INDUSTRY & INCLUSION MANUFACTURING WORKFORCE STRATEGIES **BUILDING AN INCLUSIVE FUTURE**

How community-embedded workforce organizations center racial equity, credentialing, and training to create stronger neighborhoods







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INTRODUCTION

Overview

In 2020, The Century Foundation (TCF) and the Urban Manufacturing Alliance (UMA) collaborated to create a national program to examine educational strategies and community-driven workforce models that connect diverse communities to opportunities in manufacturing, and to identify the policy change needed to scale those efforts. The Inclusion and Industry 4.0 (I&I) Project brought together leading practitioner organizations to understand and lift up best practices and challenges, and extract lessons for policymakers to expand support for community-based manufacturing training. I&I represents a critical component of TCF and UMA's goal to promote the development of effective workforce and education strategies targeting an inclusive future in manufacturing.

The I&I program builds on an earlier collaboration starting in 2017 when UMA joined TCF on their High Wage America campaign, which published nine policy research reports and held conversations with hundreds of stakeholders across the industrial Midwest. The initiative, one of a new generation of high impact TCF policy research efforts to address inequality, attracted multiple 2020 presidential contenders (Senators Sherrod Brown and Kirsten Gillibrand, and now-President Joe Biden) to its events, and national media attention for its recommendations. High Wage America research concluded that tackling inclusion, alongside a move to more advanced production, would determine the fate of American manufacturing.

Manufacturing has one of the most aged workforces in the economy and currently faces a recruitment and skill-building challenge. These come on top of the fourth industrial revolution as manufacturers are redesigning production and products to take advantage of automation, artificial intelligence, and the internet of things — demanding new skills at every level of production. To address these challenges, manufacturing companies and workforce development partners are developing new approaches to adult skill development that takes into account barriers to accessing, committing to, and completing long-term training programs. These same organizations are also going through their own learning and growing in order to better support Generation Z talent — individuals born between 1997 and 2012 — who as students experienced drastic economic, cultural, and technological shifts which have impacted K-12 learning, personal values, and ideas about meaningful, sustainable work.

Luckily, an exciting generation of workforce intermediaries is providing diverse workers new opportunities to attain skills in advanced manufacturing. These intermediaries served as our I&I cohort members, and focus on serving adults and adolescents, primarily those of color. Despite the loss of manufacturing in all of our cohort cities, these communities have long counted on the many remaining manufacturing jobs as a source



of middle-class income, especially for those workers who don't have a college degree. But a generation of

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parents who experienced job loss from that industrial decline — particularly in urban communities of color — have served as a cautionary tale for current youth and young adults. As a result, many younger workers and their families today do not view manufacturing jobs as a viable pathway, and thus have not encouraged them to develop the skills needed to enter and advance in manufacturing careers. However, the rebound in manufacturing over the past eight years, means that good-paying jobs in manufacturing could once again make a big difference for urban communities of color, and others who need well-paying work — but only if comprehensive programs are in place to make the connections between communities, training programs, and these good jobs.

The innovative leaders of the eight I&I cohort members prove that with the right program models in place, a variety of un- and under-employed adults of all ages are able obtain the necessary skills to gain employment into a rewarding career in manufacturing, with further opportunities for skills advancement and wage progression. Through 2020, cohort members, TCF, and UMA worked collaboratively through virtual roundtable discussions, seminars, and interviews to explore policies and programs, questions of scale and sustainability, and promising practices. From this work many takeaway



lessons about education, training models, employer engagement, and supportive service strategies were organized, documented, and shared.¹ Moreover, this collective research will position these organizations as national leaders who can spark replication in other communities, and provide policymakers with a road map of how to make such replication and expansion possible.

How to use the research

TCF and UMA have packaged lessons learned from the Industry and Inclusion 4.0 Project into two publications: Industry & Inclusion: Manufacturing workforce strategies building an inclusive future, and Industry & Inclusion: A Blueprint for Action, this research report and blueprint for action. This report is a journalistic set of profiles of our cohort organizations and the people who power them. Industry & Inclusion: A Blueprint for Action is a set of conclusions and insights based on the common themes of: Learning, Racial Equity, Economic Justice, Pathways to Ownership, Relational Innovations, and Creating Strong Partnerships. These publications highlight barriers and opportunities at the intersection of workforce and economic development, place a spotlight on leading members of the cohort, document learnings from the cohort's interactions, and organize research and public policy recommendations.

The scaling of successful workforce programs like those highlighted in these publications will be aided by complementary public policies. TCF, UMA, and the l&l cohort are promoting a greater priority on inclusion throughout federal manufacturing programs, such as Manufacturing USA and the Manufacturing Extension Partnership, and national workforce development programs, such as the Workforce Innovation and Opportunity Act (WIOA). TCF's *Industry & Inclusion: A Blueprint for Action* includes an analysis of ways in which federal workforce and higher education policies can be reformed to facilitate the scaling of l&l cohort members and similar program models. In addition,

¹ See Appendices.

Industry & Inclusion: A Blueprint for Action includes state and regional action areas, including how to invest federal and state dollars and how to structure higher education involvement in non-degree credential programs in manufacturing.

This report includes a summary of the interactions and discussions between cohort members, UMA, and TCF; reflections on connections within those discussions; and a collection of technical descriptions and personal profiles that share the stories and backgrounds of program leaders and stakeholders with whom they work. Industry & Inclusion: Manufacturing workforce strategies building an inclusive future will help similar workforce development organizations gain insights to improve upon existing practices and provide guidance and connections to help make the leap to new beneficial practices. Together, Industry & Inclusion: Manufacturing workforce strategies building an inclusive future and Industry & Inclusion: A Blueprint for Action are meant to be used by many different stakeholders who are advocating for new, continued, or expanded support for community-embedded, innovative workforce development organizations that are training current and future manufacturing talent.



