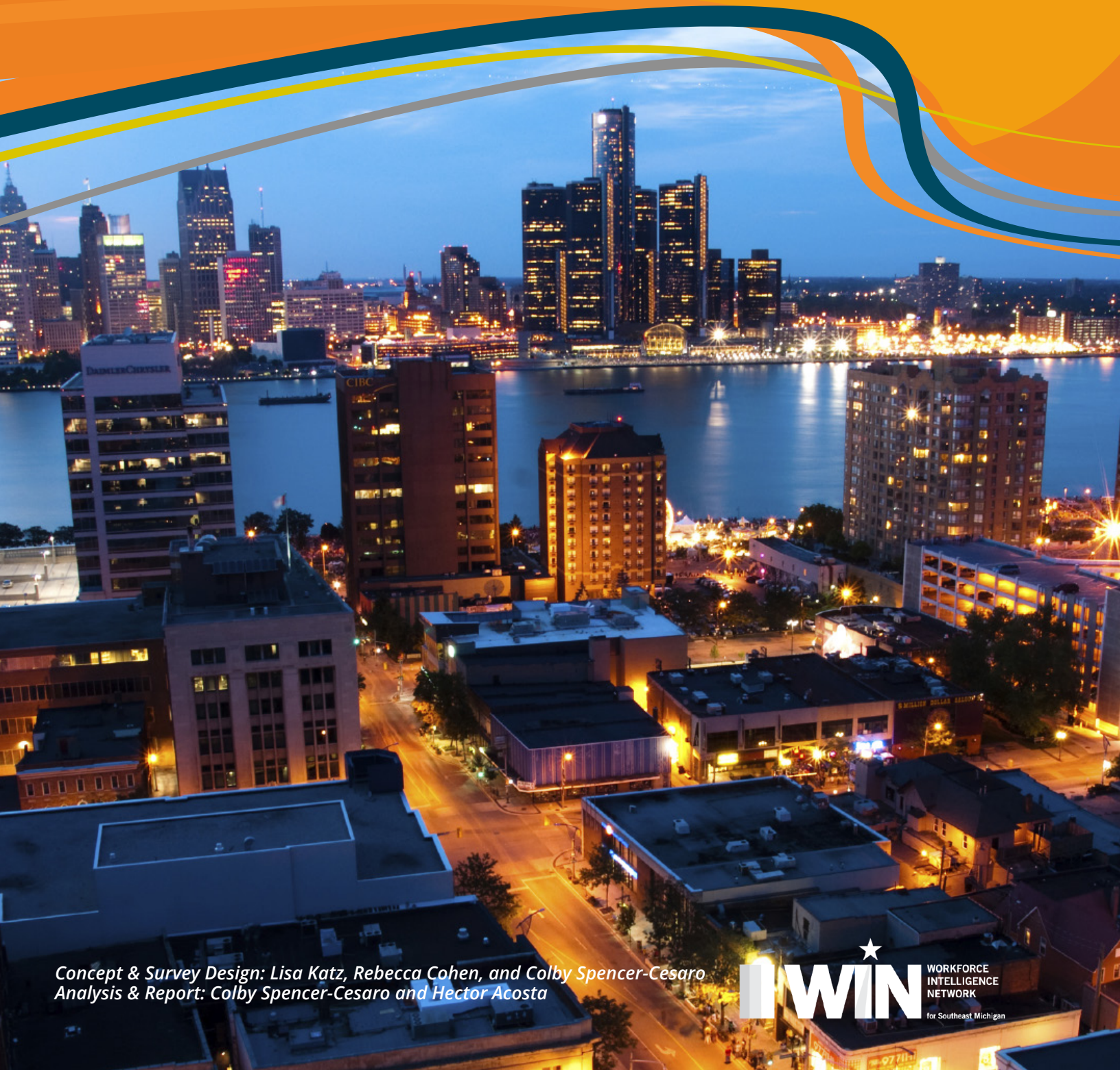
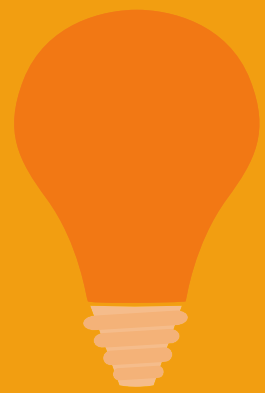


Eureka!

Innovation and Disruption in the Economy
and how the Workforce can prepare



*Concept & Survey Design: Lisa Katz, Rebecca Cohen, and Colby Spencer-Cesaro
Analysis & Report: Colby Spencer-Cesaro and Hector Acosta*



INTRODUCTION

Technological change is moving at a rapid and accelerating pace. The rise of computers and high-speed internet, transformative themselves, have played fundamental roles in supporting other significant innovations: for example, smart phones, texting, online commerce, modeling and simulation, 3-D printing, and numerous other breakthroughs have dramatically altered how business and workers shape the economy.

While new ideas and processes come about on a daily basis, the pace of adoption can vary greatly. Moreover, some technologies may prove to fundamentally alter a product or process (disruptive), while others may be more subtle in nature, offering important but less significant change (incremental). This leaves organizations that are charged with preparing companies and workers for inevitable change in a quandary: What technologies are most important to adopt now and which ones should wait for later? What do workers need to know to be successful for the jobs of tomorrow?

