SOUTHEAST MICHIGAN CONNECTED AND AUTOMATED VEHICLES SOCIAL NETWORK ANALYSIS

Workforce Intelligence Network for Southeast Michigan

May 2017

WIN WORKFORCE INTELLIGENCE NETWORK

ADVANCE MICHIGAN
Driving Opportunity Through Advanced Manufacturing

This study was prepared under contract with the Macomb/St. Clair Workforce Development Board, Michigan, with financial support from the Office of Economic Adjustment, Department of Defense. The content reflects the views of the Workforce Intelligence Network For Southeast Michigan and the Macomb/St. Clair Workforce Development Board and does not necessarily reflect the views of the Office of Economic Adjustment.

Executive Summary

Social network analysis (SNA) is a visual and mathematical analysis of how people interact, exchange information, learn, and influence each other. A successful, regional industry ecosystem depends on a strong network of engaged and aligned partners. A mature, thriving sector will often bring firms and institutions together to coordinate information sharing, seek collaborative opportunities, and maximize and expand the workforce.

Social network analysis shows how a group of businesses and organizations work and influence each other, rather than showing the way people think they relate. SNA can show key organizations that are lynchpins or show that an organization may not have as much influence as expected. It shows the human system and actual process. SNA is a mirror rather than a report card that can help identify where bridges should be built.

By studying publicly available data sources related to connected and automated vehicles (CAV) such as media articles, newsletters, meeting rosters, and websites, the Workforce Intelligence Network for Southeast Michigan (WIN) identified a total of 351 nodes (organizations) within the southeast Michigan connected and automated ecosystem. These nodes resulted in 1,399 total connections--public business ties between the identified organizations.

The top five most influential organizations within the CAV ecosystem are General Motors, Ford Motor Company, University of Michigan, American Center for Mobility, and the Michigan Economic Development Corporation.

The Center for Automotive Research (CAR) is the most connected organization within the southeast Michigan ecosystem. Other strongly connected organizations include the University of Michigan Mobility Transformation Center (UM MTC), General Motors (GM), the Michigan Alliance for Greater Mobility Advancement (MAGMA, convened and facilitated by WIN), and GENIVI Alliance.

A regional plan for Connected/Automated Transportation Systems Assets and Initiatives, currently in progress, identified an opportunity for southeast Michigan to maintain its leadership role in the CAV space through more relationship-building and networking opportunities to connect start-ups with larger companies and to connect the automotive and defense CAV subsectors.

The need for CAV mapping and collaboration extends beyond innovation, supply chain, and marketing purposes, to a need for trained and capable talent for the CAV sector. A recent Connected and Automated Vehicles Skills Gap Analysis, conducted by WIN, identified 49 unique occupation codes linked to CAV-specific projects. Due to the need for talent in CAV-related occupations, there is an opportunity for collaboration around the creation of a common set of requirements for workers. Funding could support development of public-private partnerships to create inclusive intelligent transportation systems. Collaboration within the network on training initiatives can set standards for workers across the industry and region and can prove cost effective for the companies involved.

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Project Overview:

Social network analysis (SNA) is a visual and mathematical analysis of how people interact, exchange information, learn, and influence each other. A successful, regional industry ecosystem is dependent on a strong network of engaged and aligned partners. A mature, thriving sector will often bring firms and institutions together to coordinate information sharing, seek collaborative opportunities and maximize and expand the workforce. However, there are serious challenges to achieving this.

To begin, collaboration can be challenging across large geographies or among partners who have not traditionally worked together before. As an example, the defense industry has frequently been treated as a silo, rather than aligned with or complementary to other industries in the region, like the automotive industry, despite its heavy regional focus on land systems. Insufficient resources to support partner facilitation and convening – human and otherwise – poses an additional challenge to a connected regional industry ecosystem. The competitive landscape has often been viewed as company vs. company. New economic forces are changing that model to one based on location – region vs. region. While Ford still competes with GM, the southeast Michigan region now competes with other regions around the nation and the globe in the race to build autonomous vehicles: Ford and GM in Michigan now compete with Tesla and Google in California.

To help the industry address these challenges, WIN, on behalf of the Advance Michigan Defense Collaborative (AMDC), has undertaken a social network analysis of regional defense and defense adjacent stakeholders, broadly defined across industry sectors, to identify where thought leadership, partnerships, innovative thinking, and collaboration are already occurring. This information will be used to examine pre-existing partnerships, bringing in new leaders who can help improve the health of the regional defense industry network and various nodes of economic activity (e.g., automation, cybersecurity, connectivity, etc.) that are essential to it. This overview, methodology, and social network map addresses the ecosystem related to connected and automated vehicles.

Goal

The goal of this analysis is to reveal key leaders who are missing from “the table,” and others who might provide critical thinking or serve as points of intersection across key initiatives. The intent is to establish a baseline understanding of the health of the regional defense ecosystem, with a deliberate focus on improving the health of that ecosystem over time. Well-connected ecosystems have a history of learning and innovation that outperform poorly connected regions with poorly-connected participants.

What is social network analysis?

Social Network Analysis (SNA) turns information about relationships into visual maps that reveal the dimensions of those relationships (shape, depth, concentration, etc.). Differently organized networks benefit or hinder communities in different ways. Research shows that “smart networks” are the most adept at sharing exemplary practices, spreading new innovations, exchanging information, undertaking new projects, maximizing resources, and generally collaborating.

SNA can be used to identify gaps, holes, redundancies, or barriers in communication or engagement of key partners and stakeholders; identify potential new stakeholders; develop a strategy to improve the depth and breadth of networks where needed; and improve collaboration across the region and within sub-regions or issue-/organization-specific communities.

SNA has been applied successfully in numerous communities undergoing structural economic transformation and in businesses seeking to improve processes or other outcomes. SNA will allow the region to identify and track the following metrics:

- Awareness: Who knows what is happening in the network? How likely is it that information will spread throughout the network?
- Influence: Who are the major influencers in a specific community or region? To whom are people looking for information and insight? How likely are people to positively influence others?
- Connectors: Who links people who would not otherwise be connected? How connected are parts of the network?
- Integration: What is the overall network health? Who are network leaders?
- Resilience: How dependent is the network on a few individuals?

The mapping process

Network maps were created using publicly available data and a simple software program.

Each node represents an organization that was identified as having a role in southeast Michigan’s connected and automated vehicles ecosystem, whether this role is as a business developing connected and automated vehicles, a software business developing the latest and greatest software to support these products, an association, a membership organization, an educational institution training the needed talent, or a non-profit convening stakeholders of this industry.

The power of network mapping comes from the ways communities use the information after it is collected. It can be used to convene interested individuals in solution-based activities and foster a more effective referral-based system. Increased communication and collaboration can:

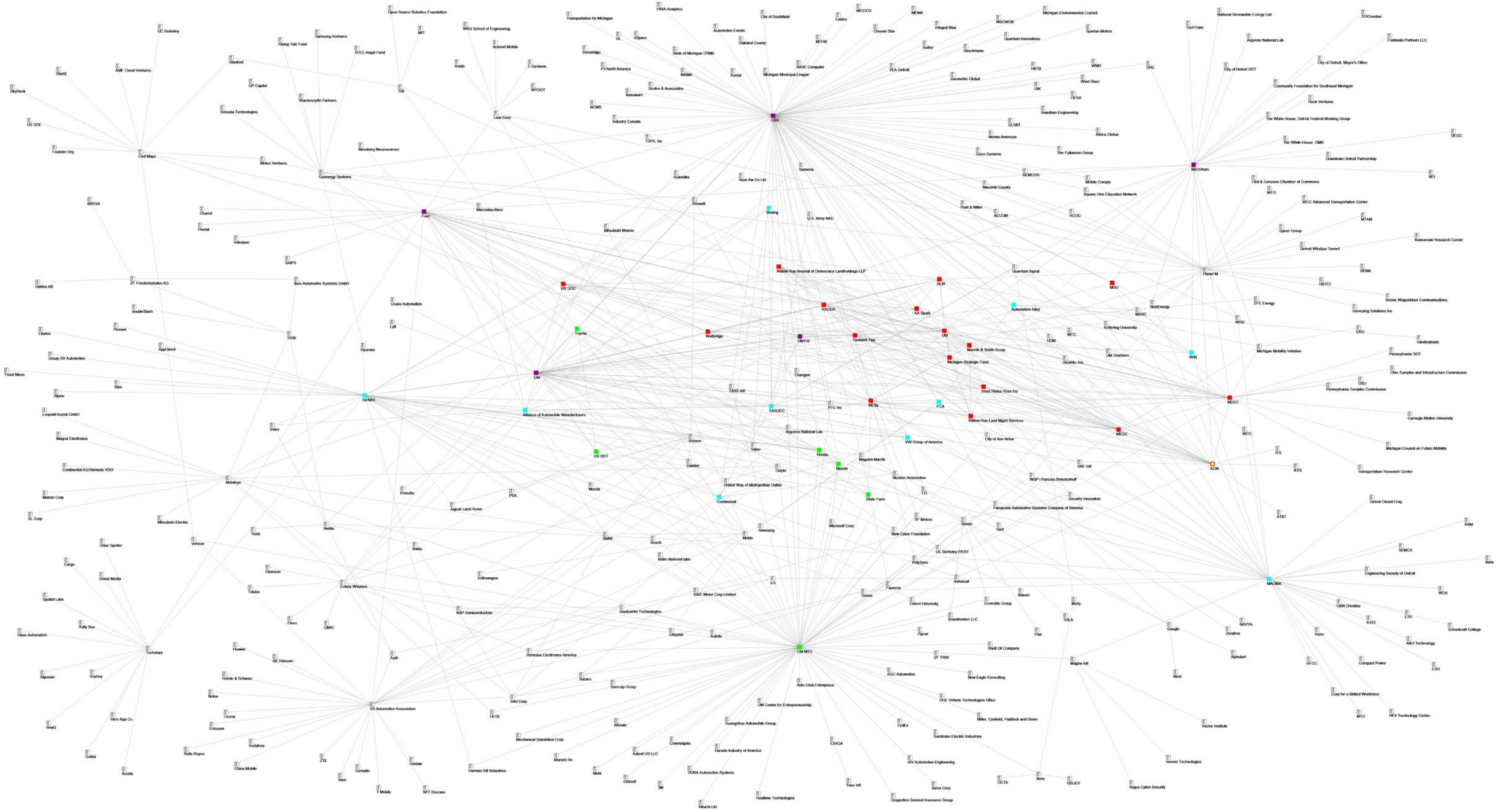
- Decrease the number of steps needed to distribute information to everyone in the network.
- Improve programs, projects, and services because of more and better information. This is particularly important in a referral network, where resource providers should know each other’s strengths and services so that they can point clients in the right direction for assistance.
- Identify opportunities for joint action.
- Create momentum around collaboration.
- Spread innovation and new ideas throughout the network to address common challenges.

The mapping software helps illustrate those organizations that have an increasing presence (more ties to others in the space) on a sliding scale. The outer zones of the map typically have 1 or 2 connections to others in the space while the inner core holds multiple redundant connections to other well-connected players in the space. Most business ecosystems function as a core-periphery network, with strong redundant connections in the core and more diverse radial connections at the periphery. It is through peripheries that new knowledge and information flow from one cluster to another.

Findings and Analysis

Findings and Analysis:

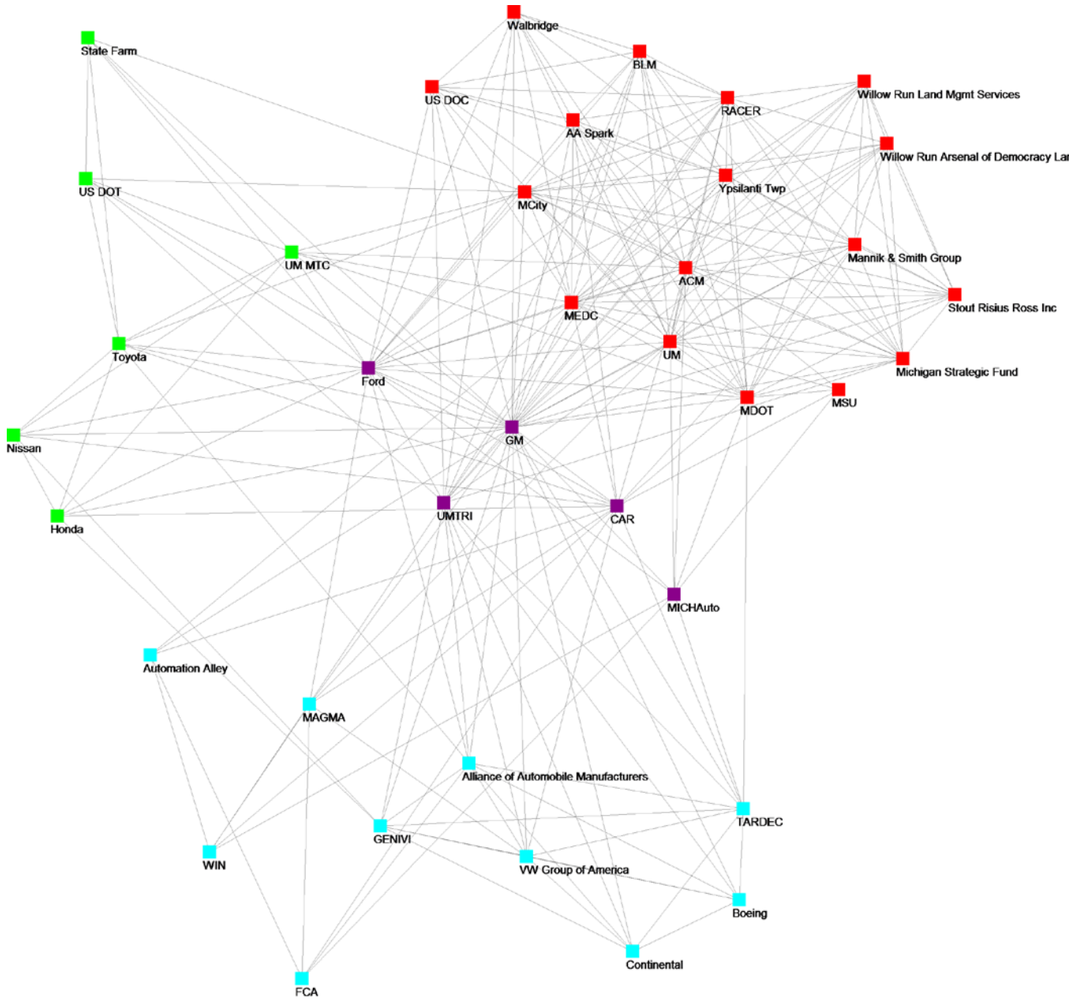
By conducting the Connected and Automated Vehicles Social Network Analysis, WIN researchers revealed a total of 351 nodes within the southeast Michigan ecosystem. These nodes demonstrated 1,399 total connections.



ECOSYTEM CORE: Influencers

The golden rule of networks is the same as the golden rule of real estate: location, location, location. Where organizations or individuals are identified in the map matters. Organizations that are centrally located on the map are more likely to be able to influence the ecosystem. High influencers are often well connected in their own community or “cluster” but also have connections to other clusters. Influencers are identified using a mathematical formula within the mapping software, which identifies connections with nodes and clusters to assess the value of those relationships and ability to influence all other nodes within the ecosystem. General Motors is the best connected and most influential in the ecosystem.

This map identifies the core members of the CAV ecosystem in southeast Michigan. This group has the most influence on the entire ecosystem. Activities and changes at these organizations can have a drastic influence on the entire community.



NOTE: Colors indicate a cluster. It does not define the types of organization nor does it identify a role within the ecosystem. Nodes with like colors work together more closely and are considered a cluster within the ecosystem.

