

Global Network of Advanced Manufacturing Hubs: Annual Report 2020

MARCH 2021



Cover: Getty Images/Hallojolie

Inside: Getty Images/JackF; Getty Images/Traimak_Ivan; Getty Images/Liuhsihsiang; Getty Images/Baranozdemir; Getty Images/AleksandarGeorgiev; Getty Images/Blue Planet Studio; Getty Images/JGalone; Getty Images/Xavierarnau; Getty Images/Ventdusud; Getty Images/Slobodan Miljevic; Getty Images/Zorazhuang; Getty Images/Steven_Kriemadis; Getty Images/Lumigraphique; Getty Images/Planet Unicorn; Getty Images/Aaron Hawkins; Getty Images/DavidBGray; Getty Images/Danefromspain; Getty Images/f11photo; Getty Images/Georgeclerk; Getty Images/Jzabloskijzabloski; Getty Images/wsfulan; Getty Images/Ewg3D; Getty Images/adz nano; Getty Images/Robert Ruidl; Getty Images/Andres; Getty Images/J. Park; Getty Images/BIM

Contents

3	Executive summary
4	1 Introduction
5	2 Meet the Global Network
12	3 Regional highlights
17	4 Collaboration between Advanced Manufacturing Hubs
18	5 Next steps for 2021
19	Contributors
20	Endnotes

© 2021 World Economic Forum. All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, including photocopying and recording, or by any information storage and retrieval system.

Executive summary

Increasing geopolitical volatility, resource scarcity and the rising cost of inputs, coupled with industry transformations triggered by the Fourth Industrial Revolution, create unpredictable challenges for manufacturing. These challenges are compounded by regional complexities related to workforce skills, government policies, infrastructure and environmental concerns.

By working together, new and existing players can enable their regional ecosystems to innovate to remain competitive – something no company, government organization or entity can do alone.

The Global Network of Advanced Manufacturing Hubs engages manufacturing ecosystems at the local, state/province or national level to allow regions to share their best practices and case examples, at the same time learning how other regions are addressing similar challenges. Launched in 2019, the Global Network of Advanced Manufacturing Hubs (AMHUBs) now includes 12 AMHUBs representing diverse manufacturing ecosystems around the world:

- Basque Country, Spain
- Denmark
- Istanbul, Turkey
- Lombardy, Italy
- Michigan, USA
- New England, USA
- Qatar
- Queensland, Australia

- São Paulo, Brazil
- Saudi Arabia
- Tamil Nadu, India
- Ulsan, South Korea

Each AMHUB has identified specific priority areas, including upskilling the workforce, scaling sustainability in manufacturing and accelerating the adoption of technology for small and medium-sized enterprises (SMEs), that reflect the critical needs of their respective regions. From these priorities, AMHUB communities are driving local initiatives and sharing the methodology and results with the Global Network to support one another's transformation journeys.

In addition to regionally focused efforts, 2020 saw the initiation of cross-AMHUB collaborations. Given the impact of the COVID-19 pandemic, these efforts primarily concentrated on sharing lessons from responses to the pandemic to help inform future efforts and mitigate further negative effects.

Finally, looking forward to 2021, the Global Network identified three core areas to shape cross-AMHUB collaborations during the year:

- Accelerating technology adoption and skills development within SMEs
- Unlocking circular economy opportunities within and across AMHUB regions
- Mitigating the impact of future shocks to global manufacturing systems.

Introduction

Global megatrends, including shifting geopolitical and trade alignments, climate change and the emergence of disruptive technologies, are reshaping manufacturing and supply chain networks. While these trends affect every corner of the planet, their impacts are regionally unique and, as such, the responses to them must be equally distinctive by region. This presents an enormous opportunity for regions to learn from one another *if* they can be more connected.

Increasing this regional connectivity of manufacturing and production ecosystems is exactly what the Global Network of Advanced Manufacturing Hubs, part of the World Economic Forum Platform for Shaping the Future of Advanced Manufacturing and Production, aims to achieve. By building collaboration pathways between regional Advanced Manufacturing Hubs (AMHUBs) throughout the world, the Global Network aims to accelerate the Fourth Industrial Revolution's positive impact on manufacturing and production ecosystems, while allowing regional stakeholders to have increased access to best practices and case examples to address the current mounting challenges facing the industry.

The Global Network engages regional production ecosystems – including stakeholders from the public and private sectors, academia and civil society – at the **local, state/province or national level** to:

- **Support** the development and/or scaling of local efforts aimed at preparing industry for the future of manufacturing and production
- **Highlight and amplify** regional success stories at the global level through the World Economic Forum Platform for Shaping the Future of Advanced Manufacturing and Production
- **Disseminate and distil** global lessons learned from the Forum's initiatives – including other AMHUBs – to regional hubs so they can learn from a global pool of experience and identify tangible action areas
- **Connect** AMHUBs directly with one another to incubate new cross-AMHUB partnerships and engagement opportunities.