In hopes of exploring answers to some of these questions, the Workforce Intelligence Network for Southeast Michigan (WIN) created an extensive, online employer survey for Michigan companies to help shed light on what business leaders predict will be the economic and workforce-related effects of some of today's most promising disruptive technologies and trends, known as Eureka technologies. 233 company leaders provided insights through the survey, the findings from which are presented throughout this report.

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SECTION ONE

Eureka Innovations and Michigan Businesses

What is a Eureka innovation?

WIN defines an innovation as a “eureka” technology or breakthrough if it helps create a new market and value chain and eventually goes on to fundamentally alter an existing market and value chain, displacing an earlier technology, process, or practice. Sometimes this phenomenon is known as “disruption,” which can occur in a very short or long period of time. “Eureka” technologies often describe innovations that improve a product or service in ways that the market does not expect, resulting in new consumers, applications and markets.

The following are examples of Eureka technologies that are likely to affect businesses and the workforce in the coming years.

	Cloud computing providing cheap and nearly limitless processing power/storage	Use of computer hardware and software resources delivered over a network or the Internet, often as a service.
	Mobile internet	Increasingly inexpensive and capable mobile computing devices and Internet connectivity.
	Mobile workplaces	A group of employees who are scattered across various physical locations and are connected by computers, smartphones and other devices via the global Internet.
	Tablet computers	A computer that accepts input directly onto an LCD screen rather than via a keyboard or mouse.
	New types of social media	Websites and applications that enable users to create and share content or to participate in social networking.
	Business-oriented social networks	Social media websites and applications like LinkedIn and Glassdoor that are business-focused.
	Real-time data	Information that is delivered immediately after collection. There is no delay in the timeliness of the information provided. Real-time data is often used for navigation or tracking.
	Increasingly sophisticated data analytical tools	Process of inspecting, cleaning, transforming, and modeling data with the goal of discovering useful information, suggesting conclusions, and supporting decision-making.
	Smart systems (machine to machine communications)	Machine to Machine (M2M) refers to technologies that allow both wireless and wired systems to communicate with other devices of the same type.
	Big data	Extremely large data sets that may be analyzed computationally to reveal patterns, trends, and associations, especially relating to human behavior and interactions.
	Visual, tactile, and voice interfaces in primary computing devices	Digital interfaces are used to connect a video source, such as a display controller to a display device, such as a computer monitor.



Automation of knowledge work

The use of computers to perform tasks that rely on complex analyses, subtle judgments, and creative problem solving.



3D Printing

Additive manufacturing techniques to create objects by printing layers of material based on digital models.



Cheap smartphones

Average global smartphone prices have been dropping. The average price of a smartphone was \$314 in 2014. By 2018 the average price will drop to \$267.



Connected vehicles & transportation systems

A connected vehicle or transportation systems is equipped with Internet access, and usually also with a wireless local area network. This allows the vehicle or system to share internet access with other devices.



Internet of Things

Networks of low-cost sensors and actuators for data collection, monitoring, decision making, and process optimization.



Embedded electronics

Any electronic system that uses a computer chip, but that is not a general-purpose workstation, desktop or laptop computer. Such systems use microcontrollers (MCUs) or microprocessors (MPUs), or they may use custom-designed chips.



Renewable energy

Generation of electricity from renewable sources with reduced harmful climate impact.



Advanced robotics

Increasingly capable robots with enhanced senses, dexterity, and intelligence used to automate tasks or augment humans.



Advanced materials (light-weight steel, nano-fibers, etc.)

Materials designed to have superior characteristics (e.g., strength, weight, conductivity) or functionality.



Autonomous vehicles

Vehicles that can navigate and operate with reduced or no human intervention.



Artificial intelligence

Development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.



Algorithmic-based diagnostics/decision making

The implementation and application of algorithms to a variety of problems to find solutions.



Drone technology

An unmanned aircraft or ship that can navigate autonomously, without human control or beyond line of sight or is guided remotely.



New oil and gas exploration and recovery

Exploration and recovery techniques that make extraction of unconventional oil and gas economical.

Which Eureka technologies do the survey companies believe will affect their business and workforce?

54.20% Cloud computing providing cheap and nearly limitless processing power/storage

48.85% Mobile internet

46.56% Mobile workplaces

45.04% Tablet computers

44.27% New types of social media

43.51% Business-oriented social networks

41.98% Real-time data

40.46% Increasingly sophisticated data analytical tools

38.17% Smart systems (machine to machine communications)

29.01% Big data

29.01% Visual, tactile, and voice interfaces in primary computing devices

28.24% Automation of knowledge work

24.43% 3D Printing

22.14% Cheap smartphones

20.61% Connected vehicles & transportation systems

20.61% Internet of Things

19.85% Embedded electronics

18.32% Renewable energy

16.79% Advanced robotics

16.03% Advanced materials (light-weight steel, nano-fibers, etc.)

14.50% Autonomous vehicles

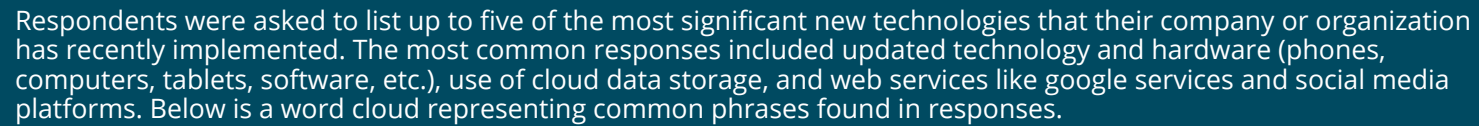
13.74% Artificial intelligence

12.98% Algorithmic-based diagnostics/decision making

7.63% Drone technology

6.11% New oil and gas exploration and recovery

Not all companies are quickly adopting and making use of the latest technologies and ways of doing business: change can be costly, and it is not always clear which changes are here to stay or are just the latest trend. But, the businesses surveyed by WIN are movers and shakers in the new frontier of technological change and advancement. In fact, over three-quarters of respondents have implemented innovative technologies and techniques in the past year.




