Industry 4.0
SUPPORTING SMALL AND MEDIUM-SIZED MANUFACTURERS
Industry 4.0

SUPPORTING SMALL AND MEDIUM-SIZED MANUFACTURERS

ECONOMIC DEVELOPMENT RESEARCH PARTNERS
International Economic Development Council

IEDC is the world’s largest membership organization serving the economic development profession, with more than 5,000 members and a network of more than 25,000 economic development professionals and allies. From public to private, rural to urban, and local to international, our members represent the entire range of economic development experience. Through a range of services including conferences, training courses, webinars, publications, research and technical assistance efforts, we strive to provide cutting-edge knowledge to the economic development community and its stakeholders. For more information about IEDC, visit www.iedconline.org.

Tracye McDaniel
President
TIP Strategies, Inc.
Chair of the Board

Craig Richard, CEcD, FM
President and CEO
Tampa Hillsborough Economic Development Corporation
Immediate Past Chair of the Board

Jeffrey A. Finkle, CEcD
President and CEO
International Economic Development Council
Economic Development Research Partners

The EDRP Program is the “think tank” component of IEDC, designed to help economic development professionals weather the challenges and grab opportunities from economic changes affecting our communities. EDRP members are leaders in the field of economic development, working through this program to improve the knowledge and practice of the profession. IEDC would like to thank the Economic Development Research Partners program for providing the impetus and resources for this project.

<table>
<thead>
<tr>
<th>AEP, Ohio</th>
<th>Charlotte Regional Business Alliance, North Carolina</th>
<th>City of Surprise, Arizona</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mark J. James, CEcD</td>
<td>Janet LaBar</td>
<td>Jeanine Jerkovic, CEcD</td>
</tr>
<tr>
<td>Vice President, Economic</td>
<td>CEO</td>
<td>Economic Development</td>
</tr>
<tr>
<td>&amp; Business Development</td>
<td></td>
<td>Director</td>
</tr>
</tbody>
</table>

| Ames Economic Development    | Chattanooga Area Chamber of Commerce, Tennessee     | Columbus 2020, Ohio       |
| Commission, Iowa             | Charles H. Wood, CEcD                                | Kenny McDonald, CEcD      |
| Dan A. Culhane, CEcD         | Vice President, Economic Development                | Chief Economic Officer    |
| President & CEO              |                                                      |                          |

| Ann Arbor SPARK, Michigan    | City of Austin Economic Development Department, Texas| Delaware Prosperity       |
| Paul L. Krutko, FM, HLM      | Julia B. Campbell                                    | Partnership, Delaware     |
| President & CEO              | Director, Economic Business Development              | William Kurt Foreman      |
|                              |                                                      | President                 |

| Blount Partnership, Tennessee| City of Cedar Hill: Economic Development, Texas     | Detroit Regional Partnership, Michigan |
| Bryan T. Daniels, CEcD       | Allison J.H. Thompson, CEcD EDFP FM Director of Economic Development | Barry I. Matherly, CEcD FM |
| President & CEO              |                                                      | HLM President & CEO       |

| Camoin Associates Inc, Virginia| City of Columbus - Department of Development, Ohio | Economic Health Office, City of Fort Collins, Colorado |
| Daniel C. Gunderson, FM, HLM | Quinten L. Harris, JD MPA Deputy Director | SeonAh Kendall, Economic Health Manager |
| Senior VP & Principal         |                                                      |                          |

| CareerSource Florida, Inc., Florida| City of Columbus - Office of the Mayor, Kentucky | Frisco Economic Development Corporation, Texas |
| Andra S. Cornelius, CEcD          | Kevin Atkins, Chief Development Office | Ron Patterson, President |
| Senior Vice President, Business & Workforce Development |                          |                                          |