SUMMARY OF METHODOLOGY

The goal of the I&I program was to create an opportunity for program leaders to tell the story of their work from their perspective, create a space to discuss what is and isn't working in current strategies, and identify challenges and discuss solutions to increase impact. To achieve this, TCF and UMA organized a new cohort of urban, community-based organizations that have built workforce development programs to help create new education and career pathways for women, communities of color, people with conviction histories, veterans, and other marginalized communities. TCF and UMA's original research plan for the cohort included in-person discussions, facility visits, and national gatherings. Due to the COVID-19 pandemic all activities shifted to virtual gatherings and discussions. The pandemic provided an unexpected backdrop that amplified the importance of the project. Yet, the economic shutdown due to social distancing guidelines, combined with a spike in demand for personal protection equipment and the shutdown of global supply chains, increased awareness of the importance of local factories as places where both essential products are made and where frontline workers work. Also during the I&I cohort, police officers in three different cities murdered George Floyd, Breonna Taylor, and Rayshard Brooks - three Black people, three among far too many before and after them - further amplifying the importance of taking action to include racial equity and inclusion in economic development and workforce strategies. While it is hard to fully grasp how collective learning may have been impacted by these historic moments, it is important to acknowledge they created an immediate shared learning experience that brought participants together in unanticipated ways.

How the project was done

TCF and UMA reorganized our original learning program into all online interactions between cohort members, project conveners, an advisory board, and other



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national experts. The research team used contemporary approaches to knowledge transfer to identify the impactful ways these eight models have been able to seed and scale programs in their own communities while strengthening local manufacturing ecosystems.

The research methods implemented over the course of the 12-month program include: roundtable discussions between all cohort organization stakeholders (industry leaders, trainees, education partners); webinars featuring cohort members, advisors, and subject matter experts; and one-on-one interviews with program leaders and stakeholders from their region. Qualitative analysis was done of these discussions to connect themes across conversations, cities, and programs. Through analysis of the findings, we extracted lessons from the field and identified barriers to success. We designed research questions in each of the structured discussions to capture the strategy behind how cohort members work



Within the larger conversation about workforce development and ecosystem engagement, we asked questions dedicated to more focused elements, such as the effects of different credentialing models — such as apprenticeships, higher education programs, or competency-based credentials — and relationships with educational institutions on program design and outcomes. We included other questions to better understand the continuing impact of Industry 4.0 technologies, such as automation, cybersecurity, and the internet of things, on the requirements in the manufacturing workforce, and how these are changing the skills required for manufacturing jobs. Within each discussion we intentionally left time and space open to allow more organic sharing and reflection.

While we based observations on qualitative research, we made conclusions in the context of the data these programs provided on job placement, wages, and credential attainment. TCF and UMA developed a standard data request for each organization participating in the cohort to organize data on demographics of participants, data on training completion and credential attainment, and job placement and retention, among other topics like funding sources and key partnerships.

To help guide and ground the research, TCF and UMA organized an advisory board to provide a deeper knowledge of workforce development models. Our advisory board was made up of national workforce development thought leaders from academia, the private sector, nonprofits, and government. The advisory board provided a much-needed national framework to the local conversations with the eight cohort members.

with communities and businesses to create career pathways for workers, particularly in communities of color and low-income populations, who currently are not well-connected to the manufacturing sector.

REFLECTIONS

Given that each cohort organization participated in a three-hour roundtable group discussion, a series of one-on-one interviews, and monthly gatherings, it is impossible to fully share all the stories and moments of learning that informed TCF and UMA's insights and reflections. This process yielded shared experiences and pain-points across multiple organizations, despite working in different cities, with different stakeholders, and within different regional histories.

Many discrete discussions ran through the collection of stories and backgrounds of the cohort members. Individual organizations talked about the process and difficulty of finding skilled trainers to provide technical instruction who also have the social awareness to work with BIPOC communities, individuals who have little to no work experience, and those who live in neighborhoods that have experienced high amounts of trauma.

Each cohort organization approaches this process in their own way. Some have been able to successfully recruit diverse teachers from industry to work full time within their companies, such as Jane Addams Resource Corporation (JARC). Other organizations have built relationships with education partners that have developed train-the-trainer style programs to help teachers better understand their students' experiences, which is a strategy Northland Workforce Training Center (NWTC) and Manufacturing Renaissance (MR) have created. Finding capable teachers echoes part of another ongoing conversation: it is important to find the right people for the right position. This goes for many different roles within the education-to-career pathway support network: roles which include technical trainers, mentors, career coaches, employer recruitment and support, program marketing, and program advocates. These conversations also touch on the idea that the whole ecosystem needs to fill these roles rather than one individual organization having all of them under one roof.



Having many partnerships within a regional ecosystem - that contribute to the well-being and support of current and future employees and manufacturing businesses – was talked about by all cohort members. There is no one way to build these relationships, nor is there just one perfect combination of partners. For example, Lightweight Innovations For Tomorrow (LIFT) and Manufacturing x Digital (MxD) have built connections to technology developers through their non-workforce development work as Manufacturing USA Institutes. They have been able to turn those connections into partnerships which have opened new possibilities for teaching high school students about cutting-edge technologies. Many organizations discussed working on ways to strengthen their regional connections to the education and workforce development networks. Even though both networks are on the education continuum, they tend to operate very differently, leading cohort members to develop separate ways to build partnerships with individual groups.

The most consistent relationships that all organizations have are with networks of manufacturers and of social service providers. Yet again, there are unique ways to manage these network relationships. Some have created fee-for-service incumbent training programs to bring manufacturers to the table — for example, JARC and Wisconsin Regional Training Partnership / Building Industry Group & Skilled Trades Employment Program (WRTP | BIG STEP) — and others rely on placing newly skilled workers in manufacturing businesses to build interest for ongoing programs, as is the case with MR. Creating relationships with social service providers often depends on building trust with individuals at each organization and providing education and insights about why the communities they serve should be pursuing careers in manufacturing.