How will Eureka technologies and ideas affect Michigan's current and future workers

Will we work more or less because of Eureka innovations?



48%
remain the same

48%
remain the
same



44%
work more
years

44%
work more
years

Respondents were heavily divided on how the average number of years worked before retirement may change in the next five years; 48% believe it will remain the same while 44% believe people will be working more years before they can retire.

What about training and collaboration?

Considering how computers have infiltrated businesses, more workers will need to be technically trained in order to get the job done, but companies are divided on future educational-attainment needs: 50% of respondents think that today's average education & training levels will be sufficient to meet future work requirements while the other 50% believe that innovation will require more training and education.

Surveyed companies in several industries believe strongly, however, that more education and training will be necessary for workers to stay competitive in the new economy:

- 70% of respondents from manufacturing firms,
- 73% of respondents from health care, and
- 64% of respondents in educational services

believed that increased education and training will be essential for worker competitiveness.

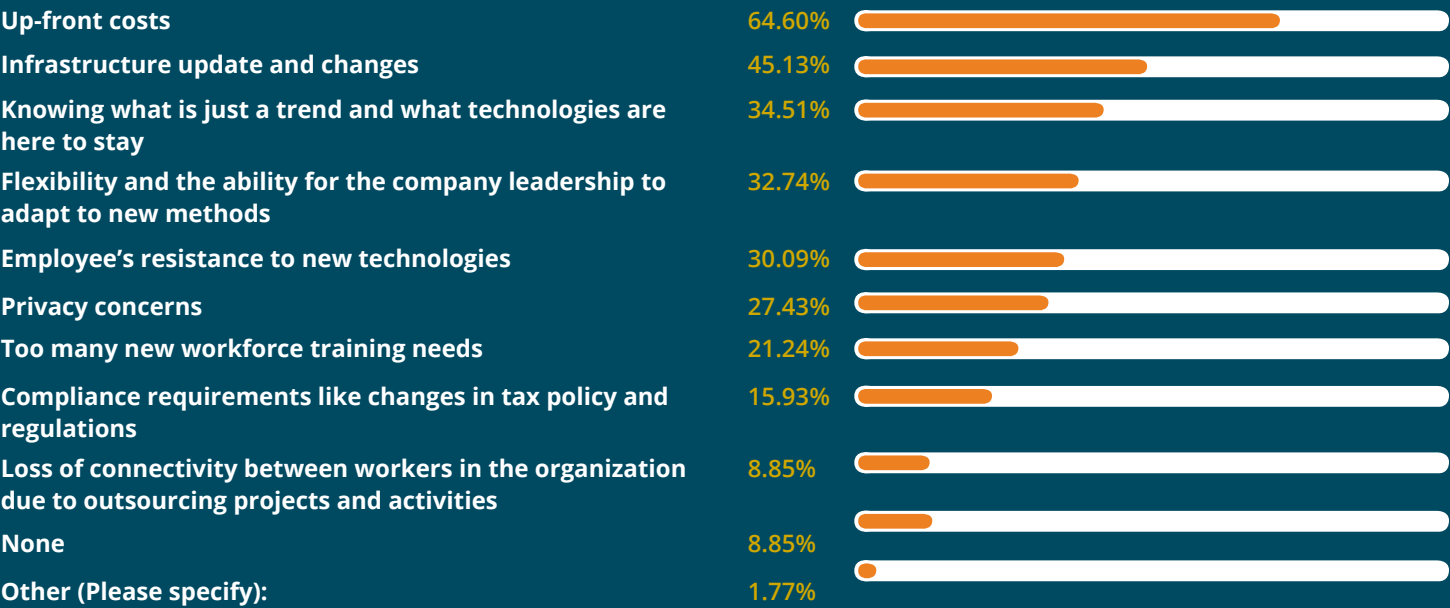
Collaboration between workers and managers will also increase, according to the businesses surveyed. A strong majority (65.98%) believe that Eureka innovations will create more linkages between workers and their bosses. Supervisors and those reporting to them will be required to work more closely, according to survey respondents.

SECTION THREE

Barriers to entry, what makes technological advancement so hard? Can every company keep up?

Businesses of all sizes struggle with which new technology and office trends to implement and which to pass by. Costs are often an important factor for both small businesses and larger firms that may have to adjust how thousands of individuals work. Many companies do not implement Eureka innovations because there are too many barriers to successful implementation.

Survey respondents noted the following barriers to implementing Eureka innovations in their companies.



Because many of these barriers affect companies differently, the WIN team asked what the MOST difficult barriers to overcome were.



The companies selecting privacy as a top 2 concern were in professional services, educational services, and health care. Their response to this question is understandable given the types of information handles by companies in these fields.

With technological updates occurring more rapidly than ever before, companies and organizations now face the daunting task of maintaining and revamping their strategic plans in the face of technological updates occurring more rapid than ever. This task can be especially difficult due to up-front costs of new technologies.

