

**Emerging Industries: Looking Beyond the Usual Suspects
A Report to WIRED**

Final Draft

September, 2007

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Executive Summary

This report breaks from the standard analysis of emerging industries. In fact, while we provide an analysis of the usual emerging industry suspects, we do not identify any emerging industry targets. Moreover, we recommend that the WIRED economic stakeholders step away from this gambit. Instead, we recommend that the area focuses on assisting existing firms to evolve—take on new markets and products— instead of trying to predict what will be the new emerging industries. It is an approach that fits in well with WIRED’s focus on innovation, builds on the competencies of the area’s core industries, and exploits the region’s unique design assets.

The major findings of this analysis are the following:

- It is extremely difficult to predict the future with the necessary degree of accuracy required for a region to wisely invest its economic development assets on one or two emerging industries. Even if the regional stakeholders are right about the industry— alternative energy, life sciences or a host of others—they may still back the wrong horse, as new and unforeseen innovations in competing technologies are making it nearly impossible to identify the potential winner.
- For the greater Grand Rapids-Muskegon-Holland region to grow it must attract and/or grow new products and services to replace those that are forced by strong market forces to leave for less costly locations and those that will become obsolete due to technological change.¹ This challenge is not unique to west Michigan; experts estimate that the life span of a typical product is less than six years. What is clear is that west Michigan will never be and should not want to be the low-cost site for any economic activity.
- According to the Bureau of Labor Statistics (BLS), from 2004 to 2014, U.S. employment is predicted to grow fastest in the following major industry sectors: health-related industries, education, professional and business services, and leisure

¹ Due to data limitations, the employment statistics and forecasts contained in this report for the West Michigan WIRED Region exclude Allegan County. As of 2003, Allegan County is not in a metropolitan statistical area, therefore current employment estimates and future projections are not available for the county.

- and hospitality. As a group, these four industries are expected to grow by 2.3 percent annually, and their employment is expected to increase by nearly 12 million jobs. However, these industries have limited abilities to bring new monies into the region.
- The WIRED region’s major export firms are in industries facing sluggish, below-average national growth. The good news is that, on average, they are more competitive than their national rivals.
- One of the challenges facing the region is that it is still dependent on a manufacturing export base. While many manufacturers offer good-paying jobs and stable employment opportunities, few face growing markets. As long as the region depends on manufacturing for its economic base, it will experience below-average total employment growth.
- Growth in the WIRED region between 2007 and 2017 is expected to be modest, with regional employment performing slightly worse than the U.S. average and slightly better than the rest of Michigan. Total private nonfarm employment in the WIRED region is projected to increase at a 0.7 percent annual average rate, compared to a 0.4 percent rate for Michigan and 1.4 percent nationwide.
- The concept of an emerging industry may be a harmful illusion because it is not so much the industry, but an individual company’s leadership and goals that are the catalysts for new products and services. Second, regional economists are in agreement that industrial clusters are the incubators for tomorrow’s products and emerging industries. Keeping the region’s existing industrial base—manufacturing and services—healthy and “young” may be the best option for the region’s economic development community.
- The report makes the following recommendations:
 - **Do not create emerging industry targets.** At best, it is nothing short of gambling and trying to pick winners. At worst, it takes resources away from meaningful efforts to enhance the region’s ability to become more innovative across its wide number of industries.
 - **Work to enhance and develop existing social clusters and build new ones that allow social networking opportunities that cross industry boundaries.** Innovation is a local activity which depends upon partnership and face-to-face interactions that can only survive in an atmosphere of trust. It is recommended that “third places” and invocation forums be created and enhanced to encourage the formation and strengthening of formal and informal networks. These networks can and should cut across industries.
 - **Development of a SWOT (Strengths, Weaknesses, Opportunities, and Threats) team of designers, engineers, and industry experts that provide new ideas for companies.** The WIRED region holds a wealth of design and

manufacturing knowledge that is the envy of other regions. These resources should be used to advance the development of innovation among the region's existing firms. Innovation is a multi-step process from idea generation, production development and design, and marketing. Smaller firms cannot be expected to do it all. A SWOT team of designers, engineers, and experts could help generate new ideas which could be the seeds for the development of new products for new markets.

- **Work with area government units, non-profits, education institutions, and art associations to improve the attractiveness of the region to professional workers.** This final recommendation is as challenging as it is important. More and more research supports the observation that talent drives investment. Talented individuals increasingly call the shots and locate where they want; capital expenditures will follow. Regions that maintain an atmosphere where ideas are in the air are already ahead in the game; however, more is needed. The region's amenities also matter. The problem is that there is no clear description of what it takes to have an attractive environment. It may come down to whether there is a "sense" that the area is open to new ideas and diversity.

Introduction

Michigan has lost more than 350,000 jobs since 2000. About half of these job losses occurred during the 2001 recession; however, during the current national expansion, from the first quarter of 2002 to the first quarter of 2007, employers in the state cut 178,000 jobs. Moreover, the short-term forecast for the state is bleak, especially with the national economy starting to slow. The University of Michigan is forecasting that the state's employment totals will continue to decline in 2008.

It is not surprising that economic developers are searching for new emerging industries to replace the jobs that have been lost in its traditional industrial sectors, especially automotive. The Michigan Economic Development Corporation (MEDC) and other organizations have identified several reasonable emerging industry targets for the state to pursue; life sciences and alternative energies technologies head most lists. Not surprisingly, these promising industries have made the list in other states as well.

The report suggests an alternative approach: support evolving industries not emerging industries. Instead of taking on the risky game of trying to pick future winners in an increasingly dynamic technological environment, this report recommends the arduous task of encouraging existing industries to become young again—to take on new products and/or enter new markets.

The advantages of such an approach, if successful, are clear. First, it can prolong the employment of the firm's current workforce—it is feasible that a move from making tractor components to wind turbine blades or from the manufacturing of auto parts to medical instruments can be done by retraining existing workers. Second, it adds diversity since it would support the region's firms in determining their own new course, not just the few that have been deemed as the emerging industries for the region.

Emerging Industries—Do You Feel Lucky?

The term “emerging industries” brings to mind industry sectors that are both entirely new and quickly growing in terms of sales and employment. Moreover, emerging industries are often equated with “paradigm shifts.” Examples of this perhaps purest type of emerging industry include the automobile industry during the first decades of the 1900s and the personal computer software industry during the 1980s.

At the time, each of these industries was almost entirely new both in terms of the inputs used in the production process and the nature and use of the product in the marketplace. Additionally, these emerging industries brought significant growth, change, and economic prosperity to the locations that happened to be home to concentrations of these developing industries, making the goal of creating or capturing future emerging industries attractive to workers and political leaders.

The concept of emerging industries should be brought down to earth. Many emerging industries are small and/or do not result in substantial change to our environment. Digital cameras, for example, heighten the enjoyment and ability to take pictures and home movies; however, it has not generated a significant change in our life styles. In sharp contrast, the internet has revolutionized and is still changing the environment of numerous sectors such as retail, finance, telecommunications, business services, medical services, and education.

The major emerging technologies are those that do not limit themselves to any one industry but instead can be adapted to increase performance and productivity in numerous traditional sectors. Although to a certain degree the introduction of the internet did bring about its own industry devoted to providing internet services (think of businesses such as AOL, Prodigy, and CompuServe), its direct impact has been modest in the long-run. Furthermore, industries that have long existed can make a shift to emergent growth due to changes in technology or shifts in demand. For example, the entry of Amazon.com into the book retail market in 1994 changed the way many of us buy books. More than that, it has forged the way in reshaping the retail sector, in that it now offers a wide and growing selection of goods to at-home consumers.

Emerging industries grow not only because of rapid technological change. They can also emerge due to demographic shifts. The growth of the nation's medical industry is due to a powerful combination of medical advancements, an aging population, personal income growth, and preference shifts in demand.

One of the major challenges and fears facing regions in regard to emerging industries is that most emerging industries come at the expense of existing industries and regions. Regions must avoid being identified with an industry that is not in the position to change. Flint, for example, is so identified with and impacted by the auto industry that it may take decades before it can grow or attract a new emerging industry of significant size. One of the more impressive qualities of Silicon Valley is that it was the birthplace of the radio technologies in the 1920s, followed by computers and transistors in the 1950s, and then internet commerce and services in the 1990s. It has recreated itself several times over; few other areas have been able to be so innovative and loose.

There are winners and losers in emerging industries as well. New drugs replace old, new procedures are advancements over previous methods. Lifecycles can be brief, and promising technologies can become history overnight. The environment becomes even more threatening when technological advancement can cross established industry territories. For example, digital technologies seemingly came out of nowhere to radically change the photography and publishing industries.

It is extremely difficult to predict the future with the necessary degree of accuracy required for a region to wisely invest its economic development assets in one or two industries. Even if the region's stakeholders successfully call the industry, they would also have to be "dead on" regarding the technology, and then be able to provide the proper nurturing environment for the industry to expand. For example, it may be a safe

bet that the home entertainment industry will continue to grow, but can anyone be secure in knowing what will be the winning technology among the competing systems?

Life science is the field on nearly everyone's short list (currently 32 states) of emerging industries, but there lies the problem. Why will one competing region win over the others and what emerging sectors or discoveries will become scaleable? For example, a new cancer breakthrough could occur at any one of hundreds of separate medical research institutes. Such a breakthrough could radically change the course of research in the field, leaving some institutes and regions at a disadvantage. At the same time, there is no guarantee that the region making the discovery will capture all the economic gain

Existing industrial clusters, quality of life, and the presence of research universities have all been identified as important ingredients to the development of emerging industries. However, an actual formula of necessary ingredients will likely never be found. And, what will be the life cycle for this new process or instrument? In a matter of a few years, procedures and products are often eclipsed by something better. Finally, the world is full of new products that were the results of mistakes and accidents, for example, Post-it notes. Is it wise for a region to invest in the development of a new emerging industry when the risks and uncertainty are so high?

In short, do you feel lucky?

Regional Considerations for Emerging Industries

Many economists have stressed the importance of understanding the regional consequences of product cycles.² In short, as a product proceeds through its life cycle, its regional focus shifts. New and emerging industries and technologies tend to be born in larger metropolitan areas where knowledge is "in the air." Urban areas that offer a diversity of industries, populations, and cultures, and that house major universities and provide desirable environments for professional workers, tend to generate environments for ideas that can cross established industry lines. While the importance of industrial clusters cannot be ignored, larger urban agglomeration factors may hold sway.³

Once a new product or service emerges, the successful ones will experience a growth period, the second stage. If the company and its new product or service is not purchased by an out-of-area firm, it is possible that it will expand in the region where it was founded. Fledging companies are highly dependent on the established networks of financial resources, suppliers, mentors, and workforces cultivated during its birth.

In the third stage, competitors enter the market with similar products or services, driving down profits and forcing the company to look for more cost-effective locations.

² The classic text is Ann Markusen, *Profit Cycles, Oligopoly and Regional Development* (MIT Press, Cambridge), 1985.

³ Zoltan J Acs, *Innovation and the Growth of Cities* (Edward Elgar, Cheltenham UK), 2002 and Karen R. Polenske ed. *The Economic Geography of Innovation* (Cambridge University Press, Cambridge UK), 2007.

Traditionally, this has led the company to explore rural or international locations. The major urban area simply becomes too costly. It is also important to note that the company's workforce also changes; research and development activities are replaced by marketing and production activities. In other words, once the product or service is moved due to cost considerations, it will likely also lose its capacity to develop new products or services. With the move, the company's strategy becomes one of making a commodity and competing on price or quality.

In the final stage the product or service becomes obsolete, and the company either closes or merges with another company, or finds a new product or service.

The key implementation of product cycle theory is that for the greater Grand Rapids-Muskegon-Holland region to continue to thrive, it must attract or grow new products or services to replace those that are relocated to less costly locations, i.e. China or Mexico. In a global market, there will always be a cheaper location for an industry to produce commodity products or to deliver simple services.

For region stakeholders and economic developers, additional factors must enter into the equation when identifying possible emerging industry targets. First, will the industry provide employment opportunities for existing residents? If an industry attracts nearly all of its workers from outside the region, then it will provide few employment opportunities for existing unemployed and underemployed regional residents.⁴

This is a major concern for industries that require highly skilled workers. Persky suggests that the best case scenario is one where the new industry generates a chain reaction in the region's labor market.⁵ Workers in the region move up to take the higher-skilled, better-paid jobs generated by the new company. This opens their former positions to residents who in turn can move up from their current lower-paid positions. The process continues until an unemployed person takes the last job that is vacated. When, a person is hired from outside the region, the chain stops. Hence the opening for a skilled machinist may have a greater impact on the region's labor market than an opening for a research chemist. Of course "indirect and induced" jobs will be created in either case; however, these jobs tend to be low-paying customer service or retail jobs.

Second, an industry's growth does not ensure that it will bring new monies into the region. Health care is expected to be a high-growth sector for years to come due to an aging population, increased wealth, and new advancements in medical treatments and technologies. However, for regions even as large as the greater Grand Rapid-Muskegon-Holland area, much of this growth will be internally driven. New monies will not be

⁴ Tim Bartik has found that, on average, eight out of every ten jobs created in a region are filled by individuals moving into the region. *Who Benefits from State and Local Economic Development Policies* (W.E. Upjohn Institute, Kalamazoo MI) 1991.

⁵ Persky, Felsenstein and Carlson, *Economic Development Strategies and Job Chains in Local Labor* (W.E. Upjohn Institute, Kalamazoo MI) 2004.

attracted into the region as much as existing expenditure patterns will be reallocated as residents spend more and more on health care.⁶

So the challenge facing a region in selecting emerging industries is three-fold. It must identify:

1. High-growth industries that will bring new monies into the region through the sales of their goods or services.
2. The winning technology, process, or system which is scalable and has a reasonable life span. Emerging industries will likely have competing technologies as well. In other words, you can bet in the right race but back the wrong horse.
3. Industries that offer job openings that will likely generate job chains which have the possibility of reaching the underemployed and unemployed.