Investing in relationships with social services, employers, and the larger ecosystem illustrates another key point: organizations often have to do a lot of work beyond skills training. One instance includes coaching employers to learn new practices and implement policies that correct for discrimination against BIPOC and women, one of the most often cited extra tasks. Some of this coaching is done one-on-one, in subtle ways, like Manufacturing Advocacy and Growth Network's (MAGNET) intern coach who helps employers understand and communicate expectations with their trainees. Whereas Menomonee Valley Partners (MVP) works with external partners to develop race and gender equity training programs for employers. JARC is launching a group discussion forum for many business leaders to come together to discuss race, equity, and inclusion barriers and strategies for change. This work outside of training illustrates gaps within the ecosystem. Many organizations have developed an informal process of taking on extra work, uncovering why it is needed, then finding new organizations to bring into the ecosystem to fill the gap. When this is not possible the next step is often to communicate the importance of doing the "new work" and then seek funding to cover the costs associated with it.

The day-to-day operations, program offerings, and service networks of each organization illustrate the effort it takes for a trainee to transition from no employment, or underemployment, to full time employment. Sometimes the effort is about planning new strategies for childcare, overcoming family and peer pressure, or covering rent and transportation costs. In other cases the effort is fighting against racist and inequitable employer practices. Each cohort leader shared, in their own way, their empathy and awareness of what it takes to commit to, what for many, is a very new and life-changing experience of learning skills needed to work in manufacturing. This awareness translates into many different strategies, all of which help make this big transition easier. As mentioned previously, all organizations have built social service networks in part to help with easing this major life transition and reducing the effort needed to solve problems associated with creating new childcare options, transportation, and even clothing. Organizations have implemented strategies internally as well. MR and MAGNET, for example, have created mentor programs to connect a trainee with someone who has shared life experiences to help guide them through the process and acknowledge their effort. NWTC and JARC offer career coaching to help individuals ease the transition into employment, preparing them before they start their career for how to navigate on-the-job conflicts and how to advocate for themselves. And, MVP created a women in manufacturing program to connect young women to professionals in careers in manufacturing to help build bridges that previous generations did not benefit from.

The following Profile Library section provides more information on these individual organizations for further study and to help uncover more connections and relationships across the I&I cohort members. *Industry & Inclusion: Manufacturing workforce strategies building an inclusive future* provides both deeper explanations as to how these themes were discussed and provides recommendations to change policies in response.

MXD PROFILE

Introduction

As part of the Industry & Inclusion 4.0 Project, UMA interviewed cohort members and their partners to gather background information and details about how they create and deliver programs. From these discussions UMA generated Organizational Profiles for each of the eight cohort members. These Organizational Profiles are divided into two parts:

Technical Descriptions: snapshots of each workforce development organization which include a brief description of their history, an overview of how their signature programs operate, self-identified keys to success, recent outcomes, and their future plans for scaling the impact of their programs.

Personal Profiles: stakeholder interviews to gain a deeper understanding of the relationships that exist between the workforce development organization and the communities and employers they serve. These include trainees, industry employers, and partners in education.

Each Organizational Profile is meant to shed light on how each cohort member successfully navigated the process of designing and implementing an innovative workforce development solution for their region and for people they support. As a collection, these eight Organizational Profiles highlight the importance of: building partnerships and ecosystems, navigating stakeholder engagement, remaining open to ongoing improvements and learning, and understanding both employers' needs and the needs of the current and future workforce.

In the Personal Profiles you will find individual meaningful experiences of: how people's lives were changed by the training programs, how after graduating trainees return to give back to the next generation, and mentorships between intergenerational workers that share a culture and background. And like the Technical Descriptions, the collection of Personal Profiles highlight important themes. For example, the need for: committing to ongoing dialogue with the community to understand their needs, cultural awareness within manufacturing companies, and a broader definition and understanding of impact and outcomes.

The Organizational Profiles provide a glimpse into the inherent complexity of preparing a new workforce for an ever-changing industry. What UMA found compelling through these discussions is that each cohort member has become an expert in discrete topics like recruiting the right people, building an ecosystem, and supporting the transition of workers. Even though no two organizations operate in the same way, they have all come to understand key important principles: leverage what makes one's region unique; bring partners of all kinds to the table to develop ideas and get feedback; create a culture of learning and education as a lifelong process, within their own organizations and within the manufacturing businesses they work with; and new programs require social innovation - a change in behavior — on the part of trainers, trainees, employers, and funders.

Please visit <u>urbanmfg.org/project/industry-and-</u> inclusion-national-cohort to read our research, commentary, and the seven other cohort member profiles.

MANUFACTURING X DIGITAL [MXD]

Where innovative manufacturers forge their futures.

Chicago, Illinois

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Brief Introduction, History, & Background

Manufacturing x Digital (MxD), previously called the Digital Manufacturing and Design Innovation Institute (DMDII), is one of 16 Manufacturing USA Institutes, a national network of centers tasked with advancing different aspects of Industry 4.0. Since opening in 2014. MxD has created a state-of-the-art innovation center for industry collaboration, with a 22,000-square-foot manufacturing floor used to demonstrate cutting edge technology, educate high schoolers, young adults, and incumbent workers, and support research and development of digitally-enhanced technologies. MxD is tasked with helping U.S. manufacturers develop new digital tools to improve different parts of the manufacturing supply chain from tracking materials and products to managing a factory floor to digital simulations that improve training and education. MxD's research and development work is supported through a multi-year commitment from the U.S. Department of Defense along with its industry partners. In about seven years of operation, its membership network has grown to include more than 300 businesses, academic institutes, and government agencies. In order to increase the adoption of digital technology and cybersecurity in manufacturing, as well as to create sustainable American manufacturing jobs, MxD is also involved in

Together, the organizations created a digital workforce taxonomy, a report documenting 165 new datacentric manufacturing jobs, running from "collaborative robotics technician" to "predictive maintenance systems specialist." The taxonomy is a valuable resource for understanding skill sets that cut across industry domains and job titles, and which are specific to niches within a certain sector of advanced manufacturing. MxD Learn expanded its workforce development offerings when the factory floor manufacturing testbed opened in 2015. At MxD's facility in Chicago, students and workers can participate in a range of activities and events, from a factory tour to hands-on training. The factory floor continues to add technologies: since the innovation center opened its doors, additions include a digitized manual assembly testbed, a discrete manufacturing testbed, and cybersecurity for operational technology demonstrations. MxD partners AT&T, Autodesk, Fast Radius, McKinsey & Company, Microsoft, Siemens, and Software AG also have dedicated space on the floor to showcase innovative manufacturing technologies. Each additional testbed and demonstration within the larger factory floor increases the opportunities for MxD to advance Industry 4.0 and train future talent.

workforce development initiatives. MxD Learn, MxD's workforce development program, is prioritizing under-resourced communities that historically have lacked equal access to high-tech career pathways. In 2019, MxD launched IGNITE at Waukegan High School, one of Illinois' largest Title 1 schools, at which 58 percent of the students are considered economically disadvantaged and minority enrollment stands at 97 percent.