Since 2008, business closings have outpaced openings by over 80,000 annually.¹ In addition to this, research performed by the Economist Intelligence Unit highlighted that 4 in 10 of their executives surveyed were concerned about losing their competitive edge in the wake of rapidly advancing technological change. These statistics lead to the conclusion that many companies may feel that the future uncertain and maintaining their current strategic plan is not possible.

Michigan's employers who took this survey, felt differently. Over half of respondents believed up-front costs to be the greatest barrier to implementing new technology. Despite this, 87% of respondents believe their company will be able to keep up and maintain its strategic plan over the next five years despite rapidly advancing technologies. Respondents were also given the opportunity to explain their answer.

While 87% of respondents felt positively about their respective strategic outlook over five years, 13% of respondents felt uncertain, and these held a number of traits in common. About 78% held a negative strategic outlook cited the overall number of workers employed with their firms (employment size) as the greatest barrier to successfully implementing their strategic plan over the next five years. These respondents cited that their larger employment size led to slower technological turnover mostly due to costs and rigid leadership. On the other hand, respondents at smaller organizations often cited that low employee numbers allowed flexibility and quick adaptations to newly-emerging technologies.

Company industry also heavily influenced respondent answers to this question. A majority of respondents who felt negatively about being able to adhere to their companies' strategic plans were representatives of publicly-funded institutions such as colleges, university health systems or workforce investment boards. These respondents cited that, in addition to larger employment size, anticipated funding challenges in the future heavily influenced whether they felt their organization could successfully implement its strategic plan over the next five years. In contrast, all representatives from manufacturing firms felt positively and answered "yes" to the question of being able to maintain their strategic plan

1. Small Business Association, U.S. Department of Labor, U.S. Census Bureau 2. John Maynard Keynes, *Economic Possibilities for our Grandchildren*, 1930

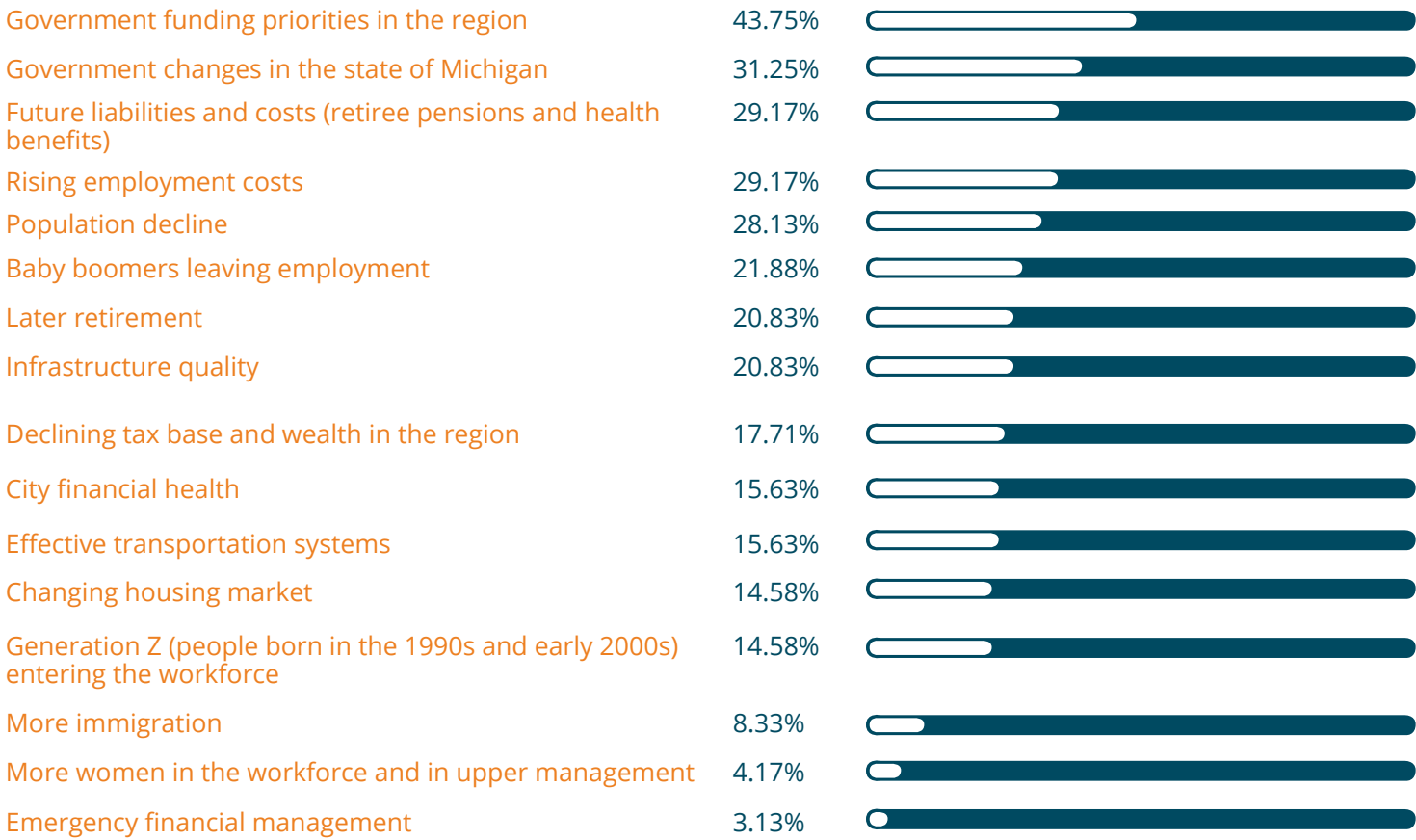
SECTION FOUR

Disruptors non-technology changes, what will affect business moving forward?