The last challenge is of particular importance to WIRED as it is focused on creating jobs that are within reach of the region's workforce and on developing the resources to assist the region's workforce to meet the needs of possible emerging industries.

Identifying National and International Economic, Demographic and Technological Trends that Can and Will Impact Regional Growth

Forecasting future economic trends is an art as well as a science, and it is seldom correct. In fact, it is prudent to review the common errors that reoccur in long-term forecasts. First, advancements in technology are consistently underestimated. Past forecasts have underestimated the rate of adoption of new technologies such as the internet for financial and retail transitions and the continuous application of more advanced computer technologies to more and more fields. At the same time, forecasts tend to also underestimate the impact of demographic changes. Immigration and an aging population are two clear and well-established trends, and yet we continue to underestimate their social and economic impacts. Finally, we tend to overestimate the rate of change in the social and economic structure of our economy. Despite great strides, issues such as poverty and racial separation still persist.

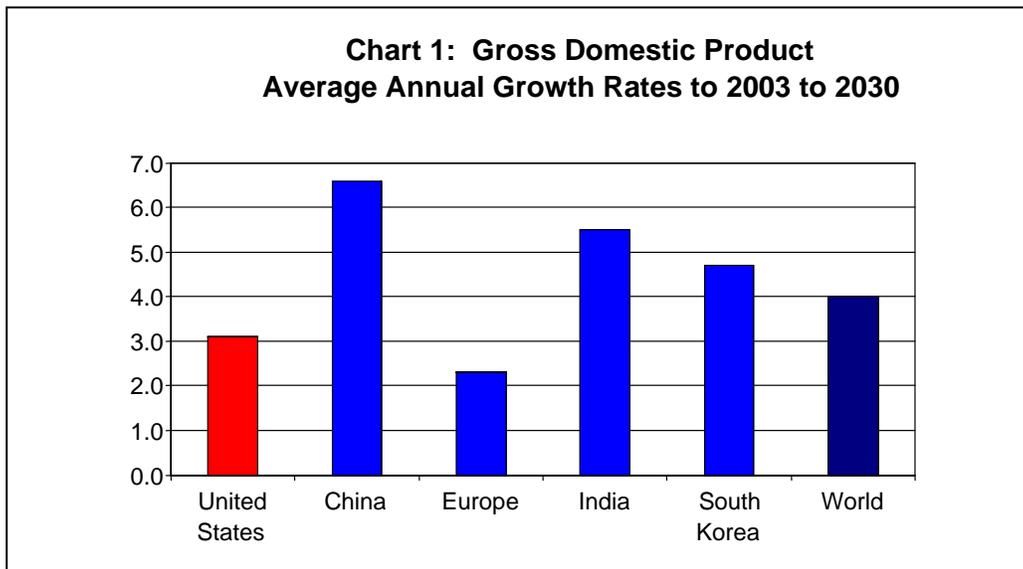
Looking into the future, there are already several economic and demographic trends that must be taken into consideration.

- **The population is growing older.** Not only are medical advances and better diets helping individuals live longer, but at the same time a generational shift is occurring as the large "baby boomer" population approaches retirement. This shift to a citizenry that is top-heavy with elderly members will definitely have an effect; however, not all the implications are known. Demand for health care services, retirement housing, and leisure services will most definitely increase. Consumer goods will be modified to meet the needs of an aging population. Other factors that will be impacted are governmental tax and service structures, the real estate market,

⁶ Nevertheless, it can be true that a growing health care sector can stop monies from leaving the area as local residents who would have gone elsewhere for treatment remain in the area.

and, perhaps most importantly, the ability of businesses to find skilled replacement workers.

- **Communication technologies will continue to explode.** The power and reach of the internet is still unknown; however, the magnitude of the growth is truly amazing relative to other forms of communication. The time it took for the telephone system to reach 50 million people was more than 70 years; it took the internet only four years. The market for e-commerce was \$2.6 billion in 1996; it grew to an estimated \$300 billion in 2002.
- **The demand for clean, secure, and dependable energy will only grow.** The expectation is that energy costs will increase dramatically in the future. Multiple factors are behind this long-term assumption, including increased demand for oil and coal by developing nations such as China and India, continued political instability in major oil-producing nations, and growing consumer concern about environmental damage and reliance on imported oil. This could drive continued development of solar, ethanol, bio-fuel, and battery technologies.
- **Global warming and other environmental challenges will not go away.** If global warming continues unabated, there will be a growing market for green technologies, construction materials and energy generation. The Scientific Committee on Problems of the Environment of the International Council for Science surveyed 200 scientists in 50 countries regarding environmental issues that will arise in the 21st century. Climate change ranked first, followed by the quantity and quality of water resources, deforestation, and desertification.
- **The fastest growing areas will be outside the U.S.** According to long-term forecasts, the U.S. economy is expected to grow at a slower pace than the rest of the world, with China and India firmly in the lead (Chart 1). With the world's fastest growing markets elsewhere, it is likely that more and more production and administrative functions will move offshore as well. The U.S. will remain a command and control center as well as a dominant research and development center; however, production and administration functions may gravitate where the end product is sold. For example, it seems highly unlikely that at this time a car designed for the markets in China or India can be produced in the U.S.
- **Competition is increasing.** The influence of other parts of the world (European Union and developing giants such as China and India) will continue to increase. Small consumer products are already produced primarily offshore. A large portion of the nation's production machinery is also made abroad.



Source: Global Insight Inc. and the U.S. Energy Information Administration.

- Product cycle will continue to shrink.** More players in the global market make it very likely that both product development and decline will grow at a more rapid pace. As hinted previously, this will likely shorten the life of any new emerging sector and limit its impact. It will not be the region’s current line of products or services that will determine its success, but its ability to innovate.
- Partnership will continue to be a major avenue for entering emerging industries.** Whether it is exploring new geographies or new uses, the ability to find suitable partners will only grow. Regions that encourage partnering and networking opportunities should be at an advantage.

National Employment Forecasts

Before forecasting what is likely to occur in the Grand Rapids-Muskegon-Holland region, it is important to look at what sectors of the national economy are predicted to experience strong growth in the coming years. Industries and occupations that have a good national outlook will always be of importance to the local market, even if the WIRED region does not have a particularly strong presence in the sector at this time. This is because the strength of these high-national-growth industries or occupations is generally not tied to the competitiveness of specific firms or specific regions, but more so to a large-scale shift in demand for the product or service provided by the sector in question.

According to the Bureau of Labor Statistics (BLS), between 2004 and 2014, U.S. employment is predicted to grow fastest in the following major industry sectors: health-related industries, education, professional and business services, and leisure and hospitality (Table 1). As a group, these four industries are expected to grow by 2.3 percent annually, and their employment is expected to increase by nearly 12 million jobs. Although they represent approximately 35 percent of 2004 employment, together the BLS predicts that they will account for over 64 percent of total net employment gains over the 10-year period. Moreover, their expected growth clearly reflects the demographic shifts discussed earlier. A growing segment of the nation’s leisure and

hospitality and education sectors will be meeting the demand generated by retirees. For example, the University of Michigan is already building residential units for retirees where the monthly rent payment will include class fees.

Table 1: BLS National Nonfarm Employment Forecast 2004 to 2014

| Major industry division | Employment 2004 | Projected employment 2014 | Estimated employment size growth | Annual average growth rate |
|---|-------------------|---------------------------|----------------------------------|----------------------------|
| Total, all industries | 132,191,700 | 150,876,900 | 18,685,200 | 1.3% |
| Goods-producing industries | 21,817,300 | 21,787,300 | -30,000 | 0.0% |
| Mining | 523,200 | 477,400 | -45,800 | -0.9% |
| Construction | 6,964,500 | 7,756,900 | 792,400 | 1.1% |
| Manufacturing | 14,329,600 | 13,553,000 | -776,600 | -0.6% |
| Service-producing | 110,374,400 | 129,089,600 | 18,715,200 | 1.6% |
| Utilities | 570,100 | 562,600 | -7,500 | -0.1% |
| Wholesale | 5,654,900 | 6,130,800 | 475,900 | 0.8% |
| Retail | 15,034,500 | 16,683,200 | 1,648,700 | 1.0% |
| Transport & warehousing | 4,250,000 | 4,755,900 | 505,900 | 1.1% |
| Information | 3,138,300 | 3,502,100 | 363,800 | 1.1% |
| Financial activities | 8,051,900 | 8,901,300 | 849,400 | 1.0% |
| Professional & business services | 16,413,700 | 20,979,900 | 4,566,200 | 2.5% |
| Private education | 2,766,400 | 3,664,500 | 898,100 | 2.9% |
| Healthcare | 14,187,200 | 18,482,100 | 4,294,900 | 2.7% |
| Leisure & hospitality | 12,479,100 | 14,693,800 | 2,214,700 | 1.6% |
| Other private services | 6,209,900 | 6,943,400 | 733,500 | 1.1% |
| Federal government | 2,727,500 | 2,770,900 | 43,400 | 0.2% |
| State and local government | 18,890,900 | 21,019,100 | 2,128,200 | 1.1% |

BLS (Nov. 2005). Summary of the projections. *Monthly Labor Review*.

Employment in manufacturing is expected to continue to decline during the next 10 years due to productivity growth and to production being moved offshore to meet the growing demand in Asia and other markets and to take advantage of lower labor costs.

Of course, within these large, relatively generic industry classifications there exists a huge range of different tasks and skills that are required for workers to fulfill these new employment positions. Shifts in the way goods and services are produced will slowly alter the mix of occupations required for producing goods and services. In addition, uneven demand shifts will also impact the number and type of workers required in a given industry.

The BLS predicts that the biggest increase in share of overall occupations will occur in professional occupations and service occupations (Table 2). On the opposite end of the spectrum, production occupations, office and administrative positions, and sales occupations are predicted to experience the largest decreases in share of total employment during the 10-year period. Most other occupational categories are expected to retain a stable share of total employment.

Table 2: Projected Occupational Share and Change 2004-2014

| Major Occupation Group | Percent of total employment | | Increase or decrease in share points |
|-----------------------------------|-----------------------------|-----------------------|--------------------------------------|
| | Share 2004 | Share projection 2014 | |
| Management, business, financial | 10.3% | 10.4% | 0.1% |
| Professional & related | 19.6% | 21.0% | 1.4% |
| Service occupations | 19.0% | 20.0% | 1.0% |
| Sales | 10.5% | 10.2% | -0.3% |
| Office and administrative | 16.4% | 15.4% | -1.0% |
| Farming, forestry, fishing | 0.7% | 0.6% | -0.1% |
| Construction and extraction | 5.3% | 5.3% | 0.0% |
| Installation, maintenance, repair | 3.9% | 3.9% | -0.1% |
| Production | 7.3% | 6.4% | -0.9% |
| Transportation | 6.9% | 6.8% | -0.1% |

BLS (Nov. 2005). Summary of the projections. *Monthly Labor Review*.

Major occupational groups that are predicted to increase their share of overall employment are also expected to grow their total employment figures at a faster-than-average rate. As shown in Table 3, professional and related occupations and service occupations are also projected to grow at the fastest annual average rate between 2004 and 2014, 1.9 percent and 1.8 percent, respectively. The occupation grouping with the third-largest projected growth rate is for management, business, financial occupations, which is expected to grow at a 1.4 percent annual average rate—just above the 1.3 percent rate for total employment, which is enough to nudge its predicted 2014 share of employment up by 0.1 percent.

Table 3: 2004-2014 Occupation Change Rate

| Major occupation group | Annual average rate of change |
|-----------------------------------|-------------------------------|
| Management, business, financial | 1.4% |
| Professional & related | 1.9% |
| Service occupations | 1.8% |
| Sales | 0.9% |
| Office and administrative | 0.6% |
| Farming, forestry, fishing | -0.1% |
| Construction and extraction | 1.1% |
| Installation, maintenance, repair | 1.1% |
| Production | -0.1% |
| Transportation | 1.1% |

BLS (Nov. 2005). Summary of the projections. *Monthly Labor Review*.

In the first part of this section, we touted the importance of national employment growth trends to the WIRED area, since they represent opportunities that are likely to be felt across the country, and they tend to be driven by changes in demand or technology. However, it is important to remember that it is possible for industries and occupations that are not expected to experience significant national growth—indeed, sometimes even for industries that are forecast to decline—to maintain a strong demand for workers. This is the case if the area needs to replace retirees or persons leaving the field. Therefore, for workforce development planning purposes, it is essential to consider not just sectors that

are projected to expand but also those that are forecast to have large demand for new workers who retire or leave to pursue different occupations. In fact, between 2004 and 2014, various types of replacement openings are predicted to account for nearly two-thirds of all job openings that occur during the 10-year period (Table 4).