The 2020 Annual Report provides an overview of the Global Network, highlights specific initiatives taking place within these regional ecosystems, and provides insights into the Global Network's collaborative efforts and outputs in 2020. It also outlines ongoing, planned and future cross-collaborative opportunities to help drive global advanced manufacturing innovation.

2

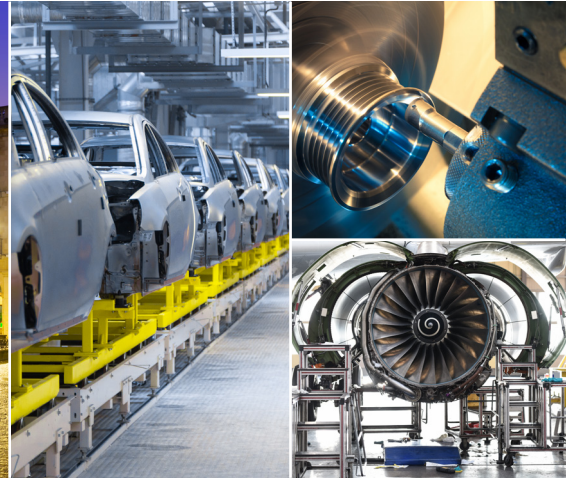
Meet the Global Network

Basque Country, Spain | Denmark | Istanbul, Turkey | Lombardy, Italy | Michigan, USA | New England, USA | Qatar | Queensland, Australia | São Paulo, Brazil | Saudi Arabia | Tamil Nadu, India | Ulsan, South Korea



Note: The regional data presented in this publication is self-reported by the host entity of each region's Advanced Manufacturing Hub.

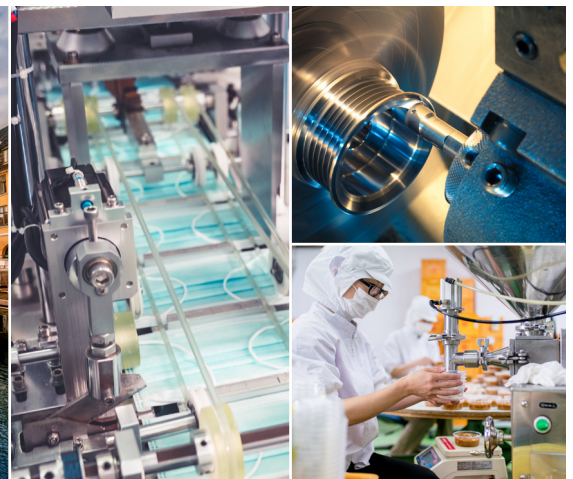
Basque Country, Spain



	Hub Host Entity: Innovalia Association
	Population: 2.2 million
	Top three manufacturing industries: Automotive, Aeronautics, Machine Tooling
	Percentage of workforce employed in manufacturing: 20%
	Manufacturing as percentage of total gross domestic product (GDP): 16%

The Basque Country region of Spain has been strongly manufacturing-based since the beginning of the 20th century. The region's industry has consistently proved that it can adapt to technological changes and is well prepared to face the challenges of the Fourth Industrial Revolution. Hand-in-hand with the Basque Industry 4.0 strategy, the region's manufacturing industry has made progress in process automation and optimization and has incorporated flexible solutions, robotization, additive manufacturing and connectivity into production.

Denmark



	Hub Host Entity: Dansk AM Hub
	Population: 5.8 million
	Top three manufacturing industries: Machinery, Food & Beverage, Medical
	Percentage of workforce employed in manufacturing: 13%
	Manufacturing as percentage of total GDP: 15%

Led by the medical sector, the food and beverage industry and the production of heavy machinery such as windmills, the manufacturing sector in Denmark is varied and produces many goods for both export and domestic consumption. As a nation, Denmark has prioritized sustainable manufacturing practices; the Denmark AMHUB acts as a coordinating body to bring public- and private-sector stakeholders together to help companies take the first steps towards a greener future.

Istanbul, Turkey



-  **Hub Host Entity:** Turkish Employers' Association of Metal Industries (MESS)
-  **Population:** 15.5 million
-  **Top three manufacturing industries:** Automotive, Food & Beverage, Metal & Machinery
-  **Percentage of workforce employed in manufacturing:** 16.3%
-  **Manufacturing as percentage of total GDP:** 18.3%

Driven by the significant influence of the automotive sector, the number of research and development (R&D) centres in the region has risen sharply (+42%) over the last five years due to electric vehicle innovation. As a result, companies are preparing their workforces for new occupations in deep learning, battery technology and infrastructure. A key focus for the AMHUB is MEXT, the MESS technology centre, which provides services that businesses need to undertake their digital transformation journeys.