MxD Learn began building out new frameworks to career pathways in digital manufacturing through a collaboration with ManpowerGroup.



"The employers in the region have a need to hire. Our aspiration is to engage young people in high school to get them excited and wanting to work for these employers. To do that we bring in the community college, the high school, faculty, and community leaders. We are trying to bring the whole community."

-Lizabeth Stuck, Head of Engagement & Workforce Development

About MxD Learn

MxD's early work with its digital manufacturing jobs taxonomy was followed by the Hiring Guide: Cybersecurity in Manufacturing. Released in 2019, it establishes a framework for MxD Learn. These resources provide an outline of what skills and knowledge need to be introduced via their programs, including IGNITE and FlexFactor. To create and deliver these programs, MxD Learn fosters collaboration and takes on the role of convener. To provide insights to translate into educational content, MxD can tap into its member network consisting of manufacturers, universities, nonprofit, and governmental entities in the Chicago region and beyond.

MxD Learn engages with high school students outside its headquarters through IGNITE: Mastering Manufacturing.

IGNITE is a three-year high school curriculum developed in collaboration with Detroit-based LIFT (also a Manufacturing USA Institute), community colleges, and high schools. IGNITE uses in-class, industry-based projects to teach high school sophomores, juniors, and seniors skills that prepare them for careers in manufacturing while establishing connections for employment opportunities. The curriculum is designed to prepare students to become multiskilled technicians, technologists, and engineers. Students starting in their sophomore year can choose to take manufacturing-focused elective courses. These classes go

beyond just increasing awareness; teachers are helping students learn through hands-on experience with technology used today in advanced manufacturing companies. The technology is accessible via two new labs at Waukegan High School, created by converting

an old woodshop. The funding came from a large investment from the community, including donations from Lake County Partners and the Siemens Foundation. Classroom and lab learning are supplemented by factory tours, demonstrations at MxD's factory floor, and presentations by subject experts. At the end of their three years, the IGNITE cohort culminates in a team capstone project where students apply what they learned about digital manufacturing and cybersecurity to an industry problem showcasing their deep understanding of manufacturing materials, technologies, processes, and systems.

FlexFactor is MxD Learn's next educational program. The FlexFactor program is based on a model developed by NextFlex (another Manufacturing USA Institute). The model was first tested in 2015, and in five years 3,209 K-12 students in the San Jose, CA region had





MxD Learn's specific responsibilities in both programs run throughout all stages: curriculum and course development, educating students, and post-graduation opportunities. At the start, MxD brought together industry partners, community college faculty, high school teachers, and MxD staff to co-create individual course content, project briefs, and the overall three-year curriculum. Now that the program is up and running, MxD is involved with educating students. MxD hosts virtual demonstrations and discussions and creates toolkits for hands-on remote learning, all due to COVID. MxD is already planning for the first cohort of students to

participated. In 2020, NextFlex developed a strategy to deliver the program virtually. In 2021, MxD and six other Manufacturing USA Institutes will implement

the FlexFactor model, with each institute augmenting it to focus on their specific expertise. FlexFactor is similar to IGNITE as both are engaging students and creating awareness. The biggest difference is the time frame; FlexFactor is a single semester program, rather than three years. Students can participate by signing up for an elective, rather than being in a cohort. In that

semester they are introduced to manufacturing careers through virtual tours, subject matter expert discussions, and technology demonstrations. The students take what they have learned, team up, and create their own product. The semester concludes with a pitch session to industry leaders and the Manufacturing USA Institute that hosts the program. In the spring of 2021, MxD will lead a collaborative process to create a FlexFactor iteration focused on digital manufacturing and cybersecurity content. And in the fall, the initial launch will be done with a regional high school as a test run. graduate in 2022 and will use its membership network to create pathways for early career success.

"The FlexFactor program empowers students to create their own solutions. Instead of us going to a school and saying this is what you need to know, students are building leadership skills demonstrating how to be innovative. Today's high school students are digital natives and don't have the fear of using digital technology. Their creativity in understanding and applying digital technology solutions can help show industry what is possible." -Michael Garamoni, Manager, Workforce Development

Keys to Success

Early in MxD's development three goals were identified as framing success: programs must be industry-driven, engage with the community, and reach diverse students. These help frame a holistic approach to developing, executing, and assessing successful programs. MxD believes if these goals are met, it leads to the creation of both meaningful workforce opportunities for the individuals going through the training and meaningful service to employers looking to hire. Collaboration is necessary for all of MxD Learn's work to come together. This means getting feedback from external partners, MxD Learn staff, MxD team members on the technology research and development side, MxD members, and students. This process allows everyone to have a shared goal but bring different perspectives in achieving it.

One way to make sure they meet their goals is by having a career pathway or blueprint strategy in mind. This means creating a series of stepping stones a student can follow. It is relatively easy to create an event that creates excitement and interest, but if you don't create a place, space, or resource for someone as an immediate next step then that excitement, interest, and connection is likely lost. MxD is responding by hosting many types of events to get people introduced to careers in manufacturing, then offering the next stepping stone via workshops and demonstrations on its factory floor. For educators and administrators that get excited, they have the opportunity to bring IGNITE or FlexFactor to their school. This also applies to manufacturing

businesses. It is possible for them to go through the same cycle: they see a technology, or hear about a creative workforce development solution, and get excited, but if they can't find an expert or supporter to help integrate new technology or hire new workers, then momentum is lost. For manufacturers the taxonomy report is an immediate resource, with the factory floor, membership, and opportunities

to contribute to educational programs being second and third possible stepping stones to get support for adopting new innovation.