Table 4: U.S. Detailed Occupations with the Greatest Number of Replacement Openings Projected 2004-2014

| Occupation Title | Thousands (000s) of Workers | | | |
|---|-----------------------------|------------------------------|---|----------------|
| | Change due to new jobs | Openings due to replacements | Percent of openings that are replacements | Total openings |
| Retail sales workers | 937 | 3,506 | 78.9% | 4,444 |
| Cashiers, except gaming | 108 | 1,688 | 94.0% | 1,796 |
| Retail salespersons | 736 | 1,547 | 67.8% | 2,283 |
| Information and record clerks | 657 | 1,387 | 67.8% | 2,045 |
| Fast food and counter workers | 448 | 1,235 | 73.4% | 1,683 |
| Other office and administrative support workers | 157 | 1,221 | 88.6% | 1,378 |
| Waiters and waitresses | 376 | 1,159 | 75.6% | 1,534 |
| Laborers and material movers, hand | 339 | 1,146 | 77.2% | 1,485 |
| Cooks and food preparation workers | 448 | 972 | 68.5% | 1,419 |
| Financial clerks | 312 | 920 | 74.7% | 1,232 |
| Other management occupations | 280 | 903 | 76.3% | 1,183 |
| Secretaries and administrative assistants | 255 | 838 | 76.7% | 1,093 |
| Health diagnosing and treating practitioners | 1,140 | 820 | 41.8% | 1,960 |
| Laborers and material movers, hand | 248 | 794 | 76.2% | 1,042 |
| Other production occupations | 10 | 765 | 98.7% | 775 |
| Building cleaning workers | 608 | 752 | 55.3% | 1,360 |
| Office clerks, general | 263 | 695 | 72.5% | 958 |
| Stock clerks and order fillers | -115 | 694 | 119.9% | 579 |
| Cooks | 272 | 658 | 70.8% | 930 |
| Metal workers and plastic workers | -90 | 652 | 116.0% | 562 |
| Motor vehicle operators | 629 | 627 | 49.9% | 1,256 |
| Other installation, maintenance, repair occupations | 342 | 612 | 64.1% | 955 |
| Other personal care and service workers | 604 | 611 | 50.3% | 1,215 |
| Assemblers and fabricators | 78 | 538 | 87.3% | 616 |
| Registered nurses | 703 | 501 | 41.6% | 1,203 |
| Sales representatives, wholesale and manufacturing | 244 | 486 | 66.6% | 730 |
| Elementary and middle school teachers | 351 | 464 | 56.9% | 815 |
| Vehicle mechanics and repairers | 234 | 461 | 66.3% | 695 |
| Driver/sales workers and truck drivers | 449 | 453 | 50.2% | 902 |
| Janitors and cleaners, ex maids & housekeeping | 440 | 450 | 50.6% | 890 |
| Health technicians | 592 | 446 | 43.0% | 1,038 |
| Financial specialists | 444 | 443 | 49.9% | 887 |
| Other protective service workers | 189 | 435 | 69.7% | 624 |
| Top executives | 375 | 433 | 53.6% | 808 |
| Miscellaneous assemblers and fabricators | 103 | 398 | 79.3% | 502 |
| Total, all occupations | 18,928 | 35,752 | 65.4% | 54,680 |

Source: BLS.

As shown in Table 4, these occupations offering a high number of replacement openings represent a variety of occupational areas. Many are low-skill, high-turnover jobs that are often considered entry level positions—such as retail sales workers, cashiers, and waiters and waitresses. However, some of these occupations represent traditional fields such as manufacturing production and office administration, which offer decent wages and benefits to workers without requiring a college degree. Additionally, several high-wage occupations in management and finance appear in this table as well, illustrating the strong opportunities that will exist for college-educated workers.

In summary, the national forecast calls for current well-identified trends to continue: health care and activities related to meeting the needs of an aging population will

continue to grow. Manufacturing and low-skilled administrative functions will decline due to both productivity improvements and many of these activities being moved offshore.

The next question is where does the WIRED region fit in this changing national economy?

Economic Conditions in the WIRED Region

Regional economies are supported by “exporting” goods and services to customers located outside the region. The earnings from these export sales are then re-circulated through the region’s supplier chains and consumer purchases. Secondary ways that a community can grow are through public and private transfer payments such as retirement income or by import substitution (providing services or making products that were previously purchased from suppliers located outside the region).⁷

In this emerging industry analysis, we focus on identifying those new industries that have the potential of bringing new earnings into the area through their export activities. It is very possible that new entertainment venues, retailers, and consumer services will emerge in the coming years; however, these activities will not generate significant new growth for the region. Instead, their success will come at the expense of their local rivals.

An old adage in regional economics is “tell me your industries and I will tell you your future.” Regions which house firms in industries that are enjoying strong national and international growth have a much higher probability of achieving above-average growth than regions which have a significant share of their firms in slow-growing or declining industries. The competitiveness of a region’s firms can make a difference; however, a region burdened with industries facing stagnant national and international markets is clearly swimming against a strong negative current.

Unfortunately, as shown in Table 5, the WIRED region’s major export firms are in industries facing sluggish national growth. The good news is that on average they are more competitive than their national rivals. In this analysis, we used location quotients to identify the region’s export industry. An industry’s location quotient is calculated by dividing the industry’s percent of the region’s total workforce by the same industry share of the nation’s workforce. If an industry’s location quotient is 1.0, the industry’s share in the region’s economy is the same as its share in the nation’s economy, and that it is likely not an industry whose product or service is sold outside the area. In this analysis, the region’s dominant export industries were identified as those having a location quotient of greater than 1.5.

⁷ For an analysis of the growth potential of an import substitution strategy for the region, see Erickcek and Watts. *Market Gap Analysis for the Greater Grand Rapids Area* (W.E. Upjohn Institute, 2007).

Table 5: Specialized Export-Based Industries for the Wired Region

| Industry | Percent share of industry in area's employment | Location quotient of industry in area (=share in area divided by share in U.S.) | Percent employment growth of industry in area, 1998-2004 | Percent employment growth of industry in U.S., 1998-2004 | Average annual percent growth of area industry 1998-2004 | Average annual percent growth of U.S. industry 1998-2004 | BLS projected average annual percent growth of industry in U.S., 2004-2014 |
|----------------------------|--|---|--|--|--|--|--|
| All industry | 100.0 | 1.00 | -1.2 | 6.2 | -0.2 | 1.0 | 1.3 |
| Export industries | | | | | | | |
| Furniture mfg. | 2.63 | 5.45 | -44.2 | -8.4 | -7.2 | -1.4 | -0.2 |
| Primary metal mfg. | 1.43 | 3.66 | -20.7 | -30.8 | -3.4 | -5.0 | -2.0 |
| Machinery mfg. | 3.08 | 3.26 | -20.7 | -28.2 | -3.4 | -4.6 | -1.4 |
| Plastics mfg. | 2.31 | 2.92 | 0.1 | -12.6 | 0.0 | -2.1 | -1.0 |
| Transportation equip. mfg. | 4.08 | 2.89 | 1.6 | -16.1 | 0.3 | -2.7 | 0.5 |
| Leather mfg. | 0.10 | 2.58 | -8.2 | -58.7 | -1.4 | -9.6 | -2.7 |
| Chemical mfg. | 1.56 | 2.18 | -34.7 | -9.0 | -5.7 | -1.5 | -0.1 |
| Fabricated metals mfg. | 2.59 | 1.97 | -17.7 | -18.1 | -2.9 | -3.0 | -0.2 |
| Beverage mfg. | 0.22 | 1.67 | 130.0 | -11.1 | 29.5 | -1.8 | -0.7 |

Furniture tops the list followed by other manufacturing activities. In fact, one of the more important findings in this analysis is that none of the region's export industries produce any type of services.⁸ The region's fast-growing health care industry has a location quotient of between 1.01 (hospitals) and 0.92 (ambulatory health care). One of the challenges facing the region is that it is still dependent on a manufacturing export base. While many manufacturers offer good-paying jobs and stable employment opportunities, few face growing markets. As long as the region depends on manufacturing for its economic base, it will experience below-average employment growth.

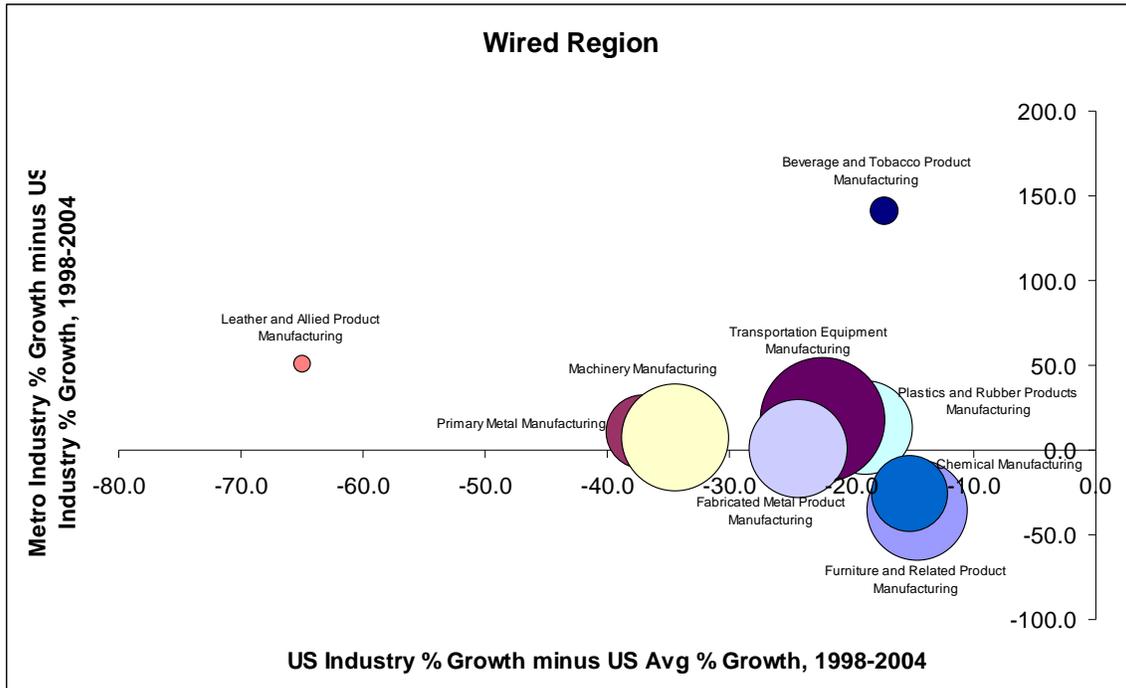
The fourth and fifth columns in Table 5 show the percent employment growth for the industry in the region and in the nation from 1998 to 2004. This was not a great period for these industries as it includes the 2001 recession and the ensuing weak recovery from 2002 to 2004. Of the nine major export industries, only three recorded employment growth during the period, led by the beverage industry where employment rose by 130 percent. Nationwide, all of the industries which contain the region's major exporters lost employment—again, it is extremely difficult for a region to grow when its major exporters are facing weak national markets.

The challenging situation facing the region is illustrated in Chart 2 below. The vertical axis shows the difference between the region's employment growth and that of its national rivals and is a measure of competitiveness. The horizontal axis measures the national employment growth of the region's industries relative to the U.S. average growth and is a measure of the robustness of the region's major export industries.

Ideally, a region would like to have highly competitive export firms—ones outperforming their national rivals—in industries facing strong national growth. None of the WIRED major export industries enjoys such an environment. All of them are facing sluggish national markets. However, regional firms in seven of the nine industries bettered their national rivals. Unfortunately, the region's furniture and chemical industries were unable to keep up with their rivals in terms of employment growth during the period.

⁸ Some may object that tourism is not included. Tourism does not have its own NAICS code so it cannot be included in the analysis. Nevertheless, all of the industries that are associated with tourism, accommodations, performing arts, eating and drinking places, and amusement and recreation all have location quotients of less than one, suggesting that tourism may not be a particularly strong export industry for the region.

Chart 2: Growth Trends in WIRED Export Industries in Wired Region



NOTE: Top 9 industries, ranked by metro location quotient, for this region. Average U.S. growth is growth of all industries for U.S. over 1998-2004 time period, which was growth of 6.2%. Bubbles are drawn to be proportional to size of industry share in this region. The horizontal axis shows the percentage growth in the industry's employment in the U.S. compared to the growth of all U.S. industries. Industries to the right of the zero vertical line are growing faster in the U.S. than the average industry. The vertical axis shows the percentage growth in the industry's employment in the area compared to the industry's growth in the U.S. Industries above the zero horizontal line are growing faster in this area than nationally, and the area is gaining market share in these industries. The most attractive industries would be those in the NE quadrant (not shown), in which the area is gaining market share in an above-average national growth industry.

Finally as shown in the last column of the Table 5, all of the region's major export industries are forecasted by the Bureau of Labor Statistics (BLS) to experience sluggish if not negative employment growth from 2004 to 2014.

The previous analysis is not without its flaws. First, it is restricted to major industry groupings. Each of the nine major export industries identified can have sub-sectors that are doing very well. For example, the region's auto industry (transportation equipment manufacturing) is doing poorly; however, this sector includes Gentex which continues to add jobs and dominate the auto mirror industry. A more detailed analysis, if it were available, would likely show more individual companies and industry sub-sectors that are both highly competitive and facing strong markets. Second, the entire analysis is incomplete because it is restricted to the national economy. All of the region's sectors operate in a global environment. Unfortunately, the lack of a consistent international data base makes such a study impossible.

Michael Porter in his Cluster Mapping Project identified seven concentrated industrial clusters in the WIRED region as shown in Table 6. The cluster rankings were determined on the MSA level and identify those industrial clusters that achieved a national ranking which was higher than the overall ranking of its MSA. In this analysis we used the ranking of the Grand Rapids-Wyoming MSA, 50th, as the cutoff point. Except for the welcomed introduction of biopharmaceuticals, the list once again points out the dependency of the region on traditional manufacturing activities.