Lombardy, Italy








-  **Hub Host Entity:** Associazione Fabbrica Intelligente Lombardia (AFIL)
-  **Population:** 10 million
-  **Top three manufacturing industries:** Machinery & Equipment, Fabricated Metals, Chemicals & Chemical Products
-  **Percentage of workforce employed in manufacturing:** 21.5%
-  **Manufacturing as percentage of total GDP:** Manufacturing share of regional added value is 35%

Lombardy, the most populated and economically prosperous region in Italy, boasts a diverse economy with a strong industrial sector. The leading region in the Italian economy as measured by total production and exports, Lombardy has strong technological and research competencies in machinery and manufacturing systems development and management. The Lombardy AMHUB prioritized circular manufacturing, efficient and zero-defect manufacturing as well as high added-value manufacturing for the production of personalized/customized products. In addition, the AFIL focuses on resilient, adaptive and robust manufacturing in the face of disruption, and on creating inclusive and social-oriented manufacturing environments with people at the centre.

Michigan, USA



-  **Hub Host Entity:** Automation Alley
-  **Population:** 10 million
-  **Top three manufacturing industries:**
Automotive, Aerospace/Defence, Agriculture
-  **Percentage of workforce employed in manufacturing:** 14%
-  **Manufacturing as percentage of total GDP:** 19%

Michigan has been known for its manufacturing prowess and productivity for more than 120 years. It has the workforce, resources and high-tech innovative ecosystem to help forward-thinking companies align with the Fourth Industrial Revolution. Michigan is the national leader for employment in industries related to this revolution and provides the resources and training employers need. As of 2019, more than 966,000 workers were employed in the manufacturing industry throughout the state. The Michigan AMHUB organizes regular working groups focused on technology, workforce, sustainability and regional ecosystem to connect leaders and innovators, to create a space and a platform for the open exchange of ideas and best practices, and to enable real change.

New England, USA








-  **Hub Host Entities:** Stanley Black & Decker; Tulip Interfaces
-  **Population:** 15 million
-  **Top three manufacturing industries:**
Computers, Electronics & Communications Equipment; Defence & Aerospace; Pharmaceuticals & Biotechnology
-  **Percentage of workforce employed in manufacturing:** 8%
-  **Manufacturing as percentage of total GDP:** 9%

New England, a region of six states in the north-east corner of the United States, has a rich history as home to a thriving manufacturing industry that has continued to prosper through the development of electronics, pharmaceuticals, and defence and aerospace. In 2020, the New England AMHUB began to lay the groundwork for a network to transform the region's manufacturing through education and collaboration.

Qatar




-  **Hub Host Entity:** Qatar Development Bank (QDB)
-  **Population:** 2.7 million¹
-  **Top three manufacturing industries:** Liquefied Natural Gas, Crude Oil Production & Refining, Chemicals & Petrochemicals
-  **Percentage of workforce employed in manufacturing:** 7.5%
-  **Manufacturing as percentage of total GDP:** 7.8%

The Qatar AMHUB, established at the end of 2020, is currently evaluating priority areas that will drive its work during 2021.

Queensland, Australia





-  **Hub Host Entity:** Government of Queensland, Department of Regional Development, Manufacturing and Water
-  **Population:** 5 million
-  **Top three manufacturing industries:** Food Production, Metal Products, Machinery & Equipment
-  **Percentage of workforce employed in manufacturing:** 7%
-  **Manufacturing as percentage of total GDP:** 7%


Queensland's manufacturing industry has consistently contributed more than AUD 20 billion annually to the state economy over the last decade and employs approximately 166,500 people, making manufacturing Queensland's eighth-largest industry and fifth-largest full-time employing industry. About one in four manufacturing employees in Queensland are women. During 2019-2020, Queensland's manufacturing industry exports totalled AUD 17.7 billion, with the food product and metal product manufacturing subsectors collectively accounting for 74% of total exports. The manufacturing industry also accounts for 23% of Queensland's total overseas exports.


São Paulo, Brazil




-  **Hub Host Entity:** Brazilian Agency for Industrial Development (ABDI)

-  **Population:** 12 million

-  **Top three manufacturing industries:** Food, Mining, Oil & Gas

-  **Percentage of workforce employed in manufacturing:** 20%

-  **Manufacturing as percentage of total GDP:** 20%

São Paulo is one of the foremost industrial centres in Latin America. The São Paulo AMHUB is helping to lead technology adoption among the nation's several thousand manufacturing establishments in São Paulo, a city that provides employment to more than 10% of the country's population. While digital transformation is a significant challenge for businesses in Brazil, the AMHUB is moving forward with programmes focused on SMEs and the regulation of new Fourth Industrial Revolution technologies like 5G to accelerate their adoption process.