MxD considers its ability to innovate across the workforce development system as a key to success. A lot of workforce development support is offered only if there is data showing a historic or current demand for a skill set. MxD's industry engagement work starts with R&D and understanding technology in future factories. This work shows where industry is going and demand for future skills. Workforce development can be challenging because you are working to meet the needs of industry and of middle and high school students. It requires understanding two very different stakeholder groups in the present, as well as predicting how industry will change and what people will need as they move to the next stage of their lives. This puts MxD in the position to find innovative ways to impact the system as a whole. By going into high schools, they are creating a demand for more educational opportunities and creating the next innovators who will define the next R&D and the design of the future factory. Over time, if successful, this strategy will create a positive feedback loop changing the way we think about workforce development. Students in high school will learn skills to operate technology while also finding new ways of applying it. They will take this know-how into a career and shape how the industry and individual companies operate, defining the next round of technology and skill sets to be taught to the next students.

"I worry that if you only provide an introduction to manufacturing to a student then you are missing the chance to get them more deeply involved. You can bring a student into a manufacturing facility and they might say 'I would really like this work' but if you leave at the end of the day, and don't provide a next step their interest may be lost. We have to give them a next step, a pathway. We try to have our program support that model; we create the next step, then the next, and the next."

-Lizabeth Stuck, Head of Engagement & Workforce Development

Outcomes

MxD's first implementation of IGNITE with Waukegan High School in 2019 included over 150 students. With COVID drastically impacting high school education, MxD pivoted to find ways to continue delivering education and opportunities, while also learning from its early findings. The original classroom teaching utilized a lot of self-directed learning, which had mixed success. Without the ability for students to be in lab spaces in their school, that strategy was made even more difficult. MxD pivoted to the development of individual toolkits for each student, allowing them to do hands-on learning at home, while also attending group video classes. They are considering individual toolkits and a more directed learning strategy even when in-person learning resumes. This ability to test and change in a short amount of time — the program was running for only six months before COVID impacted their work — shows MxD's willingness to learn and grow.

In the course of building relationships to create and deliver IGNITE, the MxD team learned that College of Lake County, just a few blocks from Waukegan High School, was in the process of building a new mechatronics degree program and lab. This connection led to identifying overlap between the IGNITE high school curriculum and the one that was about to be offered at the community college level. Together, they aligned course content to allow high school students to be dual enrolled and get college credit via their IGNITE electives. This early success has driven the exploration of new connections between 9th through 12th grade learning and community college education. MxD has since begun to work with the community college to develop an apprenticeship program in cybersecurity and digital manufacturing that is also in line with future College of Lake County offerings. When the new apprenticeship program is running, it will mean

Waukegan High School students have the chance to start their careers in manufacturing while continuing their education. It will also create new opportunities for students across the district even if their schools are not participating in the IGNITE program.

The Future [Scaling]

A key question MxD Learn's staff asks when developing any program is: Is there any opportunity to scale up beyond where we first start? One of the things that makes MxD valuable is that it is a national organization. The institute is looking at workforce challenges and solutions with a national lens while developing a community approach to creating and delivering a solution. This is why MxD has collaboratively worked with LIFT and NextFlex. All three institutes are able to test and learn in a specific location and then explore how to bring the learning models to other regions. This collaboration also means individual schools that have already adopted IGNITE and FlexFactor will have new courses and curriculum to offer, like digital manufacturing and cybersecurity.

COVID disrupted a lot of the hands-on learning that is necessary for skill development, but it also led to



a huge leap in virtual, distributed learning. MxD is exploring how to use virtual, synchronous, and asynchronous learning to connect their industry, government, and academic members, who are all across the country, with high schools and colleges within their respective regions. The institute is exploring how to provide some resources and tools that make it easier to access these programs. This opportunity could mean an individual young person could engage even if their high school is not participating, and it could offer employers and incumbent workers new training opportunities.

MxD is exploring what kind of platforms and resources are needed to provide increased accessibility to these programs. There are a lot of factors that can either help or hinder engagement. MxD Learn is also exploring academic and nonprofit engagements. Since its launch, MxD has used collaborative research and development projects,

MxD is quick to point out that the current and future success all depends on relationships. Relationships with students, parents, and teachers were often started with visits to the innovation center, which had over 1,000 visitors a month pre-pandemic. MxD Learn is in the process of rethinking outreach. Another set of relationships to build is with high schools interested in hosting IGNITE classes and cohorts. Waukegan became the first high school to participate in large part due to the Career and Technical Education (CTE) director who was very passionate about the opportunity.

He took the chance to work with MxD and ran with it. Expanding to new schools will require finding that leader willing to stand up and make it happen, or will require finding ways to communicate with schools about the opportunities to get teachers and administrators excited. Moving to other regions will also require understanding how curriculum development and adoption occurs, a factor that was made apparent when working through the initial implementation. MxD had worked with industry to validate the curriculum, but when it was presented to the high school, the high school also wanted to know that the curriculum was validated by the community college.

The last set of relationships that will be key to scaling is those involving industry partners. MxD has a very strong partnership with the Siemens Foundation, and with Siemens' cybersecurity office for North America, and they are exploring ways to expand that relationship and with other large industry partners. But there is no "one size fits all" way to work with partners, so it will take time and iteration. Successful partnerships depend on the sector, the company size, and the region.



multifaceted programming, and strategic outreach to build its ecosystem of hundreds of partners from dozens of states, spanning coast to coast. This network forms a strong foundation to leverage relationships with stakeholders committed to driving America's digital manufacturing forward into education and workforce collaborations.

Ashleigh Watson

People and Culture Director

MxD

Ashleigh Watson wanted to be a film historian, making sense of the past for us in the present and future through cinema. After getting a bachelor's degree in history from DePauw University in Greencastle, Indiana, then a masters in history and documentary filmmaking at Syracuse University, she decided that she really wanted to work with people so they could live out their stories as best as they could.

"After I graduated from college, I worked a little bit in the film industry, and then I transitioned over to HR," recalled Watson. "One of the things that's really unique about both industries is that you are always working with people. There's never a dull moment. You have to practice patience."