Table 6: Traded Clusters, 2004

| |
|------------------------|
| Automotive |
| Metal Manufacturing |
| Plastics |
| Production Technology |
| Biopharmaceuticals |
| Analytical Instruments |
| Footwear |

Source: Micheal Porter Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School

Finally, the above analysis can give the wrong impression that the WIRED region is dependent only upon a select few industries to attract new dollars into the region. Nothing could be further from the truth. First, almost all of the region's industries have an "export" component as shown in Table 7. Using our REMI model for the region, we estimate the number of employees by industry that is dependent upon the sales of their goods or services to out-of-the-region customers. It is not surprising that more than 80 percent of the employees in the region's furniture, motor vehicles, and machinery industries are dependent upon out-of-region sales. However, this analysis also estimates that more than 3,000 workers in each of the region's hospitals, ambulatory care health centers, retail trade, insurance carriers, and construction sectors are also dependent upon serving the needs of out-of-region customers.

Table 7: Regional Employment Dependent Upon "Exporting" Outside of the Region

| Variable | National Exports | International Exports | Tota Export Employment | % of Total employment |
|--|-------------------------|------------------------------|-------------------------------|------------------------------|
| Oil, gas extraction | 523 | 14 | 537 | 91.8% |
| Mining (except oil, gas) | 314 | 47 | 361 | 89.4% |
| Transp. Equip. mfg.. exc. motor vehicles | 770 | 425 | 1,195 | 89.1% |
| Furniture, related product. mfg.. | 13,783 | 531 | 14,314 | 85.2% |
| Support activities for mining | 57 | 0 | 57 | 85.1% |
| Motor vehicle mfg. | 14,438 | 2,810 | 17,248 | 83.9% |
| Scenic, sightseeing transp; supp. | 976 | 323 | 1,299 | 81.2% |
| Pipeline transportation | 185 | 4 | 189 | 80.8% |
| Machinery mfg. | 9,474 | 4,023 | 13,497 | 80.3% |
| Electrical equip., appliance mfg. | 637 | 201 | 838 | 79.4% |
| Computer, electronic product mfg. | 2,764 | 1,587 | 4,351 | 76.2% |
| Petroleum, coal product. mfg. | 20 | 2 | 22 | 75.9% |
| Textile product mills | 384 | 26 | 410 | 75.0% |
| Textile mills | 163 | 49 | 212 | 73.6% |
| Miscellaneous mfg. | 2,132 | 635 | 2,767 | 72.2% |
| Wood product mfg. | 1,649 | 81 | 1,730 | 71.8% |
| Food mfg. | 5,841 | 398 | 6,239 | 70.9% |
| Nonmetallic mineral product mfg. | 2,934 | 277 | 3,211 | 68.9% |
| Leather, allied product mfg. | 378 | 128 | 506 | 68.6% |
| Air transportation | 81 | 70 | 151 | 66.2% |
| Accommodations | 2,137 | 1 | 2,138 | 63.7% |
| Rail transportation | 262 | 58 | 320 | 62.1% |
| Chemical mfg. | 3,165 | 1,038 | 4,203 | 60.6% |
| Primary metal mfg. | 3,162 | 591 | 3,753 | 58.2% |
| Transit, ground pass. transp. | 663 | 1 | 664 | 57.1% |
| Fabricated metal product mfg. | 7,518 | 979 | 8,497 | 57.1% |
| Plastics, rubber product mfg. | 4,367 | 586 | 4,953 | 55.5% |
| Truck transp., couriers, messengers | 4,461 | 855 | 5,316 | 54.5% |
| Apparel mfg. | 43 | 6 | 49 | 53.8% |
| Beverage, tobacco product mfg. | 273 | 16 | 289 | 52.2% |
| Forestry et al. | 295 | 80 | 375 | 52.2% |
| Warehousing, storage | 524 | 19 | 543 | 50.7% |
| Insurance carriers, related activities | 5,375 | 196 | 5,571 | 49.9% |
| Broadcasting, exc. Int; telecomm. | 1,789 | 63 | 1,852 | 44.0% |
| Paper mfg. | 1,007 | 223 | 1,230 | 42.1% |
| Educational services | 6,615 | 52 | 6,667 | 41.3% |
| Printing, related support activities | 1,142 | 62 | 1,204 | 35.2% |
| Rental, leasing services | 65 | 748 | 813 | 27.6% |
| Sec, comm contracts, inv | 1,573 | 255 | 1,828 | 26.8% |
| Administrative, support services | 12,439 | 259 | 12,698 | 25.1% |
| Wholesale trade | 4,377 | 2,876 | 7,253 | 24.1% |
| Waste mgmnt. Remed. services | 388 | 1 | 389 | 22.5% |
| Motion picture, sound rec. | 111 | 135 | 246 | 20.6% |
| Mgmnt. of companies, enterprises | 736 | 801 | 1,537 | 20.3% |
| Hospitals | 3,327 | 3 | 3,330 | 16.5% |
| Publishing, exc. Internet | 283 | 103 | 386 | 13.5% |
| Ambulatory health care services | 3,398 | 2 | 3,400 | 12.0% |
| Membership assoc., organiz. | 1,209 | 15 | 1,224 | 10.1% |
| Nursing, residential care facilities | 1,299 | 0 | 1,299 | 10.1% |
| Professional, technical services | 2,211 | 650 | 2,861 | 8.9% |
| Social assistance | 1,052 | 0 | 1,052 | 8.4% |
| Amusement, gambling, recreation | 622 | 1 | 623 | 8.4% |
| Utilities | 164 | 8 | 172 | 7.4% |
| Museums, et al. | 41 | 0 | 41 | 7.4% |
| Construction | 3,171 | 6 | 3,177 | 7.2% |
| Monetary authorities, et al. | 502 | 215 | 717 | 7.0% |
| Personal, laundry services | 561 | 0 | 561 | 5.9% |
| Retail trade | 4,730 | 80 | 4,810 | 5.8% |
| Real estate | 1,010 | 11 | 1,021 | 5.3% |
| Performing arts, spectator sports | 125 | 14 | 139 | 3.5% |
| Food services, drinking places | 784 | 50 | 834 | 2.0% |
| Agriculture | 29 | 7 | 36 | 1.8% |
| Repair, maintenance | 147 | 3 | 150 | 1.5% |
| Internet service, data proc., other | 5 | 4 | 9 | 1.3% |

Source: W.E. Upjohn Institute

In conclusion, the standard analysis of the region's current situation is not promising. Its major exporters are competitive but are also facing stagnant national markets. In addition, cluster analysis suggests that the region's major industrial clusters including biopharmaceuticals are in manufacturing. Still, it would be wrong to focus on these traditional bulwarks of the region for future growth and moreover, it is incorrect and harmful to believe that regional earnings are only gained from a few industries. Export possibilities can emerge in almost all industries which draw into question the soundness of an emerging industries check list.

Regional Forecast

While national trends reviewed above are important to consider, the workforce development goals of WIRED are focused on the economy in the seven-county greater Grand Rapids region. Therefore, we have developed a custom employment forecast for the region from 2007 to 2017 using the Upjohn Institute REMI⁹ model. This forecasting model is based on macro economic growth trends, as well as the unique industrial and occupational mix that constitutes the region. The following assumptions were used in generating this forecast:

- The national economy (GDP) will grow at a 2.8 percent average annual rate during the period.
- The automotive sector will continue to decline in Michigan as Detroit-based companies and their suppliers continue to suffer market share losses.
- Overall growth (or decline) of all other industries will depend on national and international growth trends and the relative cost structure of local firms. In other words, all Michigan industries, with the exception of automotive, are presumed to follow macro trends based on their strength, cost structure, and productivity, and are not tied to locally-specific firm trends.

Growth in the WIRED region between 2007 and 2017 is expected to be modest, with regional employment performing slightly worse than the U.S. average and slightly better than the rest of Michigan. Total private nonfarm employment in the WIRED region is projected to increase at a 0.7 percent annual average rate, compared to a 0.4 percent rate for Michigan and 1.4 percent nationwide (Chart 3).

A look at regional growth within major industry sectors shows that total employment growth between 2007 and 2017 is expected to be concentrated in a few select sectors, while many industries maintain flat employment or even decline. The vast majority of new jobs—around 70 percent of the 43,500 total new jobs expected during the period—are forecast to be in the health care and social services industry (Table 8). Other industries adding a significant number of new jobs include administrative and waste services with 12,000 new jobs, followed by private education services and the hospitality,

⁹ For more information on REMI see the Appendix A.

recreation, and food service sectors. Offsetting these gains are the expected losses in manufacturing, wholesale, and retail, along with several other small sectors.

Chart 3: Forecast Regional Employment Growth and Assumed State and National Trends, 2007 to 2017

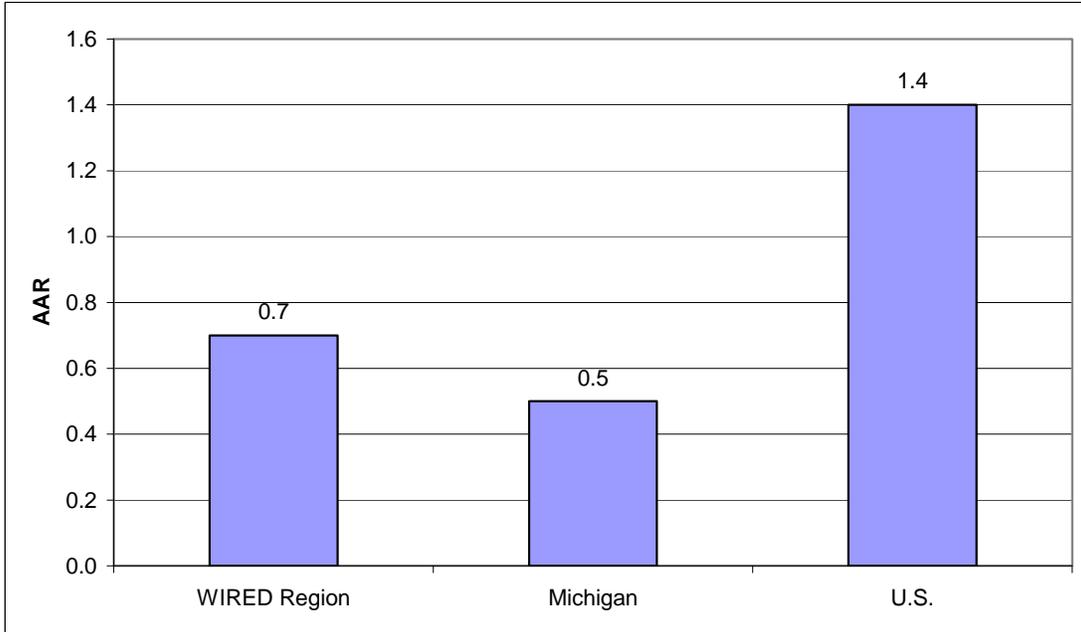


Table 8: WIRED Region Major Industry Employment Growth Forecast

| Industry Sector | Thousands of Jobs | | Change | Annual average growth rate |
|--------------------------|-------------------|---------------|--------|----------------------------|
| | 2007 Estimate | 2017 Forecast | | |
| Total Private Non-farm | 646 | 690 | 44 | 0.7% |
| Natural Resources | 3 | 3 | 0 | -1.1% |
| Utilities | 2 | 2 | 0 | -2.4% |
| Construction | 43 | 47 | 4 | 0.9% |
| Manufacturing | 125 | 112 | -13 | -1.1% |
| Wholesale | 31 | 27 | -4 | -1.3% |
| Retail | 85 | 84 | -1 | -0.1% |
| Transport & Warehouse | 16 | 17 | 2 | 0.9% |
| Information | 8 | 8 | 0 | 0.0% |
| Financial | 49 | 51 | 2 | 0.4% |
| Professional & Business | 40 | 43 | 2 | 0.5% |
| Administrative | 51 | 63 | 12 | 2.1% |
| Private Education | 16 | 21 | 5 | 2.6% |
| Health & Soc Svcs | 80 | 111 | 30 | 3.2% |
| Hospitality & Recreation | 60 | 64 | 5 | 0.8% |
| Other Services | 37 | 38 | 1 | 0.2% |

Taking a look at more detailed sector data reveals that most jobs will be created by sub-sectors of major industries that are also expected to experience significant growth. The following two tables list the top 10 winners and losers in terms of sector job growth that is forecast to occur between 2007 and 2017 (Tables 9 and 10).

Table 9: Ten Biggest Growth Sectors in the Region

| Detailed Sector | Projected change in employment 2007-2017 |
|--------------------------------------|--|
| Ambulatory health care services | 13,899 |
| Administrative, support services | 11,205 |
| Nursing, residential care facilities | 6,538 |
| Hospitals | 5,926 |
| Private educational services | 4,673 |
| Construction | 4,061 |
| Social assistance | 3,842 |
| Food services, drinking places | 2,967 |
| Prof, tech services | 2,746 |
| Amusement, gambling, recreation | 1,198 |

Table 10: Ten Regional Sectors Facing the Biggest Decline

| Detailed Sector | Projected change in employment 2007-2017 |
|---------------------------------------|--|
| Motor vehicle manufacturing | -4,463 |
| Wholesale trade | -3,703 |
| Machinery manufacturing | -2,299 |
| Fabricated metal prod manufacturing | -2,263 |
| Furniture, related prod manufacturing | -1,730 |
| Chemical manufacturing | -819 |
| Retail trade | -818 |
| Primary metal manufacturing | -759 |
| Repair, maintenance | -682 |
| Management of companies, enterprises | -515 |

Of course, each of these industries, whether growing or contracting, employs workers in a variety of tasks. The occupations expected to grow most in size over the next ten years are those closely associated with high-growth industry sectors (Table 11).

