazoo	MI
Grand Angels	Grand Rapids	MI
Great Lakes Angels	Rochester	MI
Heartland Angels	Skokie	IL
Highland Park Angel Group	Northbrook	IL
Hyde Park Angel Network	Chicago	IL
Indiana Seed Fund	Indianapolis	IN
Irish Angels	Notre Dame	IN
Lake Superior Angel Network	Superior	WI
Lakes Ventures II	Alexandria	MN
Main Street Venture Partners	Fort Wayne	IN
Marquette University Golden Angels Network	Milwaukee	WI
NEW Capital Fund	Appleton	WI
North Coast Angel Fund	Cleveland	OH
North Star Fund	Grand Rapids	MN
Ohio TechAngels	Columbus	OH

Origin Investment Group	La Crosse	WI
Phenomenelle Angels	Madison	WI
Prairie Capital II	Worthington	MN
Queen City Angels	Cincinnati	OH
RAIN Source Capital	St. Paul	MN
River Valley Capital	Montevideo	MN
Rocket Ventures	Toledo	OH
Silicon Pastures	Milwaukee	WI
Sofia Angel Fund	Minneapolis	MN
South Metro Investors	Burnsville	MN
St. Cloud RAIN Fund	St. Cloud	MN
Stateline Angels	Rockford	IL
Successful Entrepreneur Investors Angel Group	Milwaukee	WI
Traverse Angels	Traverse City	MI
Twin Cities Angels	Minneapolis	MN
Two Rivers Angel Investment Network	Mankato	MN
Wellspring Investor Alliance	Mankato	MN
Wisconsin Investment Partners	Madison	WI

Source: *Angel Capital Education Foundation. Retrieved June 19, 2009 from http://www.angelcapitaleducation.org/dir_resources/directory.aspx*

Appendix D

Two-digit North American Industry Classification System (NAICS) Codes

Code	Description
11	Agriculture, Forestry, Fishing and Hunting
21	Mining, Quarrying, and Oil and Gas Extraction
22	Utilities
23	Construction
31-33	Manufacturing
42	Wholesale Trade
44-45	Retail Trade
48-49	Transportation and Warehousing
51	Information
52	Finance and Insurance
53	Real Estate and Rental and Leasing
54	Professional, Scientific, and Technical Services
55	Management of Companies and Enterprises
56	Administrative and Support and Waste Management and Remediation Services
61	Educational Services
62	Health Care and Social Assistance
71	Arts, Entertainment, and Recreation
72	Accommodation and Food Services
81	Other Services (except Public Administration)
92	Public Administration

Source: *U.S. Census Bureau (2009).*