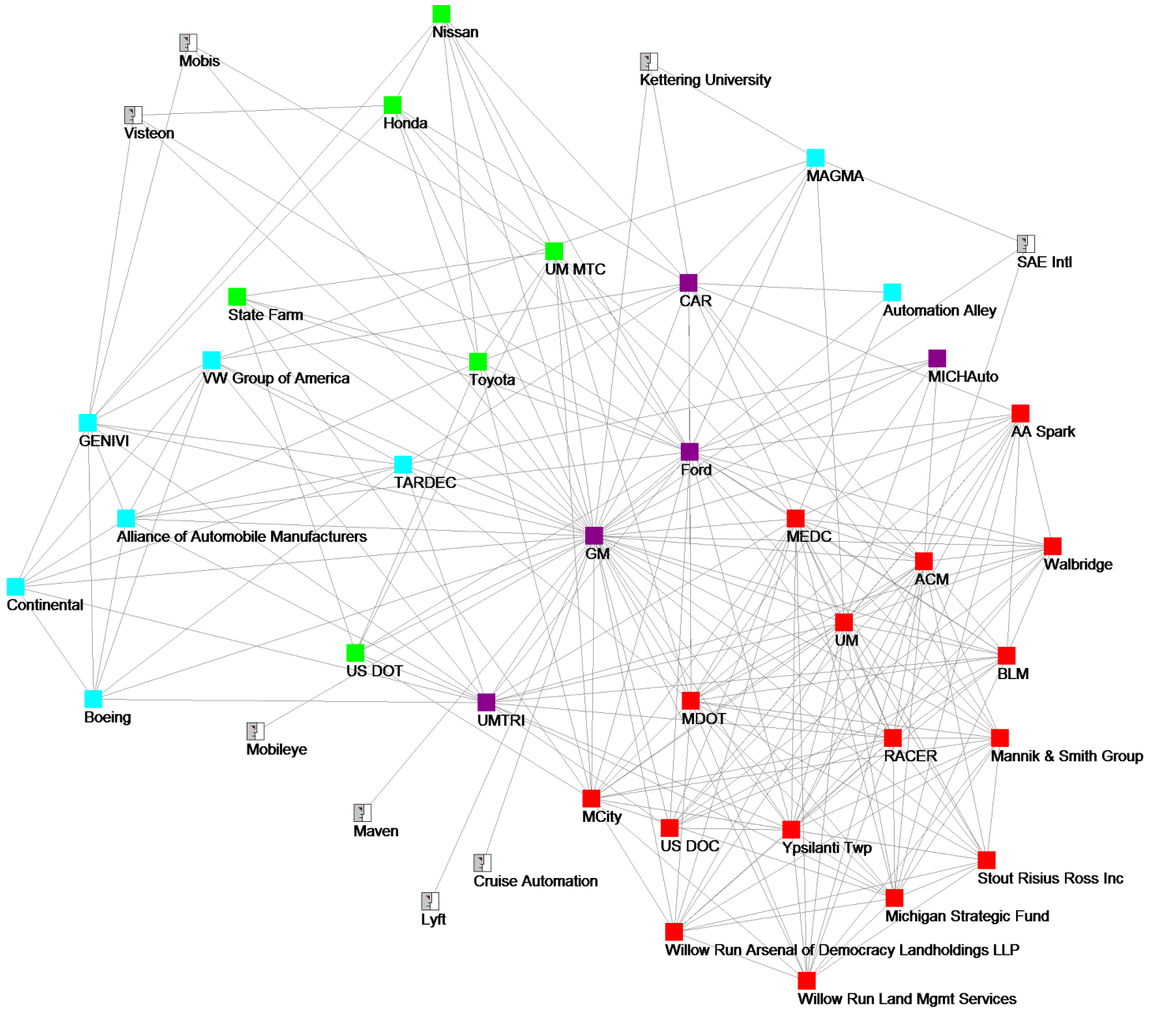
The top 15 influencers in the southeast Michigan connected and automated vehicles ecosystem are:

- General Motors
- Ford Motor Company
- University of Michigan
- American Center for Mobility
- Michigan Economic Development Corporation
- University of Michigan Transportation Research Institute
- Center for Automotive Research
- Michigan Department of Transportation
- RACER Trust
- Ypsilanti Township
- MCity
- Michigan Strategic Fund
- Ann Arbor Spark
- Mannik & Smith Group
- Business Leaders for Michigan

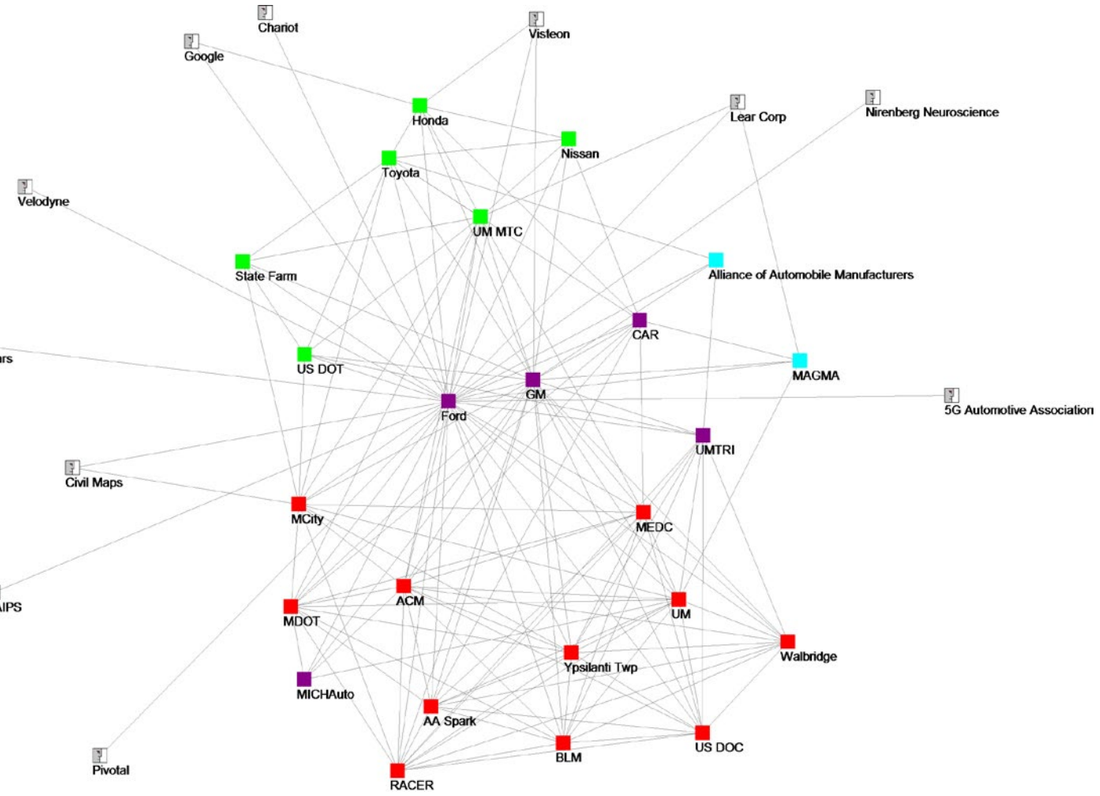
Breakdown of top 5 influencer clusters:

The following maps show the one step connections of the top five influencers.