Table 11: Large Growth Regional Occupations

| Detailed Sector | Projected change in employment 2007-2017 |
|------------------------------------|--|
| Health diagnosing and treating | 6,808 |
| Nursing & home health | 4,088 |
| Health technicians | 3,801 |
| Construction trades | 3,135 |
| Other healthcare support | 2,903 |
| Other personal care | 2,698 |
| Food and beverage serving | 2,342 |
| Information clerks | 2,235 |
| Postsecondary teachers | 2,174 |
| Computer specialists | 2,009 |
| Counselors, social workers | 1,895 |
| Building cleaning and pest control | 1,637 |
| Primary, secondary, and special ed | 1,609 |
| Business operations specialists | 1,547 |
| Other protective service workers | 1,414 |
| Other management occupations | 1,178 |
| Motor vehicle operators | 1,171 |
| Other teachers and instructors | 1,003 |

Many other occupational groups are expected to grow in size over the next ten years but at a slower pace (Table 12). This group of occupations is more diverse and contains positions that are less likely to be specifically associated with high-growth industries. Indeed, many of the positions in this category of growth consist of workers who serve multiple industries (such as top executives, marketing and advertising workers, or administrative assistants) or those who serve the general population (such as cooks, personal appearance workers, and retail sales).

Table 12: Other Growing Regional Occupations

| Detailed Sector | Projected change in employment 2007-2017 |
|---|---|
| Grounds maintenance workers | 810 |
| Other education, training, library workers | 789 |
| Top executives | 782 |
| Cooks and food prep | 766 |
| Financial specialists | 700 |
| Other installation, maintenance, repair | 682 |
| Operations specialties managers | 538 |
| Personal appearance workers | 446 |
| Law enforcement workers | 416 |
| Other food preparation and serving | 376 |
| Advertising, marketing, promotions | 350 |
| Other healthcare workers | 348 |
| Occupational and physical therapist | 337 |
| Other sales and related workers | 297 |
| Supervisors, food prep & service | 295 |
| Retail sales workers | 292 |
| Entertainment attendants | 279 |
| Other construction trades | 269 |
| Entertainers and performers, sports | 253 |
| Supervisors, construction | 239 |
| All other counselors, social, and religious | 238 |
| Supervisors, sales workers | 228 |
| Social scientists | 219 |
| Helpers, construction trades | 215 |
| Lawyers, judges, and related | 198 |
| Media and communication occupations | 173 |
| Supervisors, building & grounds crews | 168 |
| Supervisors of personal care workers | 157 |
| Art and design occupations | 133 |
| Religious workers | 132 |
| Administrative assistants | 130 |

The slowest growing occupations—those adding, on average, no more than a few new jobs to the region each year—can still represent an important group for workforce development. As shown in Table 13, some of these occupations are also population-driven service positions such as firefighting. However, many of these occupations posting small growth numbers are in fields that are highly specialized and/or require high levels of formal education such as a graduate degree. Despite growing by only a few jobs per year, many of these positions may actually be quite difficult to fill. Furthermore,

because of the small base of workers currently in some of these occupations, the forecast rate of increase is actually quite high; for example, an increase of 78 life science workers represents an 8.5 percent increase, while 88 new life, physical, social science positions represents a 5.4 percent gain.

Table 13: Slow-growing Regional Occupations

| Detailed Sector | Projected change in employment 2007-2017 |
|--|--|
| Life, physical, and social sci techs | 88 |
| Legal support workers | 87 |
| First-line supervisors, protective svcs | 87 |
| Fire fighting and prevention | 81 |
| Life scientists | 78 |
| Media & communication equip op | 73 |
| Animal care and service workers | 67 |
| Librarians, curators, archivists | 67 |
| Transportation, tourism, and lodging | 39 |
| Physical scientists | 28 |
| Other transportation workers | 28 |
| Funeral service workers | 23 |
| Supervisors of installation & repair workers | 21 |
| Extraction workers | 20 |
| Architects, surveyors, and cartographers | 19 |
| Sales representatives, services | 14 |
| Food processing occupations | 14 |
| Air transportation occupations | 14 |
| Printing occupations | 14 |
| Supervisors, office & administrative | 12 |
| Mathematical science occupations | 5 |

Finally, there are always the unfortunate occupational categories that are forecast to decline in number throughout the region during the next ten years (Table 14). Most of these types of jobs are tied to either the troubled manufacturing sector or to other traditional shrinking industries such as agriculture and natural resources. Also, a few occupations such as communications equipment operators, electronic equipment operators, and other office and administrative positions may be shrinking due to continued technological advancements.

Table 14: Occupations Shrinking in the Region

| Detailed Sector | Projected change in employment 2007-2017 |
|---|--|
| Water transportation occupations | -1 |
| Supervisors, transportation | -2 |
| Financial clerks | -14 |
| Supervisors, farming, fishing, forestry | -25 |
| Fishing and hunting workers | -36 |
| Rail transportation occupations | -43 |
| Electrical and electronic equipment | -63 |
| Drafters, engineering, and mapping | -94 |
| Communications equipment operators | -112 |
| Plant and system operators | -115 |
| All other farming, fishing, forestry | -149 |
| Textile, apparel, furnishings | -188 |
| Sales representatives, wholesale | -206 |
| Engineers | -210 |
| Vehicle mechanics | -212 |
| Other office and administrative | -213 |
| Supervisors, production workers | -236 |
| Woodworkers | -505 |
| Other production occupations | -557 |
| Material moving occupations | -723 |
| Agricultural workers | -764 |
| Material recording, scheduling, dis | -1,628 |
| Metal workers and plastic workers | -2,805 |
| Assemblers and fabricators | -3,204 |

Finally, there are always the unfortunate occupational categories that are forecast to decline in number throughout the region during the next ten years (Table 14). Most of these types of jobs are tied to either the troubled manufacturing sector or to other traditional shrinking industries such as agriculture and natural resources. Also, a few occupations such as communications equipment operators, electronic equipment operators, and other office and administrative positions may be shrinking due to continued technological advancements.

One occupation that is forecast to decrease in size within the WIRED region that may surprise some readers is engineering. Although engineering occupations are doing well nationally, with the BLS predicting above-average 13.4 percent growth between 2004 and 2014, locally many engineering positions are tied to the automotive sector, which is forecast to continue struggling for the foreseeable future. Therefore, our modeling predicts that the number of engineers employed in the WIRED region is likely to decline by about 210 workers—2.9 percent—by 2017.

Emerging Industries, Potential Impacts

Key Characteristics of Favorable Emerging Industries

The identification of specific emerging industries is difficult and risky. Common and reasonable lists include life sciences, alternative energies including bio-fuels, solar, wind, and batteries. Nevertheless, they have common characteristics that most would agree a promising emerging industry should hold:

- **It is facing strong national and global marketplaces.** Services for retirees, medical products, and low-cost energy generation are all facing strong markets. It is important to note that none of these markets are “fad” markets which have little staying power.
- **It is sustainable.** Production of goods or services should not come at the expense of exhausting nonrenewable resources nor should it generate toxic byproducts.
- **It is a part of the region’s base economy.** The activity should bring new monies into the economy by selling to customers who are located outside the region, attracting customers into the region, or stopping dollars from leaving the region.
- **It builds upon the existing industrial strengths of the region.** Since Alfred Marshall in the 1880s, regional scientists have stressed the importance of agglomerative economies.¹⁰ Today the buzz is about industrial clusters and the new economic geography, but the concept is still the same. In general, activities tend to evolve from the region’s existing industrial structure.
- **It offers employment opportunities that are attainable to the region’s current workforce.** An often-stated fear is that the new knowledge-based economy will leave many behind because their skills and training will be obsolete. This does not need to be the case. The manufacturing of new products, wind turbines, bio-fuels and medical instruments will require many of the manufacturing skills already acquired by the region’s workforce. Second, many growing fields such as medical have positions open that are attainable by existing workers who are willing to attend one or two years of training.

Even if an activity has all of these attributes, there remains a severe danger in that the region could pick the right race but bet on the wrong horse. In a world of competing technologies, management approaches, cost structures, and simply luck, it is quite possible that a region’s stakeholders will identify the industries but be unsuccessful in nurturing a winner.

¹⁰ Marshall, *Principles of Economics*, London Macmillan 1890. Marshall recognized more than 100 years ago that urban areas offer an “external” environment where ideas and knowledge could flow between firms and individuals.

What Are Other States Doing?

Many states are targeting the same emerging industries. We have researched the economic development efforts of all 50 states and found that 62 percent of the states including Michigan have life sciences or biotechnology as a targeted industry (Table 15). Michigan is among the 23 states that are targeting advanced manufacturing activities and is one of 11 states that are seeking to attract energy-related activities.

While it is possible that each state has prepared careful economic analyses that support their chosen targets, it is also very likely that a bandwagon effect is in play. Regardless of how the industries were selected, it is clear that there is a crowded field. Regions will have an increasingly hard time in separating themselves from the pack.

Table 15: Targeted Industries by State

| State | Lifescience/Bio- science/Biotech | Advanced Manufacturing | Information Technology | Aerospace | Professional Services | Energy | Logistics/ Warehousing | Agriculture/Food | Electronics | Homeland Security/ Defense | Automotive | Tourism | Film | Nanotechnology |
|----------------|----------------------------------|------------------------|------------------------|-----------|-----------------------|-----------|------------------------|------------------|-------------|----------------------------|------------|----------|----------|----------------|
| Michigan | X | X | | | | X | | | | X | X | | | |
| Alabama | | X | | | | | | | | | X | | | |
| Alaska | | X | | X | | | | | | | X | | | |
| Arizona | X | X | X | X | X | | X | X | X | | | | | |
| Arkansas | X | X | X | X | X | | X | X | | | | | | |
| California | X | X | X | X | X | | X | X | | | | | | |
| Colorado | X | X | X | X | X | | | | | | | | | |
| Connecticut | | X | | | X | | | | | | | | | |
| Delaware | | X | X | X | X | | | | | | | | | |
| Florida | X | X | X | X | X | | | | | | | | | |
| Hawaii | X | X | X | X | X | | | | | | | | | |
| Idaho | X | | | | | X | | | | | | | | |
| Illinois | X | | | | | X | X | X | | X | | | | |
| Indiana | X | X | X | | | | | | | | | | | |
| Iowa | X | X | X | | | | | | | | | | | |
| Kansas | X | X | X | X | | | | | | | | | | |
| Kentucky | X | X | X | | | | | | | | | | | |
| Louisiana | X | X | X | | | X | X | X | | | | | | |
| Maine | X | X | X | | X | | | | | | | | | |
| Massachusetts | X | X | X | | | | | | | | | | | |
| Minnesota | X | | | | | | | | | | | | | |
| Mississippi | | X | X | | | | X | | | X | | | | |
| Missouri | | | | | | | | | | | | | | |
| Montana | X | | | | | | | | | | | | | |
| Nebraska | X | | X | | | | X | X | | | | | | |
| Nevada | X | | | | | | | | | | | | | |
| New Hampshire | | X | | | | | | | | | | | | |
| New Jersey | X | X | | | | | | X | X | | | | | |
| New Mexico | X | X | | X | | | | X | X | | | | | |
| New York | | X | | | | | | | | | | | | |
| North Carolina | | X | | | | | X | X | | | | | | |
| North Dakota | X | | X | | | | | | X | | | | | |
| Oklahoma | X | X | | X | X | | X | | | | | | | |
| Oregon | | | | | X | | | | X | | | | | |
| Pennsylvania | X | X | | X | X | | | | X | | | | | |
| Rhode Island | X | X | X | | X | | | | | X | | | | |
| South Dakota | X | | | | X | | | X | | | | | | |
| Tennessee | X | X | X | X | X | | X | | X | X | X | | | |
| Texas | X | X | X | X | X | | X | | | X | | | | |
| Utah | X | X | X | X | X | | X | | | X | | | | |
| Virginia | | | | | | | | | | | | | | |
| West Virginia | X | | X | X | X | | | | | | | | | |
| Wisconsin | X | | X | | | | | | | | | | | |
| TOTALS | 32 | 24 | 16 | 12 | 12 | 12 | 11 | 10 | 8 | 8 | 6 | 5 | 5 | 5 |
| Percent | 64% | 48% | 32% | 24% | 24% | 24% | 22% | 20% | 16% | 16% | 12% | 10% | 10% | 10% |

Source: W. E. Upjohn Institute

Potential Impact

The potential impact of an emerging industry depends on whether it successfully attracts new dollars into the region. As discussed previously, industries such as restaurants, which cater to our more hectic lifestyles or outpatient surgery centers may emerge as fast-growing sectors but will not significantly add to the growth of the region. As shown later, some of the region's faster-growing industries have very modest impacts on the area's overall growth.

To estimate this impact we used the Upjohn Institute's REMI economic model of the region to generate employment multiplier estimates. Employment multipliers are the ratio of the total employment impact of a business on the region and its direct impact—the number of persons it employs. For example, if the region's total employment increases by 200 due to the firm adding 100 workers, then the firm has a multiplier of 2.0. As shown below, multipliers can reveal a lot regarding how important an industry is to the growth of the region as well as how integrated it is.