<p>| CDC Small Business Finance Corp., California| City of Lexington - Office of the Mayor, Kentucky | Gilbert, AZ - Office of Economic Development, Arizona |
| Kurt Chilcott, CEcD FM                  | Kevin Atkins, Chief Development Office | Jennifer Graves, CEcD Deputy Director, Economic Development |</p>
<table>
<thead>
<tr>
<th>Organization</th>
<th>City</th>
<th>State</th>
<th>President/CEO</th>
</tr>
</thead>
<tbody>
<tr>
<td>GO Topeka Economic Partnership, Kansas</td>
<td>Topeka</td>
<td>Kansas</td>
<td>Molly Howey, CEcD Senior Vice President for Economic Development</td>
</tr>
<tr>
<td>Great Falls Development Authority, Inc., Montana</td>
<td>Great Falls</td>
<td>Montana</td>
<td>Brett Doney, CEcD FM President &amp; CEO</td>
</tr>
<tr>
<td>Greater Des Moines Partnership, Iowa</td>
<td>Des Moines</td>
<td>Iowa</td>
<td>David L. Maahs, CEcD Executive Vice President, Economic Development</td>
</tr>
<tr>
<td>Greater Fort Lauderdale Alliance, Florida</td>
<td>Fort Lauderdale</td>
<td>Florida</td>
<td>Robert C. Swindell, President &amp; CEO</td>
</tr>
<tr>
<td>GREATER MSP, Minnesota</td>
<td>Minneapolis</td>
<td>Minnesota</td>
<td>Peter Frosch CEO</td>
</tr>
<tr>
<td>Greater New Orleans, Inc., Louisiana</td>
<td>New Orleans</td>
<td>Louisiana</td>
<td>Michael Hecht President &amp; CEO</td>
</tr>
<tr>
<td>Greater Oklahoma City Chamber, Oklahoma</td>
<td>Oklahoma City</td>
<td>Oklahoma</td>
<td>Roy H. Williams, FM President &amp; CEO</td>
</tr>
<tr>
<td>Greater Phoenix Economic Council, Arizona</td>
<td>Phoenix</td>
<td>Arizona</td>
<td>Christopher P. Camacho President &amp; CEO</td>
</tr>
<tr>
<td>Greater Richmond Partnership, Inc., Virginia</td>
<td>Richmond</td>
<td>Virginia</td>
<td>Jennifer Wakefield Interim President</td>
</tr>
<tr>
<td>Great Yuma Economic Development Corporation, Arizona</td>
<td>Yuma</td>
<td>Arizona</td>
<td>Julie J. Engel, CEcD CEO &amp; President</td>
</tr>
<tr>
<td>Idaho National Laboratory, Idaho</td>
<td>Idaho</td>
<td>Idaho</td>
<td>Stephanie Cook Program Manager</td>
</tr>
<tr>
<td>Invest Atlanta, Georgia</td>
<td>Atlanta</td>
<td>Georgia</td>
<td>Eloisa Klementich, CEcD President &amp; CEO</td>
</tr>
<tr>
<td>Invest Buffalo Niagara, New York</td>
<td>Buffalo</td>
<td>New York</td>
<td>Thomas Kucharski, CEcD President &amp; CEO</td>
</tr>
<tr>
<td>JAXUSA Partnership, Florida</td>
<td>Jacksonville</td>
<td>Florida</td>
<td>Catherine Chambers, Senior Vice President, Strategy &amp; Business Development</td>
</tr>
<tr>
<td>JobsOhio, Ohio</td>
<td>Columbus</td>
<td>Ohio</td>
<td>Matt Waldo Manager, Research &amp; Information</td>
</tr>
<tr>
<td>Lake Superior Community Partnership, Michigan</td>
<td>Superior</td>
<td>Michigan</td>
<td>Amy J. Clickner, CEcD CFRM CEO</td>
</tr>
<tr>
<td>Las Vegas Global Economic Alliance, Nevada</td>
<td>Las Vegas</td>
<td>Nevada</td>
<td>Jonas Robert Peterson, CEcD President &amp; CEO</td>
</tr>
<tr>
<td>Louisiana Department of Economic Development, Louisiana</td>
<td>Lake Charles</td>
<td>Louisiana</td>
<td>Donald M. Pierson Jr. Secretary, LED</td>
</tr>
<tr>
<td>Lubbock Economic Development Alliance, Texas</td>
<td>Lubbock</td>
<td>Texas</td>
<td>John Osborne, President &amp; CEO</td>
</tr>
<tr>
<td>McKinney Economic Development Corporation, Texas</td>
<td>McKinney</td>
<td>Texas</td>
<td>Peter Tokar III, MBA President &amp; CEO</td>
</tr>
<tr>
<td>MetroHartford Alliance, Connecticut</td>
<td>Hartford</td>
<td>Connecticut</td>
<td>David A. Griggs, CEcD President &amp; CEO</td>
</tr>
<tr>
<td>Michigan Economic Development Corporation, Michigan</td>
<td>Lansing</td>
<td>Michigan</td>
<td>Susan Proctor, CEcD Director, Global Business Attraction</td>
</tr>
<tr>
<td>Minnesota Department Employment &amp; Economic Development, Minnesota</td>
<td>St. Paul</td>
<td>Minnesota</td>
<td>Kevin McKinnon, Deputy Commissioner</td>
</tr>
<tr>
<td>Mississippi Manufacturers Association, Mississippi</td>
<td>Jackson</td>
<td>Mississippi</td>
<td>Jay C. Moon, CEcD FM HLM President &amp; CEO</td>
</tr>
</tbody>
</table>
New Braunfels Economic Development Council, Texas
Michael G. Meek, CEcD
President