Saudi Arabia



-  **Hub Host Entity:** Saudi Industrial Development Fund (SIDF)

-  **Population:** 34.2 million

-  **Top three manufacturing industries:** Chemicals & Chemical Products, Refined Petroleum Products, Food & Beverage

-  **Percentage of workforce employed in manufacturing:** 9.8%

-  **Manufacturing as percentage of total GDP:** 11.9%

The Saudi Arabia AMHUB, established at the end of 2020, is currently evaluating priority areas that will drive its work during 2021.

Tamil Nadu, India



Hub Host Entity: Guidance Tamil Nadu



Population: 67 million



Top three manufacturing industries:
Automotive, Textiles, Aerospace & Defence



Percentage of workforce employed in manufacturing: 48%



Manufacturing as percentage of total GDP: 25%

Tamil Nadu is the most urbanized state in India and one of the most industrialized, with its manufacturing sector accounting for at least one-fourth of the state's GDP. Tamil Nadu is the largest textile hub of India, and its capital city Chennai, nicknamed "The Detroit of Asia", is home to several auto component industries. In addition, the aerospace and defence industry is one of the fastest-growing sectors in the state, generating a huge amount of export revenue. The Tamil Nadu AMHUB is focused on encouraging and growing technology, innovation, industrial strategies and Industry 4.0 workforce initiatives.

Ulsan, South Korea



Hub Host Entity: Ulsan National Institute of Science and Technology



Population: 1.15 million (7.9 million including the Busan and Kyungnam areas)



Top three manufacturing industries:
Petroleum & Petrochemical, Automotive, Shipbuilding



Percentage of workforce employed in manufacturing: 33.4%



Manufacturing as percentage of total GDP: 62%

The metropolitan city of Ulsan is known as the industrial capital of South Korea and is a hub for petrochemical and automotive production as well as shipbuilding. The Ulsan AMHUB, based in the city, aims to help spur the region's manufacturing ecosystem that has been hard hit by COVID-19. In 2020, the AMHUB developed artificial intelligence (AI) standard data sets to enhance manufacturing innovation, and also focused on a carbon-neutral initiative and digital new deal for autonomous vehicles and smart ships.

Regional highlights

Basque Country, Spain

The Basque Country AMHUB, led by the Innovalia Association, has aligned the region's priority areas with the new Science, Technology and Innovation Plan and the Basque Industry 4.0 strategy, which aims to place the Basque Country among the most advanced European regions in innovation, with a high standard of living and quality of employment. The region's three strategic priorities are smart industry, clean energy and personalized health. Complementing Spain's strategic manufacturing priorities are four territories of opportunity defined by the government: healthy eating, eco-innovation, sustainable cities and creativity.

The AMHUB's mission is to contribute to the development of the territorial opportunity in eco-innovation, promoting R&D of new solutions and technologies. This will help companies reduce their environmental impact and their carbon footprint with a focus on smart digital industries and advanced production processes. The AMHUB's activities will benefit from the planned regional investment of €20 billion over 10 years, with the commitment of the Basque government to increase its annual budget by 6% to support R&D. The activities are designed to contribute to Euskadi 2030, a research

and innovation smart specialization strategy, and to align to three main pillars: scientific excellence, industrial technological leadership, and open innovation and talent.

A highlight of the Basque Country AMHUB's smart manufacturing activities in 2020 included a data sovereignty awareness-raising programme to unlock the value of manufacturing through data sharing. Over 2020, a series of webinars were hosted to raise awareness about the role of data sovereignty and the single data market. In addition, the AMHUB participated in Lighthouse smart factory trials for digital transformation of Basque industry and an International Master Programme for Automotive Workforce Transition to Future Zero Defect Manufacturing Working Environments. The World Manufacturing Forum has selected this programme as one of the 10 global best practices in skills development for the future workforce.

The AMHUB is planning a new set of activities for 2021, such as establishing an interest group on next-generation factories for manufacturing repurposing and developing a data-driven industrial innovation model for manufacturing SMEs.

Denmark

The Denmark AMHUB, led by Dansk AM Hub, aims to inspire Danish companies and help them understand the value of additive manufacturing and 3D printing technology through conferences, programmes and a national annual report that outlines the opportunities and challenges of additive manufacturing adoption.

Through programmes like AM Sustain and 3DP Try Out, the organization is engaging the regional

ecosystem and encouraging new business models through the use of additive manufacturing. AM Sustain, implemented in cooperation with the consultancy Deloitte, is a technology-driven innovation programme seeking to increase the adoption of 3D printing at Danish SMEs, strengthen supply chains, create new sustainable products with high commercial value that can potentially drive growth, increase competitiveness and reduce costs while becoming

more sustainable. 3DP Try Out allows Danish companies to borrow and test a 3D printer for one month to help them uncover opportunities and create

clarification prior to acquiring and using a 3D printer within their own businesses, while simultaneously showcasing the possibilities of 3D printing technology.