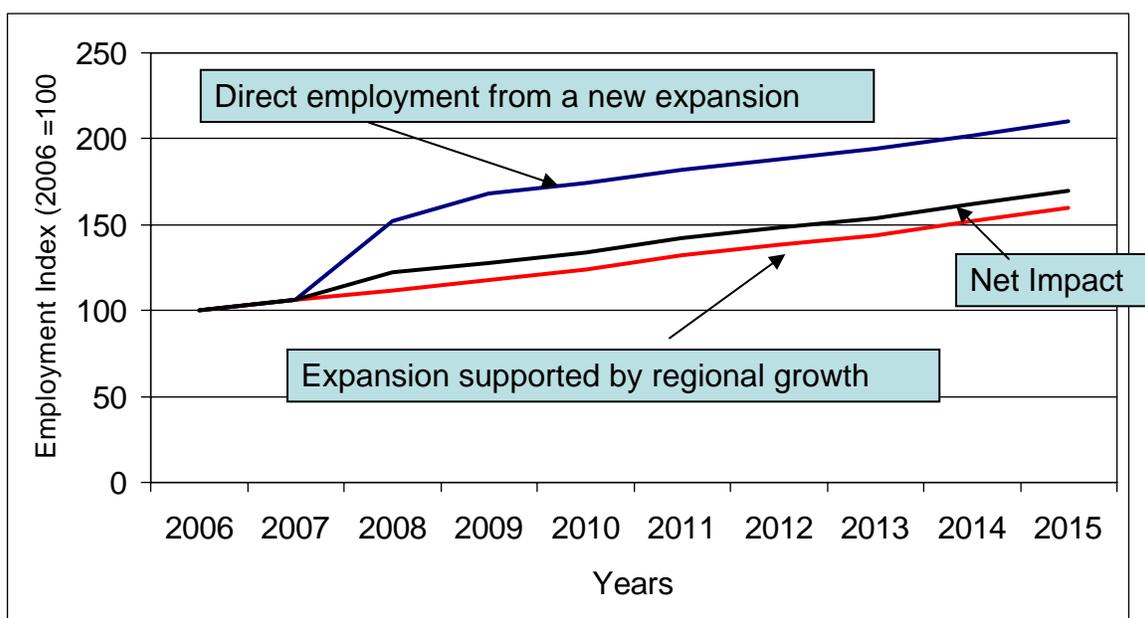
In Table 16 we present the estimated firm multipliers for several high-growth industries. The firm multiplier takes into account the possible displacement impacts of its growth on existing firms. For example, the success of a new restaurant will likely come at the expense of existing restaurants. Indeed, if a new large restaurant hires 100 additional workers, the net overall impact for the seven-county region is 15 jobs. The other 85 jobs will be offset by employment reductions at competing restaurants.

Table 16: Selected Firm Employment Multiplier

| Industry Sector | Multiplier |
|-------------------------------------|-------------------|
| Motor vehicles and parts | 2.93 |
| Furniture | 1.75 |
| Food products | 2.05 |
| Hospitals | 0.56 |
| Hospitality | 0.44 |
| Food services | 0.15 |
| Internet and data services | 0.76 |
| Performing arts and sport events | 0.75 |
| Private education services | 1.07 |
| Professional and technical services | 0.93 |

Regarding hospitals, if a region's hospital adds 100 workers and everything remains the same, on net, only 56 additional jobs will be added to the regional economy due to other hospitals downsizing in response to the expansion. Now for hospitals, everything else is NOT holding constant; we are getting older and population growth is positive. If the expansion is in line with expected increase in demand, then the displacement effect will not be a factor. This is shown in Chart 4 below. Industry employment is forecast to grow during the time period of 2006 to 2015. An expansion that results in greater employment than can be supported by the expected growth will lead to only a modest overall impact in employment.

Chart 4: Employment Impact with Displacement



In considering what effect emerging industries could have on the WIRED region, it is important to understand that the overall impact relies both on the current industrial linkages in the region and the ability of a new emerging industry to succeed in the region. Another way of looking at the prospect of picking an emerging industry to champion—an approach we do not necessarily recommend—is to look at it from the perspective of gambling: the odds of success and the rewards of success are not equal across industries.

To illustrate this difference, we have developed REMI model estimates of the employment multiplier effect of job growth in several emerging industries that are frequently touted by government and business leaders as potential future sources of growth. Although truly emerging industries are extremely difficult to model, given the fact that they are too new as to have well-understood supplier linkages, much can still be said about the local industrial concentrations and typical wage structures of the general industrial categories in which many emerging industries reside. Indeed, for the most part emerging industries that have currently been identified must, by their very nature, exist in some form—usually as a new subset of an existing industry or as an established sector that is poised to experience significant change or growth.

**Table 17: Estimated Employment Multiplier Effect
of Select Industries in WIRED Region**

| Emergent Industry Classification | Employment Multiplier |
|--|-----------------------|
| Battery technology | 3.3 |
| Medical instruments | 2.8 |
| Pharmaceuticals | 4.1 |
| Electrical transformers and technology | 2.6 |
| Hospitals | 2.0 |
| Electromedical devices | 3.1 |
| Research and development | 2.1 |

Of seven high-profile, high-tech industries that we were able to model (Table 17), the estimated employment multiplier is highest for pharmaceuticals because of the combination of high-wage positions and the number of production inputs demanded from other businesses within the region. Battery technology, electro-medical devices (electrical medical instruments), and medical instruments (non-electrical and standard medical instruments) also have a strong regional impact due to their wages and/or locally derived production inputs.

A word must be said about the potential employment impact of hospitals since Tables 16 and 17 give conflicting multiplier estimates, 0.56 vs. 2.0. The first multiplier estimates the impact of an expansion on existing services. For example, a new regional hospital that offers the same services as before but in a more attractive setting. A portion of the activity at the new hospital will come at the expense of existing, older medical centers and hence the low net multiplier. On the other hand, a new hospital which offers new services that are not elsewhere available at existing medical facilities will generate a much larger multiplier because there will be no displacement effects. Patients at the new facility will either be residents who would have gone outside the area to be treated or individuals coming in from outside the area for treatment. In either case, the hospital will be bringing new monies into the region.

Another perhaps more revealing way of thinking about industries that have high multiplier effects is to realize that this means they are part of a larger industrial cluster. Employment multipliers capture two linkages that an industry has with its area. The first represents the impact of consumer spending by its workers; this varies directly with the level of pay. The second is more relevant to the issue at hand in that it captures the industrial linkages the industry has with its local suppliers. In short, industries with large employment multipliers are in a more clustered environment. This is important as research findings show that industry clusters provide a comparative advantage.

The lowest multiplier effects are expected from jobs created in hospitals and research and development; both sectors that provide services and demand relatively fewer inputs. Additionally, hospital, medical instruments, and R&D services employ workers across a wide range of skill and wage levels. For example, although one may think of hospitals as being filled with highly compensated surgeons, in reality a large number of support

workers such as nurse aides, administrative assistants, and custodians are required for their operation.

Finally, despite their struggles in recent years, both the automotive sector and office furniture industry continue to have a strong impact on the WIRED region. The multiplier effect of employment expansion in either autos or office furniture, 3.3 and 2.9 respectively, would have an impact that is equal to or greater than most of the long-shot emerging industries so far discussed. If local firms were able to capture additional market share or develop new products for the industry, the impact would be substantial.

Table 18: Multiplier Effects of Existing Local Specialties

| Existing Industry Sector | Employment Multiplier |
|--------------------------|-----------------------|
| Motor vehicle parts | 3.3 |
| Office furniture | 2.9 |

Occupational Demand for a Select Number of Emerging Industries, Candidates, and Current Export Industries

One of the overriding goals of WIRED is to assist the region’s education providers in establishing the necessary training programs that will meet the needs of the area’s fast-growing, export industries. In this section, we present detailed occupational demand forecasts for the following export and high-growth industries:

- Pharmaceutical and medicine manufacturing (Table 19)
- Motor vehicle parts manufacturing (Table 20)
- Office furniture (including fixtures) manufacturing (Table 21)
- Medical equipment and supplies manufacturing (Table 22)
- Computer systems design and related services (Table 23)
- Management, scientific and technical consulting services (Table 24)
- Scientific research and development services (Table 25)
- Medical and diagnostics laboratories (Table 26)

In Appendix B, we provide a skills breakdown for the thirty occupations which are expected to experience the greater demand in each of these industries.

Table 19: PHARMACEUTICAL AND MEDICINE MANUFACTURING

| Occupation | 2004 | 2014 |
|---|-------------|-------------|
| Packaging and filling machine operators and tenders | 77 | 67 |
| Chemists | 50 | 49 |
| Medical scientists, except epidemiologists | 36 | 40 |
| Biological technicians | 28 | 29 |
| Mixing and blending machine setters, operators, and tenders | 27 | 28 |
| Chemical equipment operators and tenders | 27 | 27 |
| Business operation specialists, all other | 23 | 26 |
| First-line supervisors/managers of production and operating w | 25 | 26 |
| Inspectors, testers, sorters, samplers, and weighers | 27 | 25 |
| Sales representatives, wholesale and manufacturing, technica | 21 | 21 |
| Separating, filtering, clarifying, precipitating, and still machine | 21 | 21 |
| Maintenance and repair workers, general | 20 | 21 |
| Executive secretaries and administrative assistants | 18 | 17 |
| Managers, all other | 17 | 17 |
| Chemical technicians | 16 | 17 |
| Team assemblers | 16 | 17 |
| Natural sciences managers | 16 | 17 |
| Laborers and freight, stock, and material movers, hand | 16 | 15 |
| Secretaries, except legal, medical, and executive | 17 | 15 |
| Computer systems analysts | 13 | 15 |
| General and operations managers | 13 | 13 |
| Industrial production managers | 13 | 13 |
| Packers and packagers, hand | 13 | 13 |
| Biochemists and biophysicists | 13 | 13 |
| Industrial machinery mechanics | 11 | 11 |
| Microbiologists | 11 | 11 |
| Life, physical, and social science technicians, all other | 10 | 10 |
| Accountants and auditors | 10 | 10 |
| Production, planning, and expediting clerks | 10 | 10 |
| Shipping, receiving, and traffic clerks | 11 | 10 |
| Chemical plant and system operators | 10 | 10 |

Table 20: MOTOR VEHICLE PARTS MANUFACTURING

| Occupation | 2004 | 2014 |
|--|-------------|-------------|
| Team assemblers | 165 | 172 |
| First-line supervisors/managers of production and operating workers | 34 | 35 |
| Cutting, punching, and press machine setters, operators, and tenders, metal and | 42 | 35 |
| Inspectors, testers, sorters, samplers, and weighers | 36 | 33 |
| Machinists | 32 | 33 |
| Multiple machine tool setters, operators, and tenders, metal and plastic | 26 | 27 |
| Assemblers and fabricators, all other | 28 | 27 |
| Tool and die makers | 25 | 26 |
| Industrial truck and tractor operators | 26 | 24 |
| Welders, cutters, solderers, and brazers | 22 | 23 |
| Industrial engineers | 18 | 21 |
| Maintenance and repair workers, general | 20 | 21 |
| Molding, coremaking, and casting machine setters, operators, and tenders, metal | 22 | 21 |
| Computer-controlled machine tool operators, metal and plastic | 19 | 20 |
| Laborers and freight, stock, and material movers, hand | 21 | 20 |
| Production workers, all other | 23 | 19 |
| Engineers, all other | 17 | 17 |
| Welding, soldering, and brazing machine setters, operators, and tenders | 15 | 15 |
| Electricians | 14 | 15 |
| Engineering technicians, except drafters, all other | 14 | 15 |
| Industrial machinery mechanics | 14 | 14 |
| Lathe and turning machine tool setters, operators, and tenders, metal and plastics | 15 | 14 |
| Engine and other machine assemblers | 13 | 13 |
| Business operation specialists, all other | 12 | 13 |
| Electrical and electronic equipment assemblers | 12 | 12 |
| Mechanical engineers | 12 | 12 |
| Shipping, receiving, and traffic clerks | 12 | 11 |
| Helpers--Production workers | 10 | 11 |
| Grinding, lapping, polishing, and buffing machine tool setters, operators, and tenders | 11 | 10 |
| Drilling and boring machine tool setters, operators, and tenders, metal and plastics | 11 | 10 |

Table 21: OFFICE FURNITURE (INCLUDING FIXTURES) MANUFACTURING

| Occupation | 2000 | 2014 |
|--|-------------|-------------|
| Team assemblers | 120 | 128 |
| Cabinetmakers and bench carpenters | 96 | 94 |
| First-line supervisors/managers of production and operating workers | 43 | 45 |
| Woodworking machine setters, operators, and tenders, except sawing | 44 | 37 |
| Cutting, punching, and press machine setters, operators, and tenders, metal and | 37 | 31 |
| Helpers--Production workers | 27 | 29 |
| Laborers and freight, stock, and material movers, hand | 29 | 28 |
| Welders, cutters, solderers, and brazers | 26 | 27 |
| Sales representatives, wholesale and manufacturing, except technical and scienti | 23 | 24 |
| Coating, painting, and spraying machine setters, operators, and tenders | 19 | 18 |
| Industrial truck and tractor operators | 17 | 18 |
| Carpenters | 16 | 17 |
| Shipping, receiving, and traffic clerks | 18 | 17 |
| General and operations managers | 16 | 17 |
| Assemblers and fabricators, all other | 17 | 16 |
| Molding, coremaking, and casting machine setters, operators, and tenders, metal | 17 | 16 |
| Maintenance and repair workers, general | 14 | 15 |
| Packers and packagers, hand | 14 | 14 |
| Customer service representatives | 13 | 14 |
| Furniture finishers | 23 | 14 |
| Office clerks, general | 15 | 14 |
| Upholsterers | 16 | 13 |
| Sawing machine setters, operators, and tenders, wood | 15 | 13 |
| Machinists | 11 | 12 |
| Bookkeeping, accounting, and auditing clerks | 12 | 12 |
| Multiple machine tool setters, operators, and tenders, metal and plastic | 11 | 11 |
| Industrial engineers | 9 | 11 |
| Industrial production managers | 10 | 11 |
| Production workers, all other | 11 | 10 |
| Production, planning, and expediting clerks | 10 | 10 |