As a Chicagoan coming back to her hometown after grad school, her experience working in the city's film industry was fun, though it had some less than pleasant moments. "I still love the medium of film and storytelling, but I don't miss being on set and the 12-hour days."

Watson uses the people skills that she learned working on film sets in her current position as MxD's sole HR professional. Similar to on a set, where many relationships need to be managed for the sake of producing a film, Watson is building relationships with all 44 of MxD's full-time employees. She has only been in this position since June 2020, but she is already helping employees grow, even during a pandemic, by focusing on the employee experience.

"It's really important to have a relationship with the employees so they know that I'm a resource, not just for when something bad happens, but for their career development," explained Watson. "We're a small team, but a dynamic and collaborative environment.

Anytime I'm screening for resumes or during interviews, I really hone in on the fact that this is not a typical put your feet up on the desk, answering emails all day type of job. You'll be doing a lot of work."

In general, what troubles Watson about the manufacturing industry is the focus on youth and not enough focus on experienced workers who are new to the industry. If Watson could make a career change from film to HR, then why couldn't any experienced worker go from being a bank teller to working as an assembler? Watson believes that we should listen to students and reach them where they are, regardless of age.

"I think it's important to at least know the motivations of those experienced individuals, and to see if that's something that we can meet," said Watson. "We always look for what 17- to 22-year-olds need, when there could be a 35- or 36-year-old who's really looking to change their career, and are a little bit more focused on what exactly they want out of a career."

Companies may feel that it is too risky to retrain an older worker, and it can be. However, people who still have 25 years of work or less left can be as committed or more than younger employees who are just now finding out what they like, and have 50 years of work ahead of them. This is where understanding people from an HR perspective is valuable, because then you can find the workers in their 30s and 40s suited for manufacturing. How those workers are retrained while paying for a mortgage and a family is part of that risk, but Watson does not see why this cannot be fixed.

"Programs will have to work with academic institutions to sponsor adult students by giving them a stipend," explained Watson. "Companies should be prepared to either front the costs, which may not always be feasible, or be more accepting to work with programs that offer adults or older students as trainees."

Being comfortable sharing bold ideas like that is why Watson was drawn to MxD. It is a fast-paced workplace where ideas are respected, regardless of their origin. That is why diversity matters to MxD — not just racial diversity, but diversity of perspectives, especially in a global economy where manufacturers have competition overseas.

"Diversity is sometimes one of those things that people do when they feel like it. We don't have the luxury to only care about diversity when we can," said Watson. "It affects the bottom line and our ability to recruit the best candidates sometimes. In this position, I want to ensure that we are always at the forefront of any type of antiracism, diversity, and inclusion initiatives."

Paul Mefford

Global M&E Learning and Talent Development Leader

The Dow Chemical Company

Paul Mefford has seen what a company can achieve when it strives to create a diverse workforce. As Dow's Global M&E Learning and Talent Development Leader, he is optimistic about the present, but admits there is still much work to be done.

"There's a lot of people that say the right things, but in this space, it's all about action," cautioned Mefford. "I'm thankful that I get to work for a company that puts so much time and effort into diversity."

Mefford goes beyond finding the right person for the right job. If that was all he did, Dow's success would be limited. Instead, he uses his purpose to guide him rather than his job description. "My purpose is to unleash the greatness of others. And I do that through service, purpose, and inspiration each day."

According to Mefford, companies fail at their diversity initiatives because they are not deliberate and specific about what they want to achieve. "It's about intentionality," said Mefford. "It's really easy to put things on slides and on paper; it's another thing to actually do it. The challenges that I've faced in my role are there were times when I didn't speak up when I know I should have, out of fear of retribution. I think a lot of people are still afraid to speak up. Having necessary and courageous conversations around race is absolutely critical."

At Dow, such conversations are done through "inclusion moments" at the beginning of meetings, where people share interactions they've had where they learned something about other people or themselves. This openness removes the fear that employees have when talking about race, gender, or sexual orientation, and it becomes a learning experience for all in the meeting.

"That's how we've begun to

shift the culture of our company," Mefford explained. "Originally, it felt like we were happy to check the box. And now, action has taken over."

Now that the reflex is towards inclusion, Mefford works to make sure it permeates throughout the company, and not only in certain pockets. When Mefford walks into meetings and notices that everyone looks like him, he feels it's his duty to engage his colleagues in conversations that get them to see the importance of taking diversity seriously.

"We talked about it in terms of a target, but you got to have support at all levels around it," he said. "It's not just about putting female leadership in place, or minority leadership, it's about putting the right people in the right opportunities, and letting them grow and flourish." Support around diverse hires is key to them succeeding in their position, and not feeling they have to be something that they are not. Mefford offers that support by being a vocal advocate for people of color and women in the company. "I'm more vocal with my mentorship, because there's so much untapped potential that exists." Another area where Mefford has shifted Dow's priorities is in recruitment. HBCUs used to be a talent pool that they ignored, but that is no longer the case. Mefford realized that the culture shift within Dow would be solidified by ensuring that the new hires coming in fit the culture they are creating. "We had a bias around only recruiting at the top engineering universities within the United States and even abroad," admitted Mefford. "As we were recruiting from the same universities, we were targeting minorities, but our culture still was not changing. So we began to look at HBCUs by heavily investing our time and resources in STEM programs at HBCUs."

What other companies can learn from Mefford and Dow is that achieving a diverse workforce is a journey with no comfortable shortcuts. They are showing that without the desire of leadership to make that change happen, diversity plans do not work, and neither is waiting for the right moment to act.

"You can never get things 100 percent right, but you've got to constantly work on it. You need to make sure you're meeting the needs of the people where they are, through active listening, embracing them, their background, their heritage, and their culture. Not assimilating them, but allowing their strengths to come to life. We're at the beginning stages of that."

As the culture has shifted, Dow's diverse talent pool is beginning to talk about the company differently. Mefford hears those stories through mentorship and advocacy programs within the company, which is how he knows things are changing in the right direction.

"I'm more and more convinced that even if it's not my generation that gets it right, what I'm instilling in my children is amazing in that they don't see skin color as an impediment, but as a strength," said Mefford. "I'm waiting for the generation that grows up when that bias never comes into play, whether consciously or unconsciously."