Istanbul, Turkey

The Istanbul AMHUB is well aligned to support the country's manufacturing and technology vision for 2023, which consists of five components: high-tech innovation, digital transformation, entrepreneurship, human capital and infrastructure. More specifically, the 2023 manufacturing and technology strategy focuses on AI and 5G advanced connection technologies, as well as developing R&D ecosystems and technology suppliers, increasing technical talent and investing in new infrastructures in terms of cloud systems, blockchain, cybersecurity and data analytics.

MESS, which operates the Istanbul AMHUB, also leads the MEXT technology centre, providing end-to-end services for reskilling and upskilling the region's manufacturing workforce. The

organization has designed a comprehensive digital transformation education curriculum that will address the needs of executives, mid-level managers, engineers and operators, with 50,000 workers expected to benefit from these programmes each year. MEXT provides digital maturity assessment services in partnership with Fraunhofer, the largest applied development institute in Europe, and through the Smart Industry Readiness Index, developed by the Singapore Economic Development Board together with SAP, McKinsey & Company, Siemens and TÜV SÜD. In addition, the MEXT Digital Factory consists of two production lines, having more than 100 production use cases showing digital transformation.

Lombardy, Italy

The Lombardy AMHUB, led by AFIL, leverages strategic collaborations with national and European Industry 4.0 initiatives and addresses priorities through AFIL Strategic Communities. The communities, comprised of private-sector companies, universities, research centres and industrial associations, unite on common priorities and specific challenges to increase the competitiveness as well as the internationalization of the involved stakeholders. Current communities focus on the circular economy, AI, additive manufacturing, and secure and sustainable food manufacturing.

The Strategic Communities' main activities include training activity to raise awareness of the above topics through workshops, events and matchmaking; supporting the creation of research and innovation roadmaps; promoting the development of innovation projects; and enhancing access to innovation and testing infrastructures. The communities achieved a fundamental 2020 goal by creating project opportunities at both regional and European levels, finally conceiving and developing nine funded projects overall.

As one of the advanced manufacturing regions most affected by the COVID-19 pandemic, Lombardy's manufacturing ecosystem spent much of 2020 responding to this massive

disruption. In the face of this challenge, the region's manufacturing sectors simultaneously drove innovative solutions and multidisciplinary competences and creativity, thanks in large part to Lombardy's well-established research and innovation capability, coupled with a strong entrepreneurial vocation and the flexibility of companies (many of them SMEs).

Several initiatives were born of the need to respond to the pandemic. These included Mechanical Ventilator Milano, a low-cost, advanced, efficient and safe mechanical ventilator, based on an open-access project that can be easily produced in any part of the world with local materials and components. An R&D group, a collaboration of Lombardy's universities with research centres, designed and created the ventilator, which obtained fast approval from the U.S. Food and Drug Administration and is now being purchased by several national governments, including Canada.

Looking ahead, the activities and next steps identified for the Lombardy AMHUB will mainly focus on empowering the Strategic Communities on the identified priority areas and strengthening the relationships and connections with the other AMHUBs. This will help to better support and understand regional best practices and to encourage opportunities for international collaboration.

Michigan, USA

Michigan is building on its rich manufacturing heritage and technological know-how to develop the innovative, high-tech products of the future. As automation, robotics and additive manufacturing become increasingly powerful, the state is actively helping companies make the connections needed to integrate these technologies into their manufacturing processes. In fact, the Michigan Strategic Fund has approved a statewide effort to ensure 50% of Michigan manufacturers – or 6,200 businesses – are prepared to adopt Industry 4.0 technologies at some level by 2025. The state is working with Automation Alley, the operator of the Michigan AMHUB, to achieve these goals.

In the fall of 2020, the AMHUB's Technology Working Group completed a Roadmap for Home-Based Manufacturing to help manufacturers navigate the new and uncharted territory of remote manufacturing. With the COVID-19 pandemic closing the American economy, many industries have begun implementing work-from-home policies. The manufacturing industry, however, faces many fundamental hurdles that make it difficult to follow suit. The roadmap outlines steps manufacturers can take and important items for consideration for home-based manufacturing to get people back to work safely and smartly. By promoting manufacturing at home, the Michigan AMHUB aims to connect more industries and people with Industry 4.0 technologies that will help American companies and communities recover and grow.