Table 22: MEDICAL EQUIPMENT AND SUPPLIES MANUFACTURING

| Occupation | 2000 | 2014 |
|--|-------------|-------------|
| Dental laboratory technicians | 117 | 120 |
| Team assemblers | 115 | 119 |
| First-line supervisors/managers of production and operating workers | 33 | 34 |
| Inspectors, testers, sorters, samplers, and weighers | 31 | 29 |
| Ophthalmic laboratory technicians | 26 | 27 |
| Customer service representatives | 21 | 22 |
| Medical appliance technicians | 21 | 21 |
| Assemblers and fabricators, all other | 21 | 20 |
| Packers and packagers, hand | 19 | 20 |
| Shipping, receiving, and traffic clerks | 19 | 18 |
| Sewing machine operators | 17 | 17 |
| Machinists | 17 | 17 |
| General and operations managers | 16 | 16 |
| Sales representatives, wholesale and manufacturing, technical and scientific pro | 15 | 15 |
| Office clerks, general | 15 | 14 |
| Sales representatives, wholesale and manufacturing, except technical and scienti | 13 | 14 |
| Production, planning, and expediting clerks | 13 | 14 |
| Truck drivers, light or delivery services | 13 | 13 |
| Molding, coremaking, and casting machine setters, operators, and tenders, metal | 14 | 13 |
| Industrial engineers | 12 | 13 |
| Packaging and filling machine operators and tenders | 14 | 13 |
| Computer-controlled machine tool operators, metal and plastic | 12 | 13 |
| Bookkeeping, accounting, and auditing clerks | 12 | 11 |
| Multiple machine tool setters, operators, and tenders, metal and plastic | 11 | 11 |
| Mechanical engineers | 11 | 11 |
| Maintenance and repair workers, general | 11 | 11 |
| Laborers and freight, stock, and material movers, hand | 12 | 11 |
| Electrical and electronic equipment assemblers | 10 | 10 |
| Executive secretaries and administrative assistants | 10 | 10 |
| Helpers--Production workers | 10 | 10 |
| Industrial production managers | 10 | 10 |

Table 23: COMPUTER SYSTEMS DESIGN AND RELATED SERVICES

| Occupation | 2000 | 2014 |
|--|-------------|-------------|
| Computer software engineers, applications | 117 | 136 |
| Computer software engineers, systems software | 76 | 88 |
| Computer systems analysts | 76 | 81 |
| Computer programmers | 98 | 78 |
| Computer support specialists | 73 | 71 |
| Network and computer systems administrators | 35 | 39 |
| Network systems and data communications analysts | 25 | 32 |
| Computer and information systems managers | 31 | 32 |
| Customer service representatives | 31 | 31 |
| General and operations managers | 29 | 28 |
| Management analysts | 21 | 21 |
| Office clerks, general | 21 | 18 |
| Executive secretaries and administrative assistants | 18 | 16 |
| Sales representatives, services, all other | 16 | 16 |
| Sales representatives, wholesale and manufacturing, technical and scientific pro | 20 | 15 |
| Database administrators | 12 | 13 |
| Computer specialists, all other | 13 | 13 |
| Bookkeeping, accounting, and auditing clerks | 14 | 12 |
| Business operation specialists, all other | 11 | 12 |
| Accountants and auditors | 11 | 10 |
| Computer hardware engineers | 10 | 10 |

Table 24: MANAGEMENT, SCIENTIFIC AND TECHNICAL CONSULTING SERVICES

| Occupation | 2000 | 2014 |
|--|-------------|-------------|
| Management analysts | 124 | 128 |
| Office clerks, general | 47 | 43 |
| General and operations managers | 37 | 37 |
| Customer service representatives | 35 | 37 |
| Executive secretaries and administrative assistants | 38 | 35 |
| Business operation specialists, all other | 23 | 27 |
| Secretaries, except legal, medical, and executive | 28 | 23 |
| Employment, recruitment, and placement specialists | 22 | 23 |
| Computer software engineers, applications | 18 | 23 |
| Bookkeeping, accounting, and auditing clerks | 24 | 22 |
| Accountants and auditors | 20 | 21 |
| Computer systems analysts | 16 | 19 |
| Market research analysts | 17 | 17 |
| Sales representatives, services, all other | 17 | 17 |
| First-line supervisors/managers of office and administrative support workers | 18 | 16 |
| Telemarketers | 17 | 14 |
| Computer software engineers, systems software | 11 | 14 |
| Computer support specialists | 12 | 12 |
| Laborers and freight, stock, and material movers, hand | 12 | 11 |
| Environmental scientists and specialists, including health | 15 | 11 |
| Sales and related workers, all other | 10 | 10 |
| Computer programmers | 12 | 10 |
| Environmental engineers | 10 | 10 |
| Network systems and data communications analysts | 7 | 10 |

Table 25: SCIENTIFIC RESEARCH AND DEVELOPMENT SERVICES

| Occupation | 2000 | 2014 |
|---|------|------|
| Computer software engineers, systems software | 17 | 20 |
| Medical scientists, except epidemiologists | 16 | 18 |
| Executive secretaries and administrative assistants | 15 | 15 |
| Biological technicians | 14 | 14 |
| General and operations managers | 12 | 12 |
| Business operation specialists, all other | 10 | 11 |
| Computer software engineers, applications | 9 | 11 |
| Chemists | 11 | 10 |
| General and operations managers | 10 | 10 |
| Chemists | 10 | 10 |
| Computer software engineers, applications | 8 | 10 |
| Mechanical engineers | 10 | 10 |
| Business operation specialists, all other | 9 | 10 |

Table 26: MEDICAL AND DIAGNOSTIC LABORATORIES

| Occupation | 2000 | 2014 |
|--|------|------|
| Medical and clinical laboratory technologists | 111 | 136 |
| Medical and clinical laboratory technicians | 105 | 106 |
| Healthcare support workers, all other | 103 | 103 |
| Radiologic technologists and technicians | 87 | 88 |
| Customer service representatives | 39 | 40 |
| Couriers and messengers | 40 | 32 |
| Billing and posting clerks and machine operators | 36 | 29 |
| Receptionists and information clerks | 28 | 27 |
| Diagnostic medical sonographers | 24 | 26 |
| Office clerks, general | 28 | 25 |
| Medical assistants | 23 | 24 |
| Medical secretaries | 26 | 23 |
| First-line supervisors/managers of office and administrative support workers | 21 | 19 |
| Medical and health services managers | 17 | 17 |
| Data entry keyers | 20 | 15 |
| Physicians and surgeons | 14 | 14 |
| Bookkeeping, accounting, and auditing clerks | 14 | 13 |
| Medical transcriptionists | 12 | 13 |
| Sales representatives, services, all other | 12 | 12 |
| General and operations managers | 12 | 12 |
| Truck drivers, light or delivery services | 10 | 10 |
| Executive secretaries and administrative assistants | 10 | 10 |
| Bill and account collectors | 10 | 10 |
| Medical records and health information technicians | 10 | 10 |

Occupational Commonalities in Emerging Industries

From the perspective of workforce development, it may be better to focus on common needs that are likely to arise regardless of what industries emerge as future growth drivers, than it is to pick the winner ahead of time. Indeed, there are a number of occupations that are likely to increase in demand if any of the emergent industries discussed so far actually do arise in the WIRED region. These may not be all high-growth occupations overall, as are the occupations discussed earlier in the *Regional Growth Forecast* section of this report. Instead, they represent occupations that will be necessary to support the growth of potential emerging industries (Table 27).

Table 27: Occupations Common to Select Emerging Industries

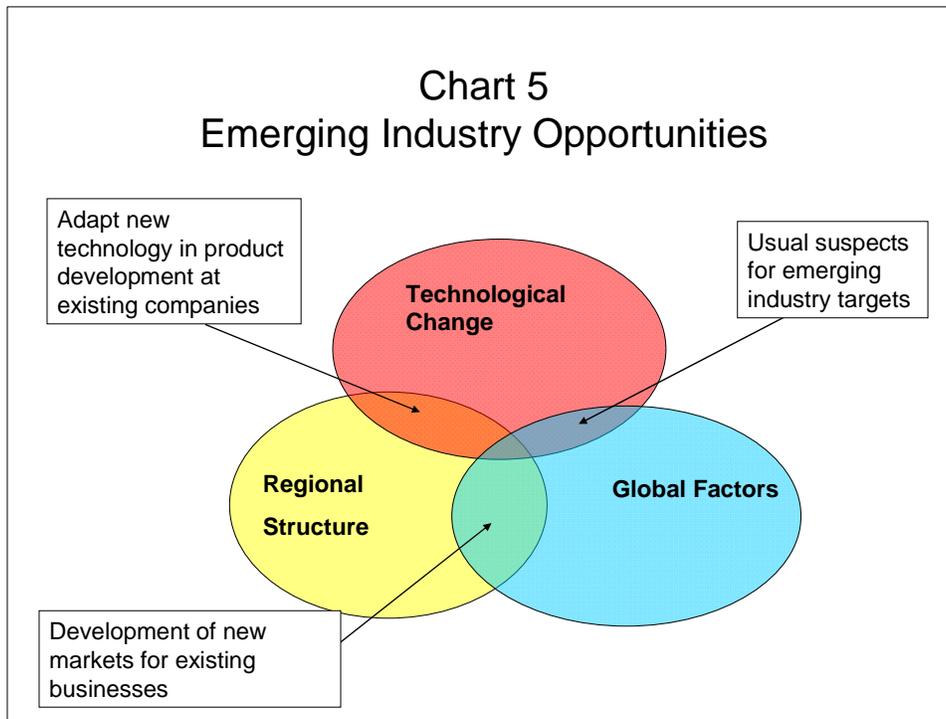
| |
|---|
| Assembly and production workers |
| Computer specialists |
| Material moving workers |
| Sales, finance, and executive positions |
| Engineers |

Occupations that are expected to be demanded regardless of what industry actually emerges represent the core of business and manufacturing operations. Of course, although there will likely need to be some specialization—e.g. production workers in a pharmaceutical facility may need different skills than those producing medical instruments—the important fact to acknowledge is that there will continue to be a significant demand for talented, adaptable workers with general knowledge of business operations, technology, and production.

Conclusions and Recommendations

The success of the WIRED region will depend upon its ability to navigate the changing economic seas that are constantly being agitated by global factors, technological change, and the health of its regional structure. It is how these three forces interact that could reveal promising opportunities of innovations. There are three overlapping areas (Chart 5):

1. Usual suspects—overlap of technological change and global factors.
2. Development of new marketing opportunities for existing businesses.
3. Adaptation of new technology in product development in existing companies.



Can Emerging Industries Be Identified Successfully?

In terms of identifying specific industries that will experience explosive future growth, we believe the answer to this key question is “highly unlikely.” There are several major challenges to developing a list of emerging industry targets for the WIRED region. First, many of the faster-growing sectors such as health care are not good sources of new growth for the region, since much of the demand is population driven. A targeted emerging industry should have the potential to become a dynamic component of the region’s export base.

Second, even if the region targets the right emerging industries, such as alternative energy or biopharmaceuticals, it is very risky for it to back a particular technology or field. Emerging markets are highly dynamic arenas with competing technologies that can generate as many losers as winners. Batteries, wind turbines, bio-fuels compete today just as steam and the internal combustion engines battled it out in the early 1900s. Also, what about nuclear fusion and hydrogen? Someone will likely lose, but whom?

Third, regions enter a crowded field when they decide to pursue life sciences, alternative energies, or the other usual, emerging-industry suspects (see Table 15). Many of these industries have already been widely recognized as having growth potential by states and metro areas across the nation, meaning the competition to attract activity is already fierce. This does not mean that an area cannot successfully compete for a piece of the action; however the costs may be large. The sad fact is that in the end not all regions will be winners, regardless of the intensity of their efforts.

Finally, there is a degree of randomness that cannot be ignored. Industries emerge due to the creativity of their founders who can reside almost anywhere. The regions that can attract and retain creative individuals, regardless of their field or interests, will have a better chance of becoming the birthplace of a new emerging industry simply because there are more “rolls of the dice” in terms of people and interactions that could bring about something new. Of course, this is the path set forth by Richard Florida and his focus on the importance of attracting the “creative class.”¹¹ Nevertheless, even if a region does everything right and becomes a creative community, it only increases the probability that something could happen.

It is tempting to jump on the bandwagon and compete in the realm of known emerging industries. The Van Andel Institute and GVSU’s Michigan Alternative and Renewable Energy Center are outstanding facilities that do hold promise for the region. Nevertheless, we believe that the region must look beyond the usual suspects. Attention should be given to creating the resources and environment for west Michigan firms, regardless of industry, to become innovative, take risks and to introduce new products and services to new markets. The greatest gain from emerging industries will come if the Grand Rapids region is able to capture the growth of a new technology from day one, instead of attempting to attract activity long after the potential of a new industry has been recognized.

Importance of Social Clusters

While there are wonderful success stories of businesses entering and accelerating in new fields, recent economic development research suggests that new industries do not emerge, instead they evolve from the area’s existing economic clusters. In other words, the region’s industry clusters are its incubators for new products and services. *Your future partially rests on how well you build on the past.* No one would be surprised if the next best thing in office furniture systems is born in west Michigan. However, we would all be surprised if the next best computer software application is developed on the eastern shores of Lake Michigan. It is possible and would be exciting, but it runs counter to current economic development thinking.

Numerous books and articles have recently been published on the geography of innovation¹² and most support Porter and Krugmann’s research that argues the importance of industrial clusters.¹³ As shown previously in Table 6, according to Porter, west Michigan’s industrial clusters include office furniture systems and automotive products. However, they also include some lesser known clusters: plastics, biopharmaceuticals, analytical instruments, and footwear.

¹¹ Florida, *The Rise of the Creative Class. And How It's Transforming Work, Leisure and Everyday Life.* Basic Books, 2002.