Eureka innovations are not the only things that businesses must take into consideration when planning for the future and their workers. Local and regional factors such as government funding, legislation, the quality of infrastructure, and population shifts matter a lot.

Among businesses surveyed:

- 31% believe that government changes in Michigan will greatly affect the way they do business.
- 29% are concerned about rising employment costs and future liability payments for pensions and retiree health care.
- 28% see population decline in the state as a concern.



Non-Technology Disruptors What industries are most concerned about what local/regional changes?

- Manufacturers are concerned about future liabilities in health care and retirement payments.
- Professional services firms are concerned about city financial health and government funding.
- Health care firms are concerned about changing government priorities and employment costs.
- IT firms are concerned about infrastructure, transportation, and population changes.
- Education related companies are concerned about rising employment costs, declining tax base, and government funding priorities.

Respondents were also given the opportunity to provide open-ended responses about non-technological changes that concerned them. Notably, the top three open-ended responses from survey takers were all talent-related and include:

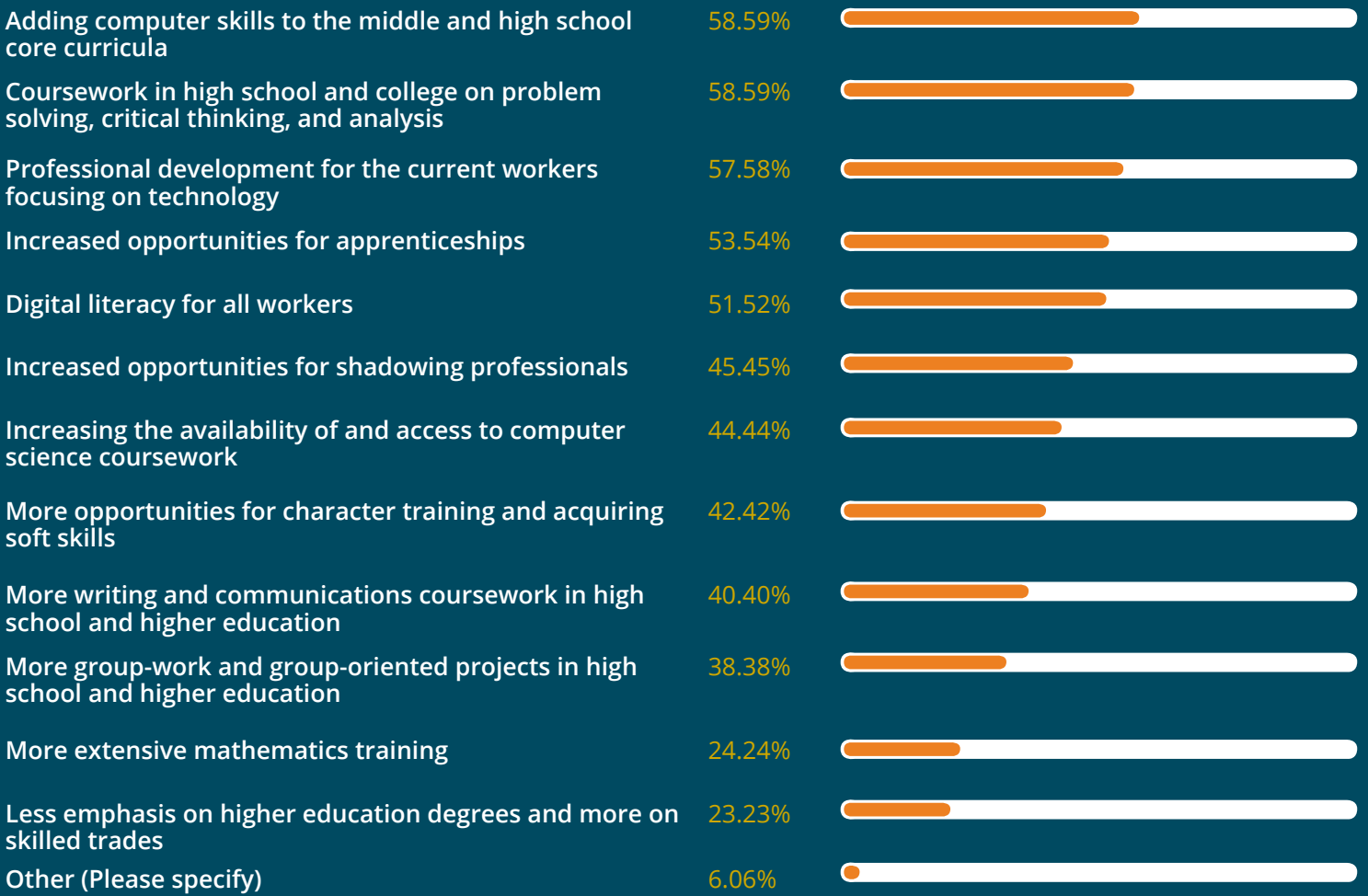
- Addressing science-technology-engineering-and math (STEM) skills shortages,
- Addressing basic employability skills/soft skills deficits, and
- The need for more collaboration between higher education, companies, non-profits, and the k-12 education system