In addition, Automation Alley recently received \$12 million in grant funding to create Project DIAMOnD, which aims to jumpstart digital transformation for the region by creating the nation's largest network of blockchain-enabled 3D printers. Project DIAMOnD, which stands for distributed, independent, agile, manufacturing on-demand, will connect 300 manufacturers on the DIAMOnD network and will accelerate digital transformation, improve the region's personal protective equipment (PPE) manufacturing response, and strengthen supply chains. The project will help the region produce PPE when needed while simultaneously ensuring the region's manufacturers are equipped with the digital capabilities necessary to be Industry 4.0-ready. Because Project DIAMOnD certifies participating businesses as "essential", the opportunity could mean the difference between growing a business and going out of business.

The significance of building the Project DIAMOnD network of 3D printers on blockchain technology cannot be overemphasized. The sheer number of printers, connected through optimal security technology, puts Michigan on the world stage and democratizes Industry 4.0 application and accessibility for even the smallest manufacturers.

The next steps for 2021 include developing a 2021 agenda and objectives for the Michigan AMHUB's working groups on technology, the workforce, sustainability and the regional ecosystem, as well as identifying international cross-collaboration opportunities with the other AMHUBs.

New England, USA

The New England AMHUB, led by a private-sector collaboration between Stanley Black & Decker and Tulip Interfaces, aims to tackle a member-driven agenda and will include representatives from the largest and most advanced manufacturing entities in the area. It will focus particularly on the skills needs of the regional workforce and accelerating technology adoption for regional manufacturers.

In 2020, the AMHUB focused on engaging its regional ecosystem to support the skills development of the regional workforce. The first such initiative was the MFG.works platform, an online community for manufacturers to connect with each other to drive development, lessons learned, best practices and networking. In addition, Stanley Black & Decker,

co-lead of the AMHUB, collaborated with its non-profit partner, the Business-Higher Education Forum (BHEF), and a network of stakeholders from academia and the public and private sectors to take major strides in supporting the workforce in the State of Connecticut in unlocking new digital careers through the Connecticut Digital Credential Ecosystem Initiative.

The New England AMHUB will look to build on these initiatives in 2021, beginning with virtual engagements for the regional stakeholders, the establishment of working groups on the key regional priorities, and a focus on bringing more SMEs into the ecosystem to accelerate their development and digital transformation.

Qatar

The Qatar AMHUB, hosted by the QDB, officially joined the Global Network of Advanced Manufacturing Hubs at the end of 2020. The QDB's vision is "to develop and empower Qatari entrepreneurs and innovators to contribute to the diversification of the Qatari economy, through successful small and

medium enterprises that are able to compete in global markets".² With this context in mind, the QDB is engaging its manufacturing ecosystem to identify priority action areas, bottlenecks and opportunities – focusing on engaging and supporting SMEs – that will drive the AMHUB's work during 2021.

Queensland, Australia

The Government of Queensland's policy priorities for growing the state's manufacturing sector are detailed in [Queensland Advanced Manufacturing 10-Year Roadmap and Action Plan – powering the Queensland economy](#). The roadmap is focused on increasing the adoption of leading-edge design, innovation, technologies, processes and practices; driving the ongoing development of a highly skilled workforce; showcasing the opportunities and achievements of Queensland's advanced manufacturing industry; and supporting regional manufacturing and manufacturing growth sectors across Queensland.

As the host of the Queensland AMHUB, the Department of Regional Development, Manufacturing and Water is delivering a

statewide programme to encourage and support Queensland manufacturers to progress towards advanced manufacturing. Some of the initiatives include Made in Queensland, which helps SMEs adopt new technologies and is expected to create more than 1,100 jobs over five years and generate more than AUD 100 million in private-sector investment; the Advanced Robotics for Manufacturing Hub, focused on accelerating industry's digital transformation; regional manufacturing hubs to support the growth of regional manufacturers and provide businesses with expert advice; and workshops and seminars to encourage and support industry's transition towards advanced manufacturing. These include Futuremap, Introduction to Industry 4.0 and Industry 4.0 masterclasses.

São Paulo, Brazil

ABDI has created a programme of user case studies to demonstrate and validate Fourth Industrial Revolution technologies to help manufacturers better understand the benefits of digital technologies. Through this programme, the São Paulo AMHUB has partnered with enterprises, innovation institutes and universities, and has developed Industry 4.0 training and workshops for workers and executives.

In addition, the AMHUB is developing regulation sandboxes to test 5G applications in agriculture, manufacturing and within cities. To carry this

out, the organization has formed a partnership between ABDI and the Brazilian National Agency for Telecommunications Regulation to align the studies' results with regulation design. In 2021, ABDI hopes to expand the results of the testbeds programme for more companies; contribute to the regulation and public policy debate of new technologies, such as 5G and AI; and develop models and frameworks of technology adoption in the health and agriculture sectors.