Rebekah Kowalski

Vice President, Manpower Manufacturing

ManpowerGroup

According to Rebekah Kowalski, until companies start viewing talent as a renewable source, they will never fill labor shortages. The Vice President of Manpower Manufacturing and Client Workforce Solutions believes that rather than waiting for the right fit or the perfect employee to come along, employers should invest in training existing workers. For 17 years, Kowalski has worked for Manpower in various capacities on the issue she is most passionate about: placing people in the industries they want to join.

"By 2025, we'll be short 2.5 million workers in manufacturing. That's a function of demographics and individuals retiring. If you layer into that the skills required, the gap actually gets to be quite higher," explained Kowalski. What does she say to employers who still want to hold out for the exact match? "The numbers just don't allow for that."

She knows the reason employers treat talent as a scarce resource is because for a long time they were right. For the last few decades, as productivity and efficiency increased, the introduction of new technologies meant that manufacturers needed the right person with the right skills to keep up. Now things have changed so much that manufacturers cannot find people to fill positions. "If you looked back a year and a half ago, the data said there was less than one person available for every open (manufacturing) job that we had in the U.S.," she described. "Even if we took all the unemployed off of the sidelines and put them into these jobs, you would still be short talent. That talent has to be treated as a renewable resource. We can't accept waste in the manufacturing world."

Through the Path Training Program that she started at Manpower, existing employees receive training for a better job, while working in their existing job. The program is expected

to train as many as 200,000 people by 2025. "That's our commitment to helping renew that element for those new jobs that are coming up. If we don't do it, it's no different than any other resource that's in short supply in the world," she warned. "The social and economic implications are pretty mind blowing. So this is one thing we have to get right."

Kowalski also believes that employers should prioritize looking for employees who are curious, rather than the perfect match. She has found that employees who are willing to ask questions tend to be the ones who take initiative, and they also are the ones eager to learn. Manpower created their own online test to measure the learnability of recruits. She encourages manufacturers to market a career path, a journey, and a mission to prospective employees, and not only a job. The hiring process should bring someone into a company's story so that their initiative becomes part of the company's story.

"If you're not telling a clear story, and you're not providing space for people to provide their recommendations and take initiative, you're missing it," Kowalski explained. "This is a leader-led behavior. Everyone from the first line supervisors on up should be inviting people to participate on what it is you're building together. That's of critical importance."

Increasing diversity in manufacturing companies fails when placing people of color in companies is not done in tandem with ensuring that there is a support system in place for those new employees to thrive. If the culture is not one of inclusion, those new employees will get frustrated and leave. To reduce the likelihood of such outcomes, Manpower does internal surveys on every company they recruit for to determine if they are suitable workplaces in which to send employees of color. "Our market managers are the ones that have the responsibility to go in and validate that a workplace is safe for an individual before they make a placement," explained Kowalski.

When she looks at the current state of the workplace during the pandemic, she has noticed a change in public opinion that could benefit both employees and employers. She refers to a January 2021 Wall Street Journal article that talked about public trust shifting away from media and government during the pandemic and to the employer.

"The employer stepped in on COVID, stepped in on social justice, and stepped in on wages, because there wasn't clear guidance coming from anywhere else, and they still had to run their business," she said. "So this is actually a good news story for employers. You (employers) have this trust for some period of time. One of the best things you can do with it is demonstrate how you will help people walk up to that next set of skills that they'll need because you're bringing new technology into your manufacturing plant."

Sean Manzanares

Senior Manager Business Strategy & Marketing

Autodesk

Sean Manzanares has worked for over five years at Autodesk helping them find the best talent on the planet. As Senior Manager of Business Strategy and Marketing for North America, he currently manages a team that includes members from North America, and recently managed a diverse team including teammates from Japan, South Korea, and China. His role, which is based in the U.S., also had him travelling to Asia three to four times per year until a few months into the pandemic.

His cultural background has helped make hiring diverse candidates a normal occurrence for Autodesk.

"As a person of color myself, I wanted to make sure that I had an inclusive look at who the candidates are, and are they able to bring their unique perspective to Autodesk," said Manzanares. "I was fortunate to look into the different cultures and the different types of people that we have throughout the world at Autodesk." His global perspective comes from working in sales at various companies for over 25 years.

"Earlier on in my career, I had an opportunity to take an international position in Singapore where I was a technical director of 13 countries in the Asia Pacific region. At the time, I came from America, and you have your North American blinders on a lot of different things," admitted Manzanares. "That's when I got my first grasp of diversity. I really was dropped into this situation where I traveled the entire Asia Pacific region. I did that for about two and a half years, and I loved it."

Years later when Manzanares arrived at Autodesk, they looked at his Asia-Pacific experience and decided that

it fit what they needed. What was only a North American role expanded to include Asia-Pacific. Of course, Manzanares could not resist.

Autodesk has over 9,000 employees worldwide, with offices in Boston, Portland, Barcelona, Montreal, Dublin, Singapore, and many other cities. It is a company that is experiencing the fruits of inclusion, and for two years has been training hiring managers about cultural diversity. Manzanares felt right at home.

Autodesk got involved with MxD when Manzanares looked at a map of the United States and noticed a void in the company's global community. "We have a big flagship headquarters in San Francisco, we have one in Boston, but we didn't have anything in the middle of the country," he recalled. "The Midwest is rich with manufacturing companies and talent. So as a member of the industry strategy team, part of my job is to work with partners and associations, and that's how I researched MxD." Now in their fourth year as an industry partner, Autodesk opened a 1,000-square-foot Generative Design Field Lab at MxD so that customers can see what their software can create.

In a strange way, Manzanares being the one to lead Autodesk to partner with MxD is a poetic coincidence. He grew up in Broomfield, Colorado, the proud son of a blue-collar dad who prioritized the trades route over a traditional path to college.

"In high school, as a sophomore, I was into drafting on a board using T-squares, triangles and circle templates on vellum," he recalled. "In 11th grade, I opted to go to Boulder TEC (Boulder Technical Education Center). So, I would spend the mornings in classes at high school, and then I would take a 30-minute bus ride to the TEC Center to spend the afternoon learning design and drafting skills and eventually I was introduced to CAD (computer-aided design) in 1983."