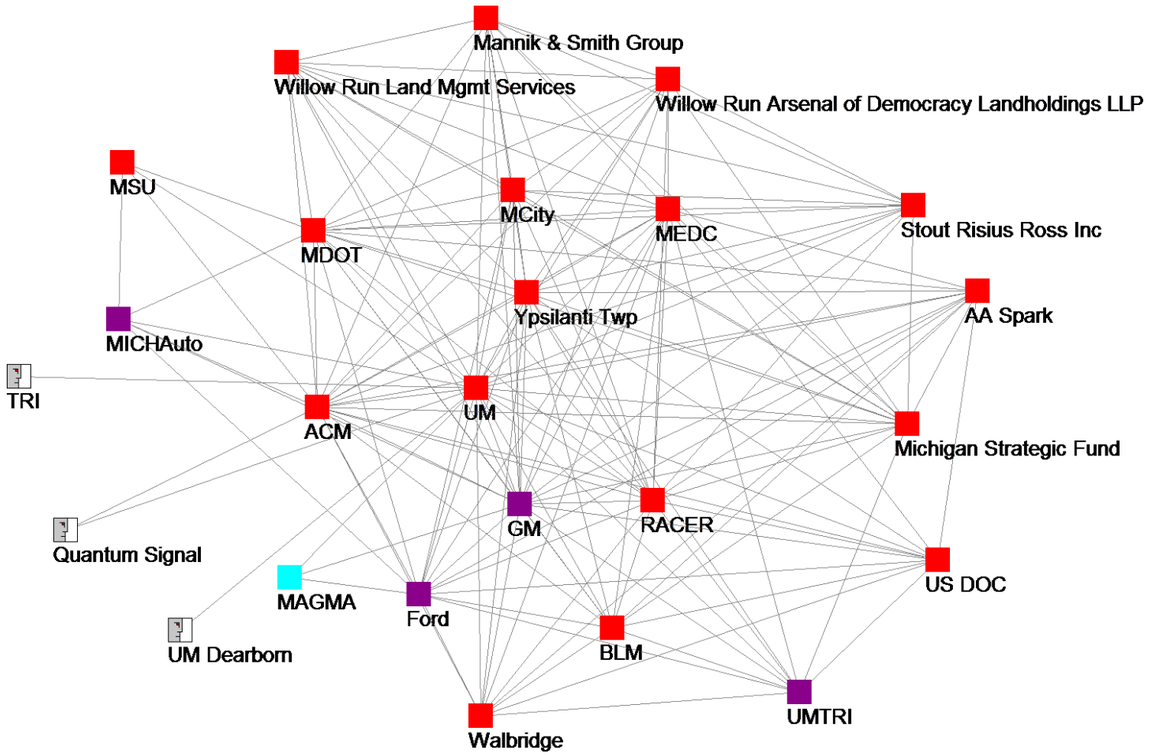
GENERAL MOTORS



FORD MOTOR COMPANY

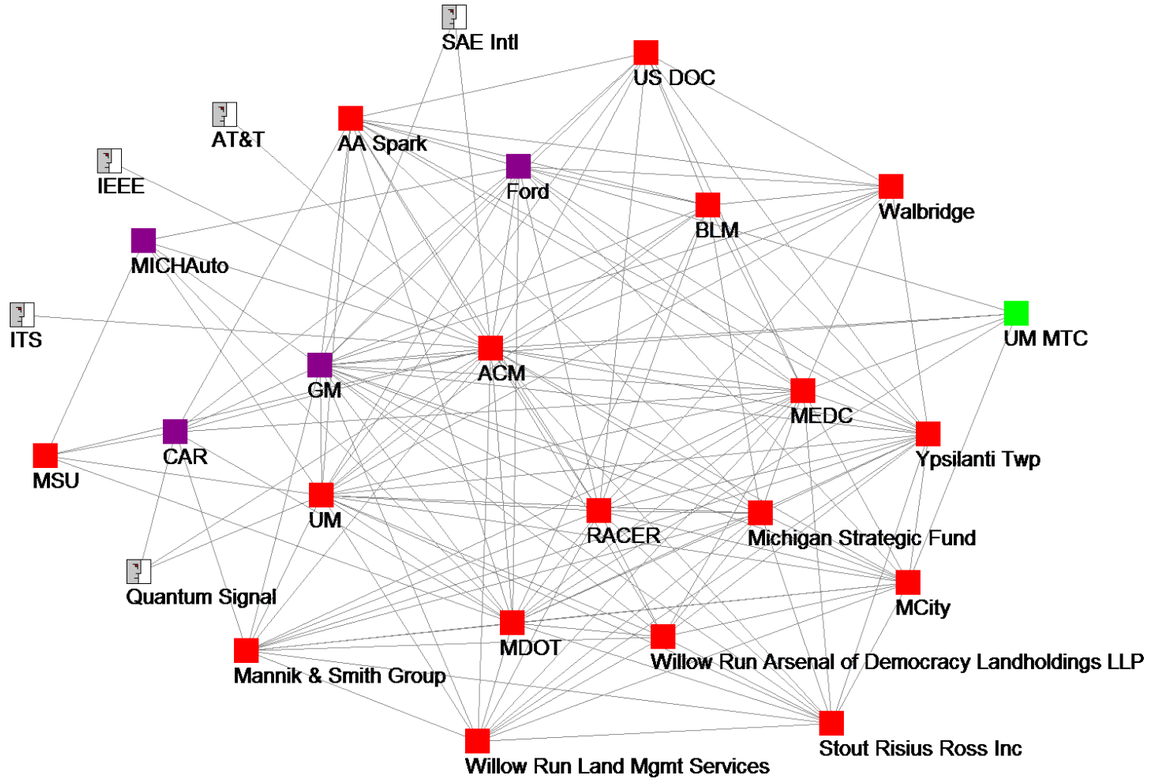


UNIVERSITY OF MICHIGAN

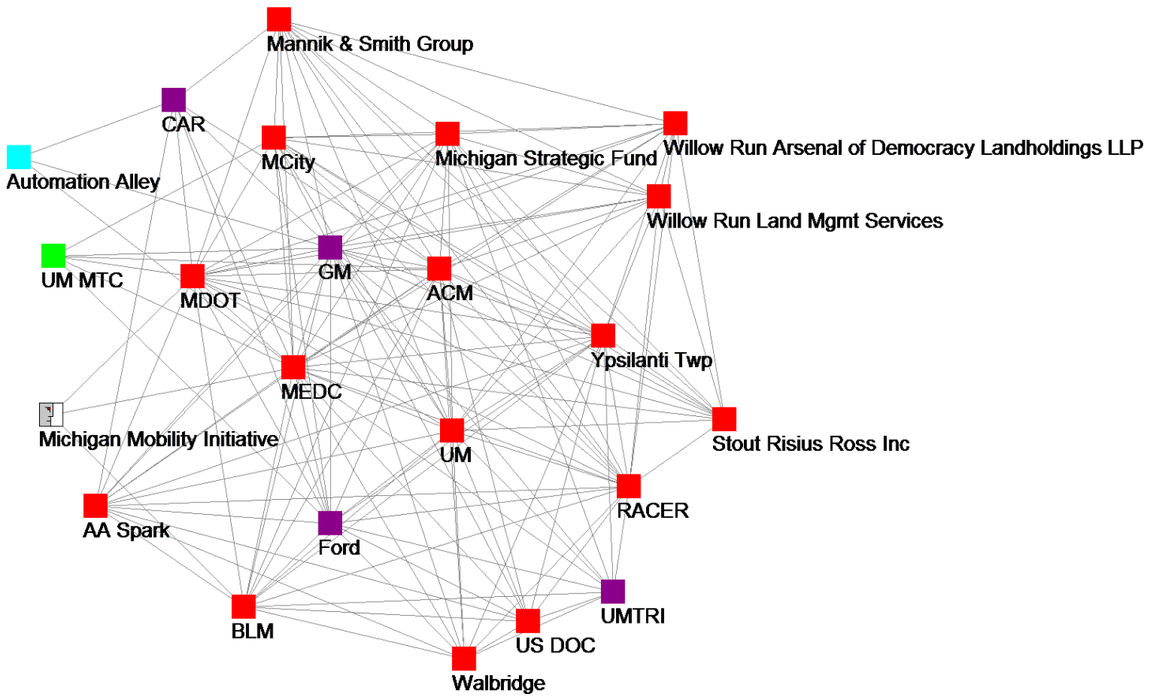


** Note, This University of Michigan node may include multiple departments. This node includes any reference to U of M that did not specify an office, department, or institute).*