New Orleans Business Alliance, Louisiana
Quentin L. Messer Jr.
President & CEO

North Louisiana Economic Partnership, Louisiana
Scott Martinez, CEcD
President

Northeast Indiana Regional Partnership, Indiana
John R. Sampson
President & CEO

Oakland County Executive Office, Michigan
David J. Schreiber
Chief Strategist

Richardson Economic Development Partnership, Texas
William C. Sproull, FM, HLM
President & CEO

Rutgers Center for Urban Entrepreneurship and Economic Development, New Jersey
Lyneir Richardson
Executive Director

Saginaw Future Inc., Michigan
JoAnn Crary, CEcD, FM, HLM
President

Salt Lake City Corporation, Utah
Lara L. Fritts, CEcD
Director, Economic Development Department

Southwest Michigan First, Michigan
Ron Kitchens, CEcD
CEO & Senior Partner

St. Louis Economic Development Partnership, Missouri
Rodney Crim, CEcD, EDFP
President

Tampa Hillsborough Economic Development Corporation, Florida
Craig J. Richard, CEcD, FM
President and CEO

Team NEO, Ohio
Christine Nelson
Vice President, Regional Business Development

Texas Economic Development Corporation, Texas
Robert Allen
President and CEO

The Economic Development Alliance for Jefferson County, Arkansas
Lou Ann Nisbett, CEcD
President & CEO

The Right Place, Inc., Michigan
Birgit M. Klohs, HLM
President & CEO

Tulsa Regional Chamber, Oklahoma
Mike S. Neal, CCE CCD
President & CEO

Virginia Economic Development Partnership, Virginia
Stephen Moret
President and CEO

Wisconsin Economic Development Corp., Wisconsin
VP of Business & Community Development
Authors

**Primary Authors**

Louise Anderson
Swati A. Ghosh

**Contributors**

Thomas Dowse
Madeline Parker
Haeden Griggs

**Copy Editor**

Tanner Bokor

**Creative Direction**

Alissa Soriano

June 2019

International Economic Development Council
734 15th Street NW, Suite 900
Washington, DC 20005
202-223-7800
iedconline.org
Acknowledgements

IEDC would like to thank the Economic Development Research Partners (EDRP) program for providing the impetus and resources for this research. We would like to acknowledge the contributions of a special taskforce comprised of EDRP that guided the research:

- SeonAh Kendall (Co-Chair)
- Bill Sproull, FM, HLM (Co-Chair)
- Carmen Mims
- Jennifer Graves
- Justine Burdett
- Rodney Crim
- Julie Engel, CEcD
- Kevin McKinnon

This paper would not be possible without their contributions and expertise. In particular, we would like to thank Justine Burdett, Bill Sproull and Julie Engel for their time and dedication to this project, and their additional assistance to the research team.

We would also like to thank the various economic development professionals who shared their experiences through surveys, interviews and focus group discussions. See a list of interviewees in the Resources section of this paper.
In 2018, the Economic Development Research Partners (EDRP) explored current trends that will impact the future of economic development in *Future Ready: Preparing for Tomorrow’s Economy*. The report looked to the horizon for threats and opportunities stemming from technological advancements, and the impacts those would have on workforce, technology, infrastructure, connectivity, and economic development as a profession over the next 10 to 15 years. The report also included recommendations for economic development organizations to better prepare their communities for the future.