Saudi Arabia

The Saudi Arabia AMHUB, hosted by the SIDF, officially joined the Global Network of Advanced Manufacturing Hubs at the end of 2020. The SIDF aims to "blaze a path to success for the industrial sector in Saudi Arabia ... [by] promoting industrial investment opportunities, strengthening the local

industry, and enhancing its performance".³ With this context in mind, the SIDF is engaging its manufacturing ecosystem to identify priority action areas, bottlenecks and opportunities that will drive the AMHUB's work in 2021.

Tamil Nadu, India

Guidance Tamil Nadu, host of the Tamil Nadu AMHUB, is focused on encouraging and growing technology and innovation, industrial strategies and Industry 4.0 workforce initiatives. To this end, the Government of Tamil Nadu just released the *Tamil Nadu Industrial Policy 2021* strategy document. In addition, Guidance Tamil Nadu will work to promote Industry 4.0 technologies, organize learning journeys and factory visits (real and virtual), launch alliances/partnerships on new technologies in manufacturing, showcase Industry 4.0 case studies addressing regional opportunities and challenges brought by digital transformation, and initiate pilot projects. Key elements of the new industrial policy include highlighting local and global roadmaps and organizational approaches to adopting and scaling technologies, collaborating with business and government bodies that maximize the potential of industrial development strategies, and sharing examples of successful policies supporting SMEs' growth, all while leveraging the Global Network of Advanced Manufacturing Hubs.

Workforce priorities will involve understanding models globally for creating Industry 4.0

entrepreneurs, understanding the disruptions caused by Industry 4.0, undertaking initiatives to reskill and upskill the workforce, identifying future skills needs in promoting advanced manufacturing, sharing learning journeys and training programmes for larger dissemination, and promoting reskilling and upskilling activities for jobs at risk.

The next steps for 2021 include convening a workshop with stakeholders to chart out the regional strategy for promoting advanced manufacturing, convening working groups on the themes identified above, charting out an agenda for 2021 and engaging anchor companies in Tamil Nadu to promote the deployment of advanced manufacturing technologies. Other next steps are leveraging the Global Network for the adoption of affordable and scalable Industry 4.0 technologies for SMEs in Tamil Nadu, promoting reskilling and upskilling activities for jobs at risk due to the shift in manufacturing technology, identifying potential manufacturers to be included in the World Economic Forum Global Lighthouse Network, and identifying partners to implement Industry 4.0 and their pilot projects in Tamil Nadu.

Ulsan, South Korea

The Ulsan AMHUB, led by the Ulsan National Institute of Science and Technology, is working closely to align government policy on new technology adoption with its own Fourth Industrial Revolution initiatives to help innovate the existing manufacturing base as well as develop new growth engines. The AMHUB is actively seeking international collaboration opportunities in the technology exchange of AI, hydrogen production, 3D printing and more.

Through the Ulsan AI Innovation Park, a platform connecting industry and academia to maximize AI technology, the AMHUB launched programmes in 2020 on workforce training and R&D, and

assisted in AI standard data sets for manufacturing innovation. Through U-Forum, which consists of 99 specialists from industry, academia, institutes and government who aim to build consensus for a Fourth Industrial Revolution strategy for Ulsan, the AMHUB developed nine projects focused on advancing the manufacturing industry to improve the region's business climate.

In 2021, the Ulsan AMHUB aims to advance Industry 4.0 initiatives focused on research, SME workforce reskilling and start-up incubation. Specifically, the AMHUB hopes to advance the region's knowledge on AI and deep learning through actual data from manufacturing facilities.

4

Collaboration between Advanced Manufacturing Hubs

Sharing insights

In the spring of 2020, during the height of COVID-19's first wave, leadership from the Global Network of Advanced Manufacturing Hubs came together to create its first collaborative paper, "[The Impact of COVID-19 on the Future of Advanced Manufacturing and Production](#)", published by the World Economic Forum in June 2020. With the arrival of the coronavirus pandemic, industry needed to move faster than ever to support the response to this international health crisis while mitigating its impact on manufacturers and their respective supply chain networks around the globe. The paper reflected an aggregate of voices from the Global Network and focused on COVID-19's impact in each region, response efforts from regional manufacturing ecosystems and governments, and best practices to achieve rapid results and mitigate the impact of the pandemic by learning from other AMHUBs.

Building connections

In November 2020, the Global Network held the first Roundtable of the AMHUB Leaders. The virtual meeting was organized by the World Economic Forum to identify regional manufacturing and production strengths and weaknesses, discuss possible international Industry 4.0 collaboration opportunities and lay the groundwork for future cross-AMHUB initiatives.

Leaders from across the Global Network agreed a significant need existed to increase AMHUB-to-AMHUB touchpoints and engagement opportunities, particularly those focused on supporting the SMEs that dominate most manufacturing regions around the world.