AMERICAN CENTER FOR MOBILITY



MICHIGAN ECONOMIC DEVELOPMENT CORPORATION



Highly connected

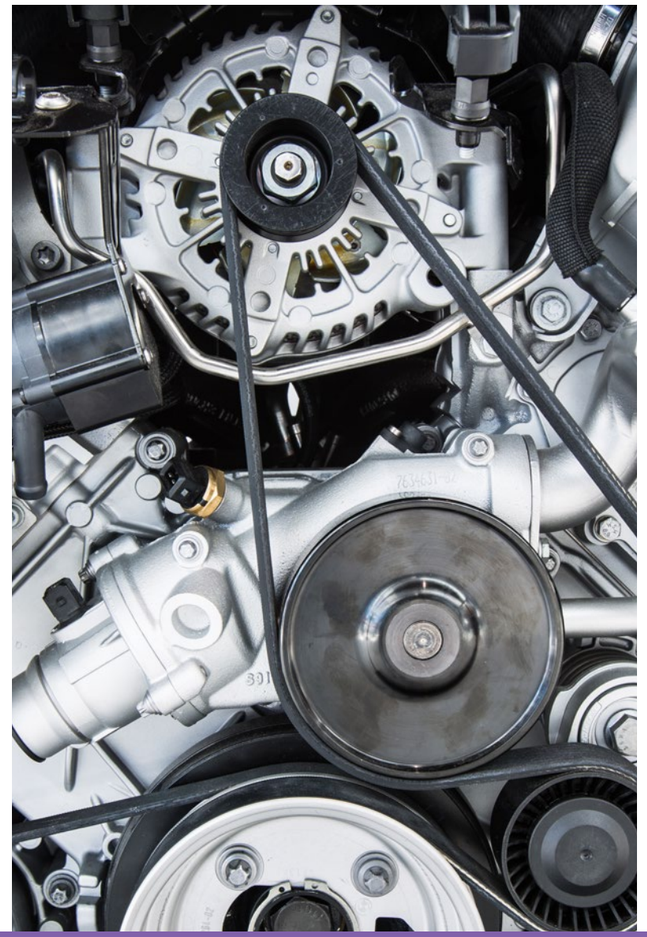
Highly-connected nodes are those organizations that have identified relationships with many other nodes specified in the research. These organizations, associations, or private businesses are considered well connected and either work or collaborate with many other players in the connected and automated vehicles space. While these organizations may not have the highest level of influence in the ecosystem, they tend to be well-informed about the ecosystem and may serve as gateways to reach out to other players.

Top fifteen most connected organizations:

- CAR (Center for Automotive Research)
- UM MTC (University of Michigan Mobility Transformation Center)
- GM (General Motors)
- MAGMA (Michigan Alliance for Greater Mobility Advancement, facilitated by WIN)
- GENIVI Alliance
- Ford
- 5G Automotive Association
- MDOT (Michigan Department of Transportation)
- MICHAuto (Part of Detroit Regional Chamber)
- Planet M
- ACM (American Center for Mobility)
- UM (University of Michigan) *
- MCity
- MEDC (Michigan Economic Development Corporation)
- Ypsilanti Twp

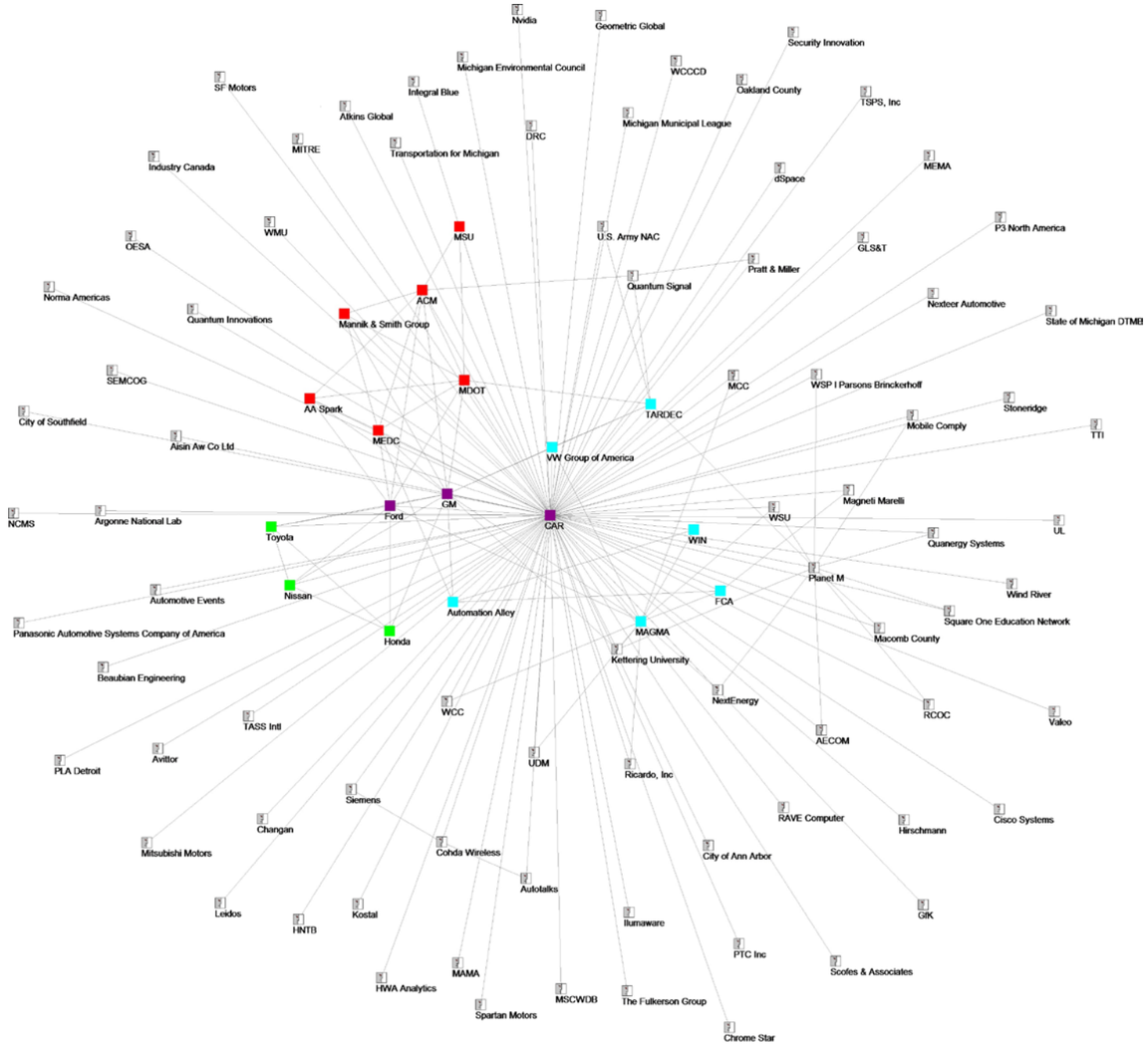
** Note, This University of Michigan node may include multiple departments. This node includes any reference to U of M that did not specify an office, department, or institute)*

The quantity of connections does not necessarily reflect the quality of the relationships. However, organizations with more connections may find it easier to foster collaboration with many players and cross industry divides. A node with many connections is often a sign that the overall network finds it beneficial to participate with that organization, which serve as a key player that attracts partners.



Center for Automotive Research (CAR)

The map below shows the one-step connections to the Center for Automotive Research and relationships between those companies.



Singular Connectors

The organizations identified below are connected to nodes that are not connected to any other organization identified in the ecosystem. This is like living in a cul-de-sac, with the routes (information flows and knowledge exchanges) being limited and often focused on only one path. Reaching out to these entities and creating additional collaboration with singular nodes may create a healthier ecosystem. To reach more of the connected and automated vehicles industry in southeast Michigan, these organizations serve as the gatekeepers to organizations that are not highly involved. Isolated nodes also existed in the research but were eliminated from the map and report, as the isolation of these nodes may indicate that they are either not participating in the CAV ecosystem, are outside of the southeast Michigan CAV ecosystem or do not play an active role.

An entity in control of structural social voids is in a good position. A person or organization with many singular nodes can set up a toll booth and charge people social currency.

Several organizations (nodes) have connections with organizations that are not replicated by other nodes. These include:

- CAR (Center for Automotive Research)
- UM MTC (University of Michigan Mobility Transformation Center)
- MAGMA (Michigan Alliance for Greater Mobility Advancement)
- 5G Automotive Association
- MICHAuto (part of Detroit Regional Chamber)
- Techstars
- Planet M
- GENIVI
- MDOT (Michigan Department of Transportation)
- Civil Map
- Quanergy Systems
- Ford
- Lear Corp
- Mobileye
- Cohda Wireless

Southeast Michigan Social Network Opportunity

As part of the Regional Plan for Connected/ Automated Transportation Systems Assets and Initiatives project (funded through the Advance Michigan Defense Collaborative and due for release in 2017), the Center for Automotive Research (CAR) interviewed several companies that are part of the CAV value chain. One interviewee stated that automakers are so desperate to be involved with Silicon Valley that they do not look at what is in their own backyards (i.e. in southeast Michigan). The research also identified southeast Michigan's opportunity to maintain its leadership role in the CAV space through more relationship-building and networking opportunities to both connect start-ups with larger companies and to connect the auto and defense CAV subsectors.