The skills that he learned at Boulder TEC happened at just the right time in the evolution of CAD. The State of Colorado gave the technical school a grant that allowed them to install one of the first mainframe Computervision CADDS4 systems in the U.S. He was learning a skill that was about to grow in demand for numerous industries that were relying on hand-drawings. "In 1984, I literally graduated on a Saturday and on Monday I started working in industry, making \$12 an hour doing CAD work at Ball Aerospace," he said.

A portion of the credits he earned at Boulder TEC were transferable to Front Range Community College where he earned an associate degree in Mechanical Design Drafting while he was working as a CAD designer. In 1992, he made the jump over from the industries that use CAD software, to the companies making the software. That is where he has been ever since.

"People always ask me; do you regret not having a bachelor's degree? And I reply, yes, I do," said Manzanares. "However, after 25-plus years working in the software industry, a four-year degree may not have helped me sell software or taught me how to build relationships. Building a career path launched by a two-year trade school has helped me build a once-in-alifetime career, allowing me to work at and with some of the world's best companies."

Donna Ruginski

Executive Director Cybersecurity Initiatives

University of Maryland Baltimore County

Standing in the way between cybercriminals and a rapidly digitizing manufacturing industry is Donna Ruginski, the Executive Director for Cybersecurity Initiatives at the University of Maryland, Baltimore County (UMBC). She's involved with both to help the manufacturing industry find the right cybersecurity talent, and to sound the alarm about dangers that lurk over the horizon, or even within company walls.

She and UMBC colleagues Dr. Nilanjan Banergee, Professor of computer science and electrical engineering, and Dr. Keith Bowman, Dean of the College of Engineering and Information Technology, partnered with MxD because they see a labor shortage nationally and internationally in the cybersecurity workforce, especially in manufacturing. "I believe that this program for improving cybersecurity in operational manufacturing technology (CyMOT) will create a learning platform that can be done synchronously or asynchronously for professionals in manufacturing," Ruginski said. "Existing employees may need to take on new responsibilities, or they may want to move into a new role within their company that has a cybersecurity focus."

She believes that in the near future, federal compliance requirements will make every manufacturer in the U.S. take cyber attacks seriously, regardless of size. According to Ruginski, small- to medium-sized manufacturers are easy targets for cybercriminals.

"Small- and medium-sized manufacturers don't have departments focused on cybersecurity like large manufacturers do," she explained. "But these smaller entities still are dealing with the same challenges and have to be able to address them in order to stay competitive."

She hopes that manufacturers are concerned enough by the

frequent stories about hacking in the news to take action. If the U.S. government can be hacked, then a little-known manufacturer in the Midwest can also be hacked. Companies cannot afford to think that it cannot happen to them. "This brings to bear research that's required to enable manufacturers to operate even under attack, so that they don't have to shut down operations completely, but can continue to operate in some form."

CyMOT's unique cybersecurity for manufacturing training is a pilot program at MxD, and is funded by the Department of Defense. The plan is to use the feedback from manufacturers in this first phase to refine the course. "Our goal is to create a full, comprehensive curriculum that mirrors the MxD hiring guide," she said. "What's unique about this partnership is we have engaged an academic institution, the University of Maryland, Baltimore County, a leader in cybersecurity education; we also have UMBC Training Centers, who are experts in workforce development programs in cybersecurity; and we have MxD, who are experts in manufacturing and cybersecurity." Of all the cyber threats that worry Ruginski, none is more troubling than ransomware. She fears that it is only a matter of time before a large manufacturer gets hacked through no fault of their own. Threats happen quickly, using stealth tactics, and are evolving. Without the new technology, the countermeasures, and the application of best practices, manufacturers are vulnerable.

"The ransomware threat that we face, because we're inundated with emails daily, can so easily lead to a bad event happening," warned Ruginski. "You have to be really on your toes about what you're looking at, what you're opening, and not becoming a victim, if you haven't become one already."

ABOUT THE ORGANIZERS



The Urban Manufacturing Alliance (UMA) advances place-based strategies

that create more equitable communities by building community wealth through employment, ownership, and entrepreneurship through manufacturing. We connect and convene hundreds of partners across more than 200 cities, helping them learn from one another, and act as a collaborative ecosystem builder that supports local manufacturing communities and leads a national movement. UMA then partners with the practitioners in those ecosystems to create local, regional, and national research. By documenting the voices, trends, and data emerging from manufacturing communities, we provide practitioners, policymakers, and leaders with the references they need to develop new, equitable models of economic development. From that research, we tell stories, taking the trends we observe and crafting them into rich narratives that capture how our members spark change.



The Century Foundation (TCF) is a progressive, independent think tank that conducts research, develops solutions, and drives policy change

to make people's lives better. We pursue economic, racial, and gender equity in education, health care, and work. In this pivotal moment in America, we stand with a strong and firm commitment to developing policy solutions that will help this country truly realize racial justice. Founded in 1919 by the progressive business leader Edward Filene, TCF is one of the oldest public policy research institutes in the country. TCF pursues its mission by conducting timely, nonpartisan research and policy analysis that informs citizens, guides policymakers, and reshapes what government does for the better. We are distinguished by our commitment to a thoughtful and targeted strategy to bring our work to those who can contribute to making practical affirmative change. Our experts come from academia, journalism, and public service-all with a shared commitment to advancing progressive ideas that benefit the public good.

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APPENDICES

For further learning, please consider:

Industry & Inclusion Opening Commentary

→ Racial Equity and Advancing the Future of Manufacturing

Industry & Inclusion Project Webinar Takeaways & Event Recordings:

- → Pursuing Equity, Inclusion, and Industrial Rebirth in the Age of Covid 19
- → Advancing Equity and Inclusion in Manufacturing Credentialing and Technology
- Greating the Future Manufacturing Workforce by Enhancing Diversity and Addressing the Skills Shortage
- Partnership and Relationship Innovation To Build Race-Conscious Advanced Manufacturing Training Programs