Next steps for 2021

In 2021, the Global Network of Advanced Manufacturing Hubs will continue to participate in a rich engagement programme to ensure that AMHUBs have the opportunity to highlight their success stories while continuing to learn from the rest of the Global Network. In addition, during the latest virtual Leadership Meeting of the Global Network of Advanced Manufacturing Hubs, AMHUB leaders identified three priorities to shape cross-AMHUB collaborations for 2021: 1) accelerating technology adoption and skills development within SMEs; 2) unlocking circular economy opportunities within and across AMHUB regions; and 3) mitigating the impact of future shocks to global manufacturing systems.

To address the Global Network's goal of accelerating technology adoption and skills development for SMEs, AMHUB leaders identified three immediate actions that need to be taken. First, an engagement framework needs to be developed that helps regions to better capitalize on and to connect SMEs to innovation labs and model factories in their regions. Second, many SMEs still struggle to understand which advanced manufacturing technologies are most suitable to address their industry and size-specific challenges. The Global Network aims to support the creation of a roadmap to help companies understand

how to make these decisions. Finally, given the strong experience of several AMHUBs with scaled adoption of AI in manufacturing, the AMHUB leaders agreed that a concerted effort to launch pilots supporting SMEs to adopt AI technologies could rapidly provide significant positive impacts.

Sustainability and circular economy solutions offer tremendous potential for manufacturers and represent the future of manufacturing processes. Implementing and realizing these solutions, however, has been extremely difficult as it requires collaboration across multiple stages of global supply chains. The AMHUB leaders discussed the possibility of leveraging their local ecosystems to create testbeds for this type of cross-supply chain collaboration to drive greater circularity in supply chains. The community is now mapping what such pilots could look like and beginning to onboard local partners to further explore this effort.

Finally, the COVID-19 pandemic made it clear to manufacturers around the world that they were not fully prepared to adapt to a shock with such global reach. The Global Network plans to launch a cross-AMHUB "What If" working group to help better prepare the global manufacturing ecosystem to respond in a rapid and agile way to future challenges.

Contributors

World Economic Forum

Maria Basso

Specialist, Shaping the Future of Advanced Manufacturing and Production

Francisco Betti

Head, Shaping the Future of Advanced Manufacturing and Production

Felipe Bezamat

Project and Community Lead, Shaping the Future of Advanced Manufacturing and Production

Ian Cronin

Project Lead, Shaping the Future of Advanced Manufacturing and Production

Automation Alley

Cynthia Hutchison

Vice-President

Nicole Kampe

Manager, Global Content Strategy and Development

Acknowledgements

The World Economic Forum thanks the following organizations for their contributions to this publication and participation in community discussions and initiatives:

Associazione Fabbrica Intelligente Lombardia (AFIL)

Automation Alley

Brazilian Agency for Industrial Development (ABDI)

Dansk AM Hub

Government of Queensland, Department of Regional Development, Manufacturing and Water

Guidance Tamil Nadu

Innovalia Association

Qatar Development Bank (QDB)

Saudi Industrial Development Fund (SIDF)

Stanley Black & Decker

Tulip Interfaces

Turkish Employers' Association of Metal Industries (MESS)

Ulsan National Institute of Science and Technology

Endnotes

1. Qatar statistics from World Economic Forum research, based on Government of Qatar, Planning and Statistics Authority, “Monthly Figures on Total Population”, December 2020, <https://www.psa.gov.qa/en/statistics1/StatisticsSite/pages/population.aspx>. The other information in this regional summary for Qatar is sourced from: The World Factbook, “Qatar: Economy”, <https://www.cia.gov/the-world-factbook/countries/qatar/#economy>; Planning and Statistics Authority, State of Qatar, *Labor Force Sample Survey 2018: Statistical Analysis*, June 2019, https://www.psa.gov.qa/en/statistics/Statistical%20Releases/Social/LaborForce/2018/statistical_analysis_labor_force_2018_En.pdf; and The World Bank, Data, “Manufacturing, value added (% of GDP) – Qatar”, 2000-2019, <https://data.worldbank.org/indicator/NV.IND.MANF.ZS?locations=QA> (all accessed 3 March 2021).
2. Qatar Development Bank, “Vision and Mission”, 2020, <https://www.qdb.qa/en/about-qdb> (accessed 3 March 2021).
3. Saudi Industrial Development Fund (SIDF), “About Us”, 2020, <https://www.sidf.gov.sa/en/AboutSIDF/Pages/AboutUs.aspx> (accessed 3 March 2021).



COMMITTED TO
IMPROVING THE STATE
OF THE WORLD

The World Economic Forum, committed to improving the state of the world, is the International Organization for Public-Private Cooperation.

The Forum engages the foremost political, business and other leaders of society to shape global, regional and industry agendas.

World Economic Forum
91–93 route de la Capite
CH-1223