Several of the smaller companies interviewed mentioned challenges in connecting all big players but especially with potential defense customers, and those at auto companies mentioned wanting to interact more with entrepreneurs. Interviewees also identified an opportunity to promote the region's CAV assets through more marketing. By identifying CAV assets and communicating the activities occurring in southeast Michigan, the region's network can begin to encourage more local investment and attract additional investment dollars from outside the region.

Collaboration in Training and Education

The need for connected and automated vehicle mapping and collaboration extends beyond the innovation, supply chain, and marketing purposes to the need for trained and capable talent. Interview respondents to the Advance Michigan Defense Collaborative's regional CAV planning process reported that talent was by far the biggest weakness for southeast Michigan in the CAV space.

A recent Connected and Automated Vehicles Skills Gap Analysis , conducted by WIN, identified 49 unique occupation codes linked to CAV-specific projects. This diverse array of occupations signals the difficulty in identifying a complete CAV workforce and the requisite set of skills for future training. With much of the CAV space still in development, no standards have been developed to analyze the supply of skills, knowledge and abilities of workers already employed in this space. The greatest demand for workers with CAV skills was for those in IT, information security, and computer systems. The high need for individuals with security clearance provides another barrier to entering this workforce. Cities across the U.S. with high levels of CAV job posting activity include Washington D.C., Detroit, Boston, and Baltimore.

This need for talent presents an opportunity for collaboration through creation of a common set of worker requirements. Creating inclusive intelligent transportation systems will require funding to develop public-private partnerships. Roadways and vehicles can be connected to support autonomous mobility, but without the proper inclusion and training of the public, first responders, the disabled community, and other stakeholders, full potential safety benefits may not be realized. Collaboration within the CAV network on training initiatives can set standards for workers across the industry and region and can prove cost effective for the companies involved.

About the Advance Michigan Defense Collaborative

The Advance Michigan Defense Collaborative (AMDC) is a group of organizations that provides immediate and sustained assistance to firms and workers in a 13-county region in Southeast Michigan affected by reduced Department of Defense procurement. The group coordinates assistance to organizations that promote research, industrial development, and talent development relevant to the defense industry. Efforts support resiliency and capacity in autonomous transportation and connected mobility, lightweight materials manufacturing sector, and information technology, with a focus on increasing security of automated transportation systems and products. The core coalition of partners includes the Macomb/St. Clair Workforce Development Board, Workforce Intelligence Network for Southeast Michigan, Michigan Defense Center-an operation of the Michigan Economic Development Corporation, Merit Network, and Macomb County Office of Economic Development and Planning.

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Appendix A: Methodology

Based on training with Orgnet, LLC, a contractor procured to assist with social network analysis, WIN researchers chose to focus social network analysis research efforts on open source data with a focus on media articles, company sponsored websites, and available meeting information from known conveners of connected and autonomous vehicle stakeholders. Staff attained articles between May 2016 and October 2016. WIN researchers saved articles sources and searches of additional articles using applicable keywords in the news "app" of search engines such as Google and Yahoo to ensure data was attained from a broad range of sources. The team used a wide range of methods to gather articles, including those received directly from media through regularly received email updates, through newsletters from organizations known to provide this type of material, from keyword searches, pulled from LinkedIn from individuals known to WIN staff members, and from social media sites including Twitter, Facebook, and LinkedIn.

The sampling method used is what is commonly known as snowball sampling. This technique starts with a focus node. WIN researchers found connections of connections with this additional level of research.

Researchers used the following keywords to search for applicable articles:

- Connected cars research
- Connected vehicles research
- Autonomous cars research
- Autonomous vehicles research
- Connected and autonomous cars research
- Connected and autonomous vehicles research
- CAV research
- C/AV research
- Driverless cars research
- Driverless vehicles research
- Connected cars
- Connected vehicles
- Autonomous cars
- Autonomous vehicles
- Connected and autonomous cars
- Connected and autonomous vehicles
- CAV
- C/AV
- Driverless cars
- Driverless vehicles
- Southeast Michigan*
- Michigan*
- Metro Detroit*
- Detroit*

Researchers combined the keywords with an asterisk with the rest of the search terms to create a list related to the AMDC region. For example, "Metro Detroit" would have been added to the "CAV" search to obtain articles related to CAV in Metro Detroit.

The table below contains a list of the news sources and the number of articles from each news source. Bylines of news articles were used to determine the originator of each article.

To expand the data resources, an additional source was added to the original media articles data. This source was a list of connected and automated vehicles stakeholders developed for a C/AV regional plan RFP. This list was vetted by the representatives from MAGMA, MichAuto, Mobile Technology Association of Michigan (MTAM), and WIN for the purposes of adding unknown CAV stakeholders.

MEDIA	ARTICLE AMOUNT	SHARE OF TOTAL ARTICLES ANALYZED
Mlive	6	9%
The Detroit News	9	13%
Wards Auto	1	1%
The Wall Street Journal	1	1%
The Detroit Bureau	1	1%
Associated Press	2	3%
Michigan Radio	1	1%
Forbes	2	3%
Automotive News	6	9%
Detroit Free Press	9	13%
Crain's Detroit	16	23%
MiTechNews	7	10%
Bloomberg	4	6%
TU Automotive	1	1%
The Michigan Daily	1	1%
Hybridcars.com	1	1%
Bridge Magazine	1	1%
The New York Times	1	1%
Total	**70**	**100%**

WIN chose to focus on the connections between organizations rather than connections between individuals. Public sources were less likely to discuss individuals and it was more difficult to determine if individuals were working directly with one another. Articles were most likely to address organizational relationships, partnerships, etc. Each article was treated with the same process for determining the links associated with each article. Links identified within the map will only be presented once within the map, regardless of the number of times this link was identified within the articles and materials analyzed. This was determined to be the best process as a higher profile story that may have been covered by multiple stories does not indicate additional strength in the connection, nor does this necessarily indicate a stronger relationship between nodes.

Creating network maps is an iterative process. With multiple sources of data, conflicting information can be seen and explored and alternate spellings and acronyms can be found. This results in input and correlation activities related to the social network map.

Data was de-duplicated manually using Excel formatting by the WIN DOD grant and research team. A series of maps were created and revised for minor errors and accuracy (duplicate organization names, spelling errors, etc).

External Review:

A draft of the map was shared with CAR, a contractor working for the Advance Michigan Defense Collaborative (AMDC) to create a connected and automated vehicles regional plan. During the review of the SNA research, CAR recommended additional research pertaining to nodes that are more active in the southeast Michigan CAV space than portrayed in the SNA map. This resulted in 21 additional nodes and 139 added connections. The organizations identified as more prevalent than originally portrayed included:

- Lear
- Valeo
- Cohda Wireless
- Magna
- Mobis
- NVIDIA
- PTC Inc
- Qualcomm
- Quanergy
- Ricardo
- Savari
- Tass
- Iteris
- P3
- Visteon
- ZF TRW

Researchers then again reviewed open source information to identify the connections for these nodes, heavily focusing on each node's public facing website.

CAR also noted a trend towards connections associated with the American Center for Mobility. This can be explained through noting the time frame for acquiring news articles. Several announcements were made regarding the ACM within this timeframe.

Reading the Map and Explanation of Connections

The research team revised its approach to focus on the "central hubs," eliminating organizations with one or fewer connections (the outliers). Included in the list were organizations with two or more connections on the maps.

Methodology and Standardization: Company Specific Webpage Research

The following parameters were used to decide whether to include an organization in the SNA:

1. For membership organizations (ex: Alliance of Automobile Manufacturers), all members were included in the list if the membership organizations were actively working in the C/AV space

2. For general partnerships, researchers required that there be a C/AV component as part of the relationship. Example: MICHAuto lists all its partners on their handouts. These partners were included if there is a C/AV component to their relationship

3. Meeting attendees were included if they were linked to the meeting host, but not necessarily to each other. If an organization representative attends a meeting, it can be assumed that a relationship exists between the meeting holder and the attendee, but this does not guarantee that interaction or a relationship was developed between meeting attendees. Example: CAR CAV Working Group attendees can be linked to CAR, but not to each other (one assumes they are working with CAR, but attending a meeting does not mean they are working with each other)

Limitations:

Link Strength

The current maps reflect connections that have been established using our described methodology While the strength of these connections is relevant, it was concluded that an assignment of strength between nodes is not able to be determined using the existing public data sources. The recurrence of connections in news articles, on website pages, and in meeting notes may only represent that a story is of a higher profile and therefore received more coverage than other stories. For example, when the American Center for Mobility purchased the Willow Run site, the coverage of this story dominated all other CAV and auto news reports. Thus, the strength of these ties would be inaccurately magnified.