*Industry 4.0* further builds on the extensive research of *Future Ready*. Where *Future Ready* took a broad look at the impact of various technologies across multiple economic sectors, this paper dives deeper into one aspect: the impact of Industry 4.0 technologies on small and medium-sized manufacturers (SMMs), and how economic development organizations (EDOs) can assist them.

“Industry 4.0” is a shorthand term – similar to “smart manufacturing” or “digital manufacturing” – for a group of advanced digital and physical technologies and applications that are rapidly changing manufacturing. Those technologies include additive manufacturing (also called 3D printing); cybersecurity; advanced materials; modeling, simulation, visualization and immersion; artificial intelligence; robotics; big data; the industrial internet of things; and cloud computing.

---

Where they are in place, these technologies are dramatically transforming manufacturing. That transformation is more common among larger firms, which are better resourced. The challenges that SMMs face in adopting Industry 4.0 technologies include lack of a technology knowledge and expertise; lack of financial and consulting resources; and among some, lack of awareness of the need, or relationship to their bottom line.

Yet adopting these technologies will become critical to SMMs’ competitiveness in the not-too-distant future, particularly as OEMs and larger firms begin to require their use among their suppliers and partners.

This paper looks at the impact of Industry 4.0 technologies on SMMs through four areas of economic development practice or influence: business retention and expansion, workforce development, infrastructure needs, and entrepreneurship. Drawing on a survey of EDOs and on case studies, it shows practical strategies in response to I4.0 challenges and opportunities. Case studies include:

- NIST’s Manufacturing Extension Partnership programs (Michigan, California, Tennessee, Illinois, Wisconsin)
- Greater Memphis Medical Device Council and Greater Memphis Alliance for a Competitive Workforce
- Manufacturing Works and Team NEO in Northeast Ohio
- Fayetteville, Arkansas, Chamber of Commerce
- Allianz Industrie 4.0, Germany
- Innovation Superclusters Initiative, Advanced Manufacturing Supercluster, Ontario, Canada

The paper finds that EDOs and related organizations are helping their SMMs in the following ways:

**Business retention and expansion:** EDOs are actively educating companies on the capabilities of new technologies; working to assess manufacturers’ needs and readiness for I4.0 solutions; and connecting manufacturers to technical assistance for I4.0 adoption.

**Workforce development:** EDOs and related organizations are working on initiatives that provide manufacturing career awareness and guidance to students, parents and educators; facilitating connections between industry and education and training institutions to ensure that needed skills are being taught; and organizing or helping organize internships and apprenticeships.

**Infrastructure:** EDOs are working to expand access to high-speed internet, a critical element of I4.0 adoption.

**Entrepreneurship:** In addition to the usual methods EDOs employ to foster entrepreneurship in their communities, they are supporting digital manufacturing startups in two primary ways: engaging in promotional and educational activities around the possibilities of making, and providing facilities and technical expertise.
The paper includes five recommendations for economic developers to help their SMMs adopt I4.0 technologies.

1. **First, educate yourself about I4.0 technologies.** The more economic developers are able to learn about I4.0 technologies – the opportunities and challenges of each, and applications in different industries – the better they are able to help their businesses understand and adopt them.

2. **Then, educate your companies about I4.0 technologies.** EDOs should engage in regular communications and events (e.g., tours, webinars, newsletters, social media) to help their SMMs understand why new technology adoption matters.

3. **Identify sources of technical assistance and connect manufacturers to them.** Each U.S. state has a Manufacturing Extension Partnership (MEP) program, which is the premier source of technical support for manufacturers in I4.0 and other areas. Beyond MEP centers, community colleges and technical departments at higher educational institutions, and retired or “loaned” engineers can help.

4. **Collaborate with education providers to help build the pipeline of skilled workers.** Economic developers are well positioned to bridge the communication gap between manufacturers and education and training providers. They can help build students’ awareness of the opportunities in manufacturing careers, and partner with K-12 systems, community colleges, universities and other learning institutions to ensure that training programs are available that meet the skill requirements of local businesses.

5. **Advocate for supportive public policies and investments.** Economic developers have an important role to play in assembling coalitions to advocate for big investments that will pay off in terms of community competitiveness, such as infrastructure, K-12 education, and broadband.