¹² These include Sheshinski, Strom and Baumol ed., *Entrepreneurship, Innovation, and the Growth Mechanism of the Free-Enterprise Economy*, Princeton University Press, Princeton, NJ 2007; Breschi and Malerba ed. *Clusters, Networks and Innovation*, Oxford University Press, 2005; and Steiner ed *Clusters and regional specialization: On geography technology and networks.* Oxford University Press, 1998

¹³ Porter, *The Competitive Advantage of Nations*, Macmillan, London, 1990 and Krugman *Geography and trade*, MIT Press, Cambridge 1991.

There are two important ingredients for a dynamic industry cluster: physical assets and social assets. The physical assets are measured in efficiency and agglomeration. Social assets include networking and partnerships. Competing industries locate next to each other to build a mutually beneficial supplier base, attract a specialized labor supply and training resources, and to steal ideas, concepts and people from each other. These physical attractors are important, but they also can grow rigid. Pittsburgh's steelmakers became stuck in an obsolete method of steel production. The Big Three were blindsided by Toyota and other foreign competitors. In short, commodity producers, in their drive to remain lean and competitive, can develop strong physical clusters, but, they run the risk of diminishing the industry's social assets that are key to supporting innovation. These social assets include the networking and partnership opportunities which can generate Marshall's "air of ideas."

The social aspect of clusters is surprisingly strong. Although information can be shared on the internet anywhere in the world, physical space still matters. Theoretically, a person residing in Outer Mongolia can research and track the patent activity of any U.S. company as long as internet service is available. She can also collaborate with her colleague in Lima, Peru. However, research shows that this is not what happens. "The diffusion of information is a process embedded in location."¹⁴ It is more likely that these two individuals will meet in one of the nation's major urban areas. Why else are individuals willing to pay outrageous rents to be in places like San Francisco, Boston, New York, or Seattle? In addition, why are employers willing to pay higher wages than they would if they were located in other parts of the country? The answer is that these areas seem to maintain an "air of ideas" which provides benefits for the individual and firm alike.

Social clusters are built on trust which, in many respects, is the ultimate gain from social capital. There are identified conditions for trust. First, ideas must flow both ways. In fact, networks are innovative only when new ideas flow in both directions. Second, new ideas seldom stick the first time around. They may have to be repeated several times before they are given their full due. This means that the networks must be open to repetition. New partners must be introduced into the network to keep the flow of ideas coming. *Most importantly, research suggests that the benefits of social clusters decline with the loss of innovativeness.* Two competing *commodity* producers do not have the incentive of entering a social cluster because they have little to gain from sharing.

¹⁴ Cowen. "Network Models of Innovation and Knowledge Diffusion," in Breschi and Malerba *Cluster, Networks and Innovation* Oxford University Press 2005 pg 31.

Recommendations

Based on the findings of this analysis, we offer four recommendations for consideration.

A. Do not pick emerging industry targets.

For reasons cited throughout this report we cannot recommend the establishment of emerging industry targets. At best, it is nothing short of gambling and trying to pick winners. At worst, it takes resources away from meaningful efforts to support innovation across its wide number of export industries.

B. Work to enhance and develop existing social clusters and build new ones that allow social networking opportunities that can cross industry boundaries.

IRN, in its excellent analysis, *Global Supply Chain Evolution Analysis*, highlights the challenges facing the WIRED region's export industries in keeping their existing clusters intact. Global pressures are forcing some firms to discontinue long-standing partnerships in order to gain cost reductions on commodities. This can inflict great long-term harm on the uniqueness of the region. Only if innovation is constantly injected into the process, can the region's existing clusters be maintained. If an industrial cluster becomes rigid or focused on standardized production, then its days in the region are limited and the likelihood of new product emergence declines.

The development of social clusters to serve as a conduit of new ideas and innovation is vital. However, these conduits depend upon the health, strength, and reach of networks both formal and informal. The innovation process calls upon the tacit and noncodifiable nature of technology—the importance of experience and the cumulative nature of learning.

Because innovation highly depends on tacit knowledge, it is site focused and will occur on a firm-to-firm basis. Innovation is product-specific, and it must be encouraged across a wide range of the region's firms for the region to remain competitive. In addition, it is a local game: spatial proximity encourages the creation and diffusion of knowledge, especially new knowledge which is unstructured and mostly tacit in nature and can be best transferred by personal contact.¹⁵

Of course, innovative ideas can be generated internally; however, the difference between innovative firms and innovative communities is the presence of a strong and functional social cluster. In spite of the near-zero cost of global communication, face-to-face interaction still holds value.

The development of learning economies consists of both forming partnerships and opportunities to have face-to-face interactions between firms. However, this

¹⁵ Elsie L. Echeverri-Carroll and William Brennan, "Are Innovation Networks Bounded by Proximity" in Fischer et.al *Innovation, Networks and Localities*, Springer, Berlin, 1999 pgs. 28-49.

communication will only achieve its maximum potential in an air of trust. In short, ideas can only float in an atmosphere of trust, for if the partners within the cluster can trust each other this reduces the ever present fears of one member appropriating the new idea or innovation.

Addressing the issue of social clusters is not easy. The development of “third places” would be a step in right direction.¹⁶ Current programs such as the Right Place’s Fourth Friday series and its ongoing manufacturing councils are very good beginnings. Nevertheless, we recommend a new initiative: *West Michigan Brainstorming*. It would host regular meetings of invited leaders of innovative firms across a wide range of industries. Participants would come together to hear and comment on new ideas that are generated by guest speakers or members of the group. It is a must that the new initiative be led by two to three “champions”—highly-regarded individuals representing innovative companies. If it isn’t, other potential participants may lose interest and be unwilling to make the time to attend the meetings. Efforts should be made to encourage and assure new blood is constantly injected into the group and that an air of trust is maintained.

Even if this initiative is not adopted, it remains true that the region could benefit from additional efforts to foster interaction both across industries and from places traditionally outside the current west Michigan social structure. For example, bringing together individuals from different occupations, industries, and backgrounds could slowly begin to generate social networks not currently active in this region.

C. Development of a SWOT (Strengths, Weaknesses, Opportunities and Threats) team of designers, engineers, and industry experts that provide new ideas for companies.

Again, it is our belief that most innovations occur on the product level and must be encouraged across as many industries as possible. Unfortunately, too many of the west Michigan businesses are busy struggling to keep their current production as lean as possible just to survive in today’s highly competitive environment.

In addition, smaller firms are at a disadvantage. “Firms, especially smaller firms, that lack appropriate in-house R&D facilities have to develop and enhance their absorption capacity by means of other sources, such as learning from customers and suppliers, by interacting with other firms and taking advantage of knowledge spillovers from other firms and industries.”¹⁷ The effectiveness of the region’s drive to promote and nurture innovation will rest on its ability to generate the means to increase innovation capacity.

We understand and appreciate the importance of operating as leanly as possible and the role of Michigan Manufacturing Technology Center-West (MMTC-W) is fundamental

¹⁶ Third places are locations which are separate from home and the traditional workspace. They can include coffee bars, hotel lobbies, and outdoor sitting areas. They offer a neutral location where ideas and opinions can be shared.

¹⁷ Manfred M. Fischer, “The Innovation Process and Network Activities of Manufacturing Firms” in Fishcer, Suarez-Villa and Steiner (ed) *Innovation, Networks, and Localities*, Springer, Berlin 1999, pg 16.

and should be supported. Nevertheless, if new innovation and design are not thrown into the mix, a sole focus on lean manufacturing can be a path that leads to making a strictly commodity grade product. The firm's short-term survival is more ensured, but without product innovations, its long-term success is threatened.

Many researchers have focused their efforts on understanding innovation. We believe that Hansen and Birkinshaw's supply chain concept is helpful in mapping WIRED potential.¹⁸ They suggest that the innovation process occurs in three steps: idea generation, product development, and marketing. Too many good ideas fail to be fully developed. Too many innovative products never reach their market potential. And finally, too many boring products do make it to market. A successful company, therefore, cannot focus solely on its core capabilities, but should address its weakest links in the innovation chain. Idea companies must focus on production and marketing. Marketing companies must focus on product development. Finally, good product makers must partner or expand their marketing departments and idea generation capabilities.

This supply chain concept fits in well to Nambisan and Sawhney's concept of an innovation bazaar.¹⁹ Companies face a spectrum of opportunities in pursuing innovation. At the one end of the spectrum are the raw ideas that can be generated internally or externally. These ideas and concepts are not ready for product development or markets but may hold tremendous potential. At the other end of the spectrum are companies who can purchase market-ready innovation from another company or simply partner with or purchase the innovative company. This is a low-risk, high-cost solution, while the former is a high-risk, low-cost approach. Of course, time is also a factor; if a company is in a high-pace industry, it may not be able to afford to wait for concepts to reach their potential. In these instances it is better to buy market-ready ideas and rely on your marketing and distribution systems. Worse yet, a company's executive team may believe that time allows for only cost-saving innovations for their existing product line.

The economic development community could make use of its unique mix of manufacturing and product designers and engineers and create a SWOT team that would conduct a one- or two-day SWOT evaluation of a participating company's products or services and generate a report suggesting ideas on new products, new applications, and new markets. The report would be confidential and strict non-compete agreements would be followed. Of course, it would be the company's decision to pursue any of the ideas put forth in the evaluation. In our interviews with several company CEOs, we found interest in participating with such a program.

It is likely that the major challenge facing this proposed activity is getting the approval of the companies' management teams. In fact, Kanter has found that it can be the

¹⁸ Hansen and Birkinshaw, "The Innovation Value Chain" Harvard Business Review, June 2007 pp. 121 to 130.

¹⁹ Nambisan and Sawhney, "A Buyer's Guide to the Innovation Bazaar" Harvard Business Review, June 2007 pp 109 to 118.

company's CEO who is the major barrier to innovation, as he may try to control idea generation.²⁰ In short, "to get more successes, you have to be willing to risk more failures." No one likes risk and innovation is risky; however, a prudent act of cost and process control can, in fact, simply add to long-term risk. Communication, not control, is the key element to successful innovation. Informal networking, internally and externally, are important steps to innovation. Unfortunately, managers can feel threatened by new ideas and, therefore, nix the process.

D. Work with area government units, non-profits, education institutions, and art associations to improve the attractiveness of the region to professional workers.

This recommendation is clearly outside the mission of WIRED. Nevertheless, the Grand Rapids-Muskegon-Holland region is competing for talent. Human capital will only grow in importance relative to physical capital in the coming years. A region's urban landscape, willingness to accept diversity, and its overall sense of place will become more and more important as the region seeks to become a sticky place in an increasingly slippery world. Talent can pick their location and in making a decision, the Grand Rapids region is likely to be compared, fairly or not, to locations such as Chicago and Ann Arbor. Moreover, it is clear that when looking at the more successful metro areas, cost of living is a secondary consideration. To compete in the knowledge-based world, the quality of the urban, suburban, and rural environment matters greatly. The West Michigan Strategic Alliance (WMSA) Regional Indicators Efforts is a great first step in examining the issue, but more needs to be done.

Last Words

Although the world is becoming flatter in terms of technology, it is also becoming more uneven in terms of opportunity and income. Thousands of workers in west Michigan have worked hard and productively in making furniture, auto parts, food products, and a host of other goods. Unfortunately, in today's global environment, their skills may become obsolete and their employment opportunities, outside of their current employer, dim. Creating an environment for the region's existing manufacturing firms to explore new markets and develop new products is, in short, assisting them to evolve into new industries. If successful, a firm's transition into a new industry would not only be reenergizing, it could increase its profitability. More importantly, it will likely enable them to retain their existing workforce. Of course, retraining will likely be required; however, this is a better outcome for its workers and community than an alternative approach which attracts new professionals while, at the same time, allows others to face a long spell of unemployment and a lifetime of low earnings.

Finally, addressing the future of the region is going to require changes to both the supply and demand sides of the workforce. On the demand side, economic and community development efforts should work to develop an environment for innovation and rapid adoption of new products, technologies, and ideas. We believe an economically thriving region is the best way to support a strong workforce. Additionally, this environment must

²⁰ Kanter, "Innovation: the Classic Traps," Harvard Business Review, November 2006 reprint RO611C.

recognize the importance of making itself socially open and physically attractive if the region is going to bring in the best and brightest new residents.

On the other side of the equation, workforce development efforts will struggle if the focus remains on only traditional job skill training and placement. The existing workforce may be best served by efforts to develop flexibility, adaptability, and general learning capabilities if they are to take advantage of employment opportunities associated with emerging industries. Simple productivity and efficiency training will not be enough to ensure employment in the long-term.

Appendix A

W.E. Upjohn Institute REMI Economic Model for the Greater Grand Rapids-Muskegon- Holland Region

The W.E. Upjohn Institute maintains an economic computer model especially designed to estimate the economic impact of changes in the greater Grand Rapids area which includes the three metropolitan areas of Grand Rapids–Wyoming (Kent, Newaygo, Ionia, and Barry counties), Muskegon–Norton Shores (Muskegon County) and Holland–Grand Haven (Ottawa County). Unfortunately, the model used in this report excluded Allegan County. The model was constructed by Regional Economic Models Incorporated (REMI) and contains three separate components that together capture the resulting total impact on the local economy because of a change in employment. These components are:

- an input-output model that estimates the impact on the local economy of changes in inter-industry purchases. This component of the model captures the impact of an increase in orders to local suppliers of goods and services as well as the impact of households increasing their purchases of consumer goods and services.
- a relative wage component that estimates the impact of the expected changes in the area's cost structure due to changes in economic activity. For instance when a major employer moves into the area, it can cause wages to increase across almost all industries due to the increased demand for workers and other local resources. This boost in wages, while generating additional consumption expenditures, increases the cost of doing business in the area, making the area slightly less attractive to other industries.
- a forecasting and demographic component that forecasts the resulting changes in future employment and population levels due to a change in economic activity.

Appendix B

See the Attached Excel File