Elimination of Single Nodes:

WIN's elimination of organizations with a single connection before the website research phase did not eliminate single nodes from the final map. The organizations on the current map with only one connection are those that were discovered because of the website research of the better-connected organizations. For example, on WIN's map, DURA Automotive Systems is only connected to UM MTC (now known as Mcity). This connection was discovered while doing research on UM MTC's website. WIN did not encounter other connections to DURA Automotive Systems in its initial research.

The single connection nodes could be further developed in a future stage of the project, as they may be connected to several different organizations in the CAV space.

Additional Limitations:

1. Strength of connections is not accurately determinable using existing data sources.

2. The variety of news sources is limited based on what WIN staff members encountered and could attain through searches.

3. Connected and automated vehicles research and development is considered proprietary information. Proprietary information is not shared with the public and, thus, many existing relationships may not be included in this analysis.

4. Due to the competitive nature of the current CAV industry and the "race to autonomy," many organizations have kept their relationships and partnerships with others confidential.

5. Networks change, and change is more likely to occur early in the life of the sector. This sector, while tied to a mature automotive industry, is likely to shift drastically in the next few years. Consistency will develop over time.

Appendix B: Identified CAV Nodes

NODE	FULL NAME (if an acronym or abbreviation was used on the map)
313Creative	
3M	
5G Automotive Association	
A&D Technology	
A123	
AA Spark	Ann Arbor Spark
AAM	American Axle Manufacturing
Acerta	Acerta Systems Analytics Inc.
ACM	American Center for Mobility
Adient US LLC	
AECOM	
AGC Automotive	
Aisin Aw Co Ltd	
Algocian	
Alliance of Automobile Manufacturers	
Allstate	
Alphabet	
Alpine	
Alps	Alps Electric Company
AME Cloud Ventures	
AppDirect	
Arada	
Argonne National Lab	
Argonne National Lab	
Argus Cyber Security	
AT&T	
Atkins Global	
Audi	
Auto Club Enterprises	
Autoliv	
Automation Alley	
Automotive Events	
Autonet Mobile	Autonet Mobile Inc.
Autotalks	
Avittor	
Baidu	
Beaubian Engineering	
Behr	
Bernie Wagenblast Communications	
BLM	Business Leaders for Michigan
BMW	BMW AG
Boeing	The Boeing Company
Bosch	
Brandmotion LLC	
BriaQ	
CAR	Center for Automotive Research
Cargo	
Carnegie Mellon University	
Changan	
Chariot	
China Mobile	
Chrome Star	
Chrysler	
Cisco	
Cisco Systems	
City of Ann Arbor	
City of Detroit DOT	
City of Detroit, Mayor's Office	
City of Southfield	
Civil Maps	
Clarion	
Clemson	Clemson University
Cohda Wireless	
Commsignia	
Community Foundation for Southeast Michigan	
Compact Power	
Continental	

Appendix B: Identified CAV Nodes

NODE	FULL NAME (if an acronym or abbreviation was used on the map)
Continental AG/ Siemens VDO	
Corp for a Skilled Workforce	
Cruise Automation	Cruise Automation Inc
Daimler	
Danlaw	
DEGC	Detroit Economic Growth Corporation
Delphi	Delphi Automotive Plc
Denso	
Desay SV Automotive	
Desjardins General Insurance Group	
Detroit Diesel Corp	
Detroit Windsor Tunnel	
DOE Vehicle Technologies Office	
Donut Media	
doubleSlash	
Downtown Detroit Partnership	

NODE	FULL NAME (if an acronym or abbreviation was used on the map)
DRC	Detroit Regional Chamber
Drive Spotter	Drive Spotter Inc.
dSpace	
DTE Energy	
DURA Automotive Systems	
Econolite Group	
Engineering Society of Detroit	
Ericsson	
ESG	ESG Automotive
E-Systems	
Faurecia	
FCA	
FedEx	
Ficosa	
Flex	
Flint & Genesee Chamber of Commerce	
Fontinalis Partners LLC	
Ford	Ford Motor Company

NODE	FULL NAME (if an acronym or abbreviation was used on the map)
Founder.Org	
Gemalto	
GENIVI	
Geometric Global	
Gett	
GfK	
GKN Driveline	
GLS&T	Great Lakes Systems & Technology
GM	General Motors
GoKid	
Google	
GP Capital	
Grand Total	
Guangzhou Automobile Group	
Haas Automation	Haas Inc
Haldex AB	
Harada Industry of America	
Harman Intl Industries	

NODE	FULL NAME (if an acronym or abbreviation was used on the map)
HATCI	HATCHI Hyundia America Technical Center, Inc
HERE	
Hero App Co	Hero App Co.
HEV Technology Center	
HFCC	Henry Ford Community College
Hirschmann	
Hitachi Ltd	
HNTB	HNTB Corporation
Honda	
Huawei	
HWA Analytics	
Hyundai	
IAV Automotive Engineering	
Ibeo Automotive Systems GmbH	
Idaho National labs	
IDIADA	Applus IDIADA
IEEE	Institute of Electrical and Electronics Engineers

NODE	FULL NAME (if an acronym or abbreviation was used on the map)
Ilumaware	
Industry Canada	
Inmarsat	
Innoviz Technologies	
Integral Blue	
Intel Corp	
Isuzu	
Iteris	
ITS	ITS Corporation
Jaguar Land Rover	
Kettering University	
Keweenaw Research Center	
Kostal	
Lear Corp	
Leidos	
Leopold Kostal GmbH	
LG	
LTU	Lawrence Technological University

NODE	FULL NAME (if an acronym or abbreviation was used on the map)
Lyft	
Macomb County	
MAGMA	Michigan Alliance for Greater Mobility Advancement
Magna Electronics	
Magna Intl	
Magneti Marelli	
MAMA	Michigan Aerospace Manufacturer Association
Mando Corp	
Mannik & Smith Group	Mannik & Smith Group Inc
MASC	Michigan Autonomous Systems Collaborative
Maven	
Mazda	
MCC	Macomb Community College
MCity	
MDOT	Michigan Department of Transportation
Mechanical Simulation Corp	

NODE	FULL NAME (if an acronym or abbreviation was used on the map)
MEDC	Michigan Economic Development Corporation (MEDC)
MEMA	Motor & Equipment Manufacturers Association
Mercedes-Benz	
MICHAuto	
Michigan Council on Future Mobility	
Michigan Environmental Council	
Michigan Mobility Initiative	
Michigan Municipal League	
Michigan Strategic Fund	
Microsoft Corp	
Miller, Canfield, Paddock and Stone	
MIT	Massachusetts Institute of Technology
MITRE	MITRE Corporation
Mitsubishi Electric	

NODE	FULL NAME (if an acronym or abbreviation was used on the map)
Mitsubishi Motors	
Mobi	
Mobile Comply	
Mobileye	Mobileye NV
Mobis	
Motus Ventures	
MSCWDB	Macomb/St. Clair Workforce Development Board
MSU	Michigan State University
MTAM	Mobile Technology Association of Michigan
MTTI	Michigan Tech Transportation Institute
MTU	Michigan Technological University
Munich Re	
National Renewable Energy Lab	
NAVYA	NAVYA ARMA
NCMS	National Center for Manufacturing Sciences
NEI	New Economy Initiative for Southeast Michigan

NODE	FULL NAME (if an acronym or abbreviation was used on the map)
Nest	Nest Labs Inc.
New Cities Foundation	
New Eagle Consulting	
Nexteer Automotive	
NextEnergy	
Nirenberg Neuroscience	
Nissan	
Nokia	
Norma Americas	
NTT Docomo	
NVIDIA	
NXP Semiconductors	
Oakland County	
OCTA	Orange County Transportation Authority
OESA	Original Equipment Suppliers Association
Ohio Turnpike and Infrastructure Commission	