SECTION FIVE

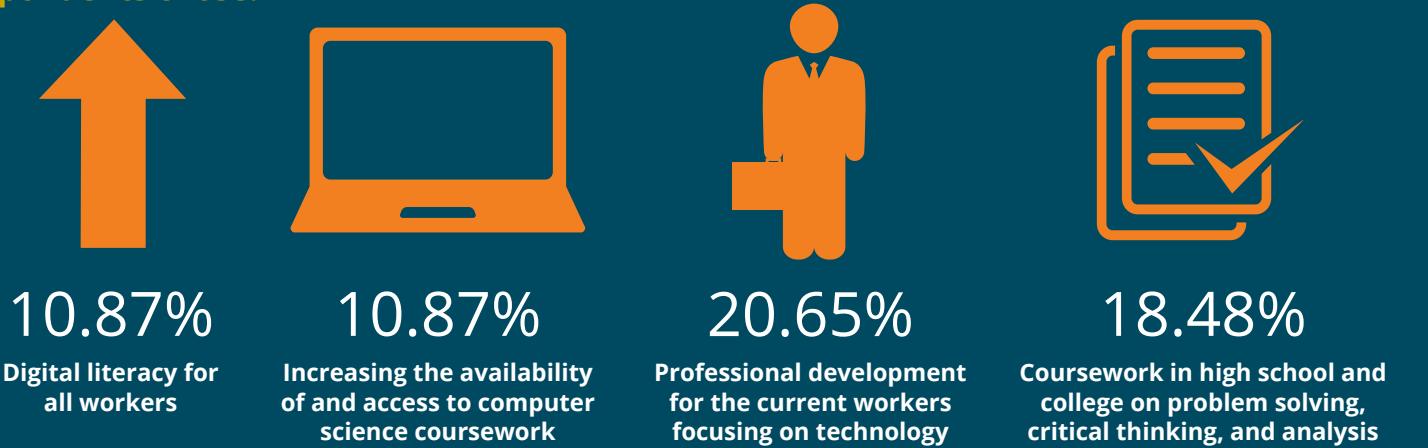
What's next? How to prepare for the future

With each new technological change or innovation in the economy, the workforce must adapt and respond. New training and skills, a shift in work-life balance, a change in hierarchy, and other modifications are necessary to keep current and future workers ready to move business forward. WIN asked survey takers to identify the most pressing training needs for the workforce of the future.

What can be done NOW to prepare for anticipated shifts in workforce needs? Respondents clearly believe that more training and education in these areas is important.



When asked, "Please indicate which of the following you believe is the most important to do now to prepare for some of the anticipated shifts in workforce needs in the next 5 years?" Respondents chose:



Responded shifted when respondents were required to select a single training focus that was considered the *most important*.

When asked what was simply important (vs. most important) to do to prepare the workforce for technology shifts in the next five years, employers placed equal emphasis on problem solving/critical thinking/analysis and on computer skills. Apprenticeships, a form of experiential, hands-on learning, ranked close behind.

Workforce Preparation	MOST Important	Important
Coursework in HS and college on problem solving, critical thinking, and analysis	18%	59%
Digital literacy for all workers	11%	51%
Adding computer skills to the middle and high school core curricula	4%	59%
Increased opportunities for apprenticeships	8%	54%
Less emphasis on higher education degrees and more emphasis on skilled trades	9%	23%

Each industry offered a different response when asked about the *most important* education and training change that will help Michigan’s workers be competitive in the future. In some cases, industries were split with equal weight placed in two individual education solutions.

Industry	MOST important education change to prepare workforce
Construction	Professional development for the current workers focusing on technology
Educational Services	Coursework in high school and college on problem solving, critical thinking, and analysis; Professional development for the current workers focusing on technology
Finance and Insurance	Digital literacy for all workers
Health Care and Social Assistance	Coursework in high school and college on problem solving, critical thinking, and analysis
Information	Coursework in high school and college on problem solving, critical thinking, and analysis
Manufacturing	Professional development for the current workers focusing on technology; Increased opportunities for apprenticeships; Increasing the availability of and access to computer science coursework
Professional, Scientific, and Technical Services	Coursework in high school and college on problem solving, critical thinking, and analysis; Professional development for the current workers focusing on technology
Public Administration	Professional development for the current workers focusing on technology; Less emphasis on higher education degrees and more on skilled trades
Utilities	Digital literacy for all workers
Other Services (except Public Administration)	Coursework in high school and college on problem solving, critical thinking, and analysis; Digital literacy for all workers

Many companies that work with WIN talk about the need for more training programs to address their skills needs. As part of this survey, WIN asked companies to indicate their willingness to be part of the workforce training solutions. Here is what the respondents said:

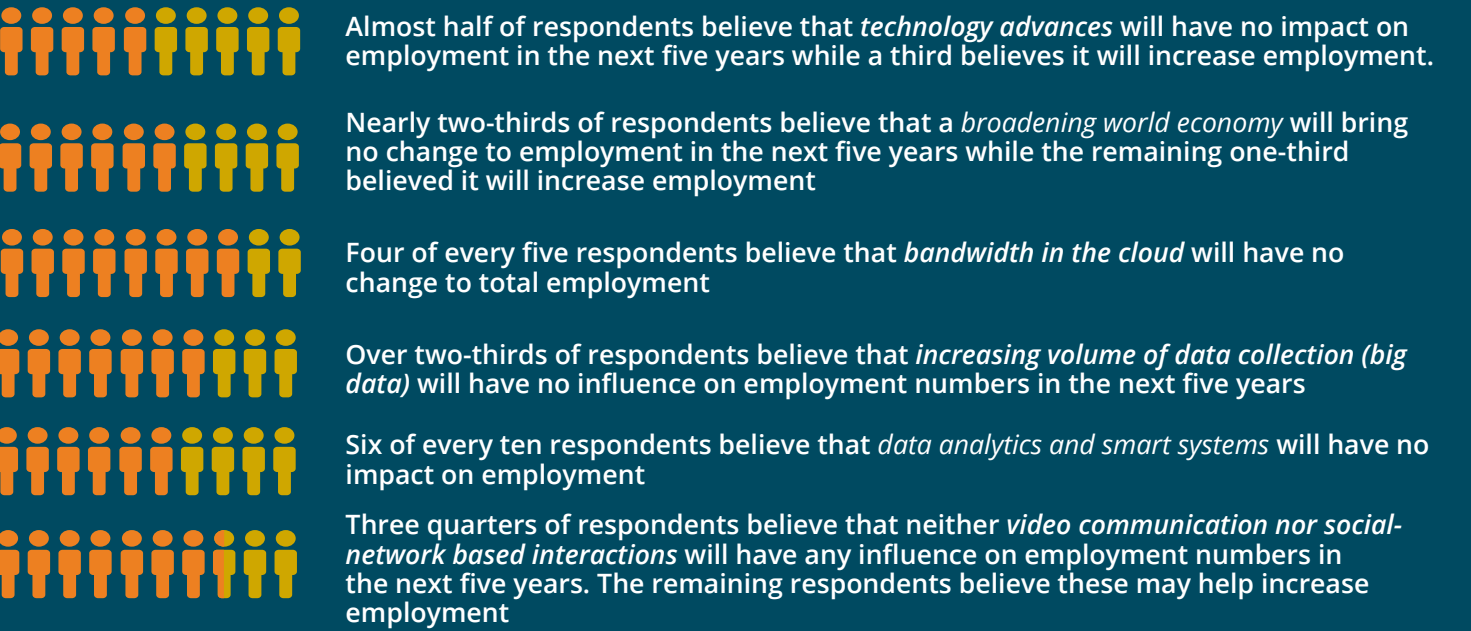


Future of the workforce: will robots take over our jobs?

In 1930, in the midst of the Great Depression, John Maynard Keynes warned of a “new disease” that could cause economies and populations to suffer: technological unemployment. Keynes wrote on the possible problem for the future “This means unemployment due to our discovery of means of economizing the use of labour outrunning the pace at which we can find new uses for labour.”²

Keynes’ worry has not come to fruition, yet, and the majority of employers in Michigan believe that increases in technological innovations will either have positive or no impact on employment in the near future.

Respondents were asked to consider a number of technological improvements and how they may affect employment at their company in the next five years. Here are their responses:



From these responses, we gather that most employers in Michigan believe that technological innovations will not have much of an impact on employment in the near future. About 20-30% of respondents have optimistic views of technology and that improvements will create new jobs. According to Michigan’s business community robots are not going to take over our jobs — at least not in the next five years.

**While companies are more interested in training their workers, many do not want to partner on programs that will benefit other companies.*

2. John Maynard Keynes, Economic Possibilities for our Grandchildren, 1930

Concerns for the future: the new frontier and its challenges

Until recently, consumers rarely dwelled on the security of their information on credit or debit cards. In 2013, however, widespread fear dominated headlines when Target released information on their data breach. Then, 2014 was filled with even more data breaches; hundreds of millions of records with personal and financial information were stolen. When asked what will be the most negative effect of technology change on companies and workers over the next five years, 25% of respondents chose greater exposure to security breaches. This was the most selected answer and demonstrates how recent data breaches have shaped how both consumers and employers prioritize security.

The next most selected answer to this question was worry over a reduced scope for direct human interaction with customers, suppliers, and partners. While the percentage of e-commerce sales as a share of total retail sales has doubled since 2008, online retail still only accounts for seven percent of all retail sales. Nonetheless, nearly 20% of employers that took this survey fear the negative effects of automation and technology on the future of consumer-employer relations.

25% of respondents

said the most negative effect of technology change over the next 5 years would be greater exposure to security breaches

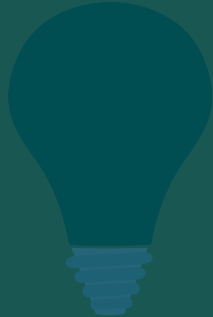


17% of respondents

said the most negative effect of technology change over the next 5 years would be reduced scope for direct human interaction with customers, suppliers, and partners

Conclusion

The Eureka survey findings have provided insight into what Michigan's companies and current and future workers must do to compete in an ever-changing economy. Michigan's firms, at large, believe that they will be able to maintain their near-future strategic plans continuing business as usual – a more confident answer than many global firms had in other similar surveys. The workforce, on the other hand, must strive to keep up with technological advances working to keep their skills fresh. Eureka innovations are cropping up every minute making it imperative that companies and the educational community work closely together and continue to create a ready, willing, and most importantly prepared workforce to keep Michigan's businesses moving forward.