NODE	FULL NAME (if an acronym or abbreviation was used on the map)
Open Source Robotics Foundation	
OSIsoft	
OSU	The Ohio State University
Oxford University	
P3 North America	
Panasonic Automotive Systems Company of America	
Pennsylvania DOT	
Pennsylvania Turnpike Commission	
Pioneer	
Pivotal	
PLA Detroit	Public Lighting Authority Detroit
Planet M	
PolySync	
Porsche	
Pratt & Miller	
PSA	PSA Group

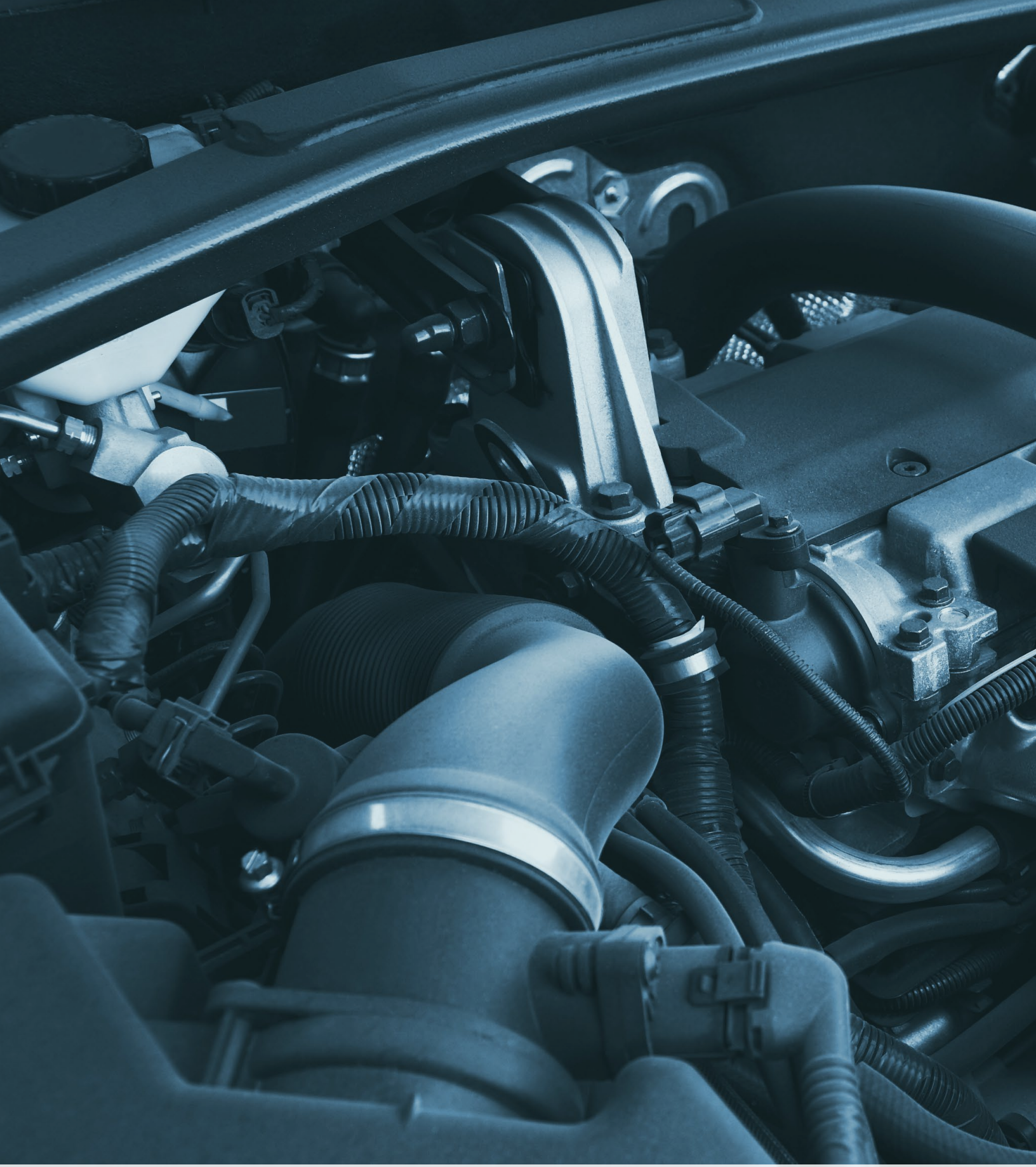
NODE	FULL NAME (if an acronym or abbreviation was used on the map)
PTC Inc	
QMIC	Qatar Mobility Innovations Center
Qualcomm Technologies	
Quanergy Systems	
Quantum Innovations	
RACER	Revitalizing Auto Communities Environmental Response Trust (RACER)
Rally Bus	
RAVE Computer	
RCOC	Road Commission for Oakland County
Realtime Technologies	
Renault	
Renesas Electronics America	
Ricardo, Inc	
Rising Tide Fund	
Rock Ventures	
Rohde & Schwarz	

NODE	FULL NAME (if an acronym or abbreviation was used on the map)
Rolls-Royce	
SAE Intl	Society of Automotive Engineers
SAIC Motor Corp Limited	
SAIPS	
Samsung	Samsung Electronics Co.
Samsung Ventures	
Savari	
Schoolcraft College	
Scofes & Associates	
Security Innovation	
SEMA	
SEMCA	Southeast Michigan Community Alliance
SEMCOG	Southeast Michigan Council of Governments
Sensata Technologies	
SF Motors	
Shell Oil Company	
Siemens	
SK Telecom	

NODE	FULL NAME (if an acronym or abbreviation was used on the map)
SkyDeck	
SL Corp	
Spartan Motors	
Spatial Labs	
Spicer Group	
Square One Education Network	
Stanford	Stanford University
StartX	
State Farm	State Farm Mutual Automobile Insurance
State of Michigan DTMB	
Stoneridge	
Stout Risius Ross Inc	
Subaru	
Sumitomo Electric Industries	
Suncorp Group	
Surveying Solutions Inc	
T Mobile	
TARDEC	US Army Tank Automotive Research, Development and Engineering Center
TASS Intl	
Techstars	
TechTown	
TEEC Angel Fund	
Telstra	
Tesla	Tesla Motors
The Fulkerson Group	
The White House, Detroit Federal Working Group	
The White House, OMB	
THEA	Tampa Hillsborough Expressway Authority
Toyota	
Transportation for Michigan	
Transportation Research Center	
Trend Micro	

NODE	FULL NAME (if an acronym or abbreviation was used on the map)
TRI	Toyota Research Institute
TRW	
TSPS, Inc	
TTI	Texas A&M Transportation Institute
U.S. Army NAC	National Automotive Center
UC Berkeley	
UC Berkeley PATH	UC Berkeley Partners for Advanced Transportation Technology (PATH)
UDM	University of Detroit Mercy
UL	
UM	University of Michigan
UM Center for Entrepreneurship	
UM Dearborn	University of Michigan, Dearborn
UM MTC	U-M Mobility Transformation Center (MTC)
UMTRI	University of Michigan Transportation Research Institute
United Way of Metropolitan Dallas	
URC	University Research Corridor
US DOC	Department of Commerce
US DOE	
US DOT	U.S. Department of Transportation
USDOT	
Valeo	
Vanderplaats	
Vector Institute	
Velodyne	
Verizon	
Viavi	
Visteon	
Vodafone	
Volkswagen	
Volvo	
Voyhoy	
VW Group of America	

NODE	FULL NAME (if an acronym or abbreviation was used on the map)
Walbridge	Walbridge Development LLC
Wardenclyffe Partners	
WCC	Washtenaw Community College
WCC Advanced Transportation Center	
WCCCD	Wayne County Community College District
WDA	Workforce Development Agency
Willow Run Arsenal of Democracy Landholdings LLP	
Willow Run Land Mgmt Services	Willow Run Land Management Services
WIN	Workforce Intelligence Network
Wind River	
WMU	Western Michigan University
WSP I Parsons Brinckerhoff	
WSU	Wayne State University
WSU School of Engineering	
WYDOT	Wyoming Department of Transportation
Xerox Corp	
Ypsilanti Twp	Ypsilanti Township
Zendrive	
ZF Friedrichshafen AG	
ZF TRW	
Zipcar	
ZTE	ZTE USA



WIN WORKFORCE INTELLIGENCE NETWORK

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Driving Opportunity Through Advanced Manufacturing