METHODOLOGY

WIN researchers worked closely with Survey Sciences Group (SSG) to develop the Eureka survey. Taking questions from the Economist Intelligence Unit’s³ report on technological innovation and disruption along with McKinsey’s⁴ study of the same topic, the WIN team focused questions to Michigan businesses.

Once the survey was compiled it was sent in pilot form to a group of other researchers in the WIN network for feedback. After the feedback session WIN released the report for public response in May 2014 through several channels including:

- Ad in Crain’s Detroit Businesses online
- Ad in Crain’s Mackinac Policy Conference Publication
- WIN direct outreach to employer partners in health care, IT, and manufacturing
- Michigan Works! direct outreach to employers
- Ad in the WIN newsletter

The WIN team presented in June 2014 at the Michigan Career Educator and Employer Alliance Conference (MCEEA) and shared preliminary findings from the first survey responses. The survey remained open at this point.

The survey was closed at the end of December 2014.

Where are the survey companies headquartered?

91.26% of survey takers had company HQ in Michigan, all companies surveyed have a location in Michigan.

Demographics of Survey takers

- 233 respondents
- 21 survey takers took the survey on a mobile device
- 13.37% in manufacturing industry
- 11.63% in health care
- 11.05% in professional services

How large are the survey companies? How many employees?

- 26.58% of survey takers were in companies with 1,000 or more employees
- 42.41% have under 50 employees

Is this representative of company sizes in Michigan?

No, the Eureka survey over represents large firms: in Michigan less than 1% of companies have 1,000 plus employees compared to 26.58% of the Eureka sample. Of all firms in Michigan, 94.57% have under 50 employees while only 47.36% of the Eureka survey sample have under 50 employees.

Company Employment	Eureka Survey Group	All Michigan Businesses ⁵
1-4	6.96%	52.20%
5-9	3.16%	20.02%
10-19	8.23%	13.48%
20-49	22.15%	8.87%
50-99	6.96%	3.00%
100-249	7.59%	1.72%
250-499	8.23%	0.45%
500-999	8.23%	0.17%
1,000+	26.58%	0.10%

How representative of Michigan businesses is the survey sample?

The Eureka survey over represents the opinions of educational services organizations, manufacturing, and non-profits and well represents health care, IT, professional services. Several industries are not represented in the survey sample at all.

Industry	Eureka Survey Group	All Michigan Businesses
Accommodation and Food Services	0.6%	9.03%
Administrative and Support and Waste Management and Remediation Services	0.0%	5.32%
Agriculture, Forestry, Fishing and Hunting	0.0%	0.25%
Arts, Entertainment, and Recreation	0.0%	1.53%
Construction	2.3%	8.37%
Educational Services	23.3%	1.08%
Finance and Insurance	0.6%	6.08%
Health Care and Social Assistance	11.6%	12.04%
Information	4.1%	1.59%
Management of Companies and Enterprises	0.0%	0.73%
Manufacturing	13.4%	5.71%
Mining, Quarrying, and Oil and Gas Extraction	0.0%	0.17%
Professional, Scientific, and Technical Services	11.0%	9.90%
Public Administration	7.6%	0.15%
Real Estate and Rental and Leasing	0.0%	3.49%
Retail Trade	1.7%	16.01%
Transportation and Warehousing	0.0%	2.64%
Utilities	1.2%	0.18%
Wholesale Trade	0.0%	5.25%
Other Services (except Public Administration)	3.5%	10.48%

3. “Agent of change: The future of technology disruption in business,” A report from the Economist Intelligence Unit, 2012
4. “Disruptive technologies: Advanced that will transform life, business, and the global economy,” McKinsey Global Institute, 2013
5. Data from County Business Patterns, U.S. Census

WHO at each company took the survey?

Most of the survey takers either were in management/owner roles at their firm, in human resources, or in strategy and business development.

General management	27.5%
Human resources	25.5%
Strategy and business development	14.1%
Customer service	16.8%
Marketing and sales	3.4%
Operations and production	2.7%
Information and research	2.7%
IT	3.4%
R&D	2.7%
Finance	1.3%
Risk	0.0%
Procurement	0.0%
Supply-chain management	0.0%
Legal	0.0%

Half of the survey respondents have a lot of influence on, or are the final decision makers for hiring at their company.

Hiring Influence	Share of Respondents
No Influence	24.22%
Some Influence	25.47%
A Lot of Influence	39.13%
Final Decision Maker	11.18%

More than half of the survey respondents have a lot of influence on, or are the final decision makers for technology implementation at their company.

Technology Implementation Influence	Share of Respondents
No Influence	2.40%
Some Influence	44.80%
A Lot of Influence	40.80%
Final Decision Maker	12.00%

ABOUT WIN

The Workforce Intelligence Network of Southeast Michigan (WIN) is a collaborative effort between nine community colleges and seven Michigan Works! Agencies, in partnership with numerous other organizations, to create a comprehensive and cohesive workforce development system in Southeast Michigan that provides employers with the talent they need for success.

WIN's activities focus on four areas: data & research, employer engagement, policy, and talent pipeline development. WIN covers a 9-county area, including Genesee, Livingston, Macomb, Monroe, Oakland, Shiawassee, St. Clair, Washtenaw and Wayne. WIN was founded with the support of the New Economy Initiative for Southeast Michigan and publicly launched in November 2011.



WIN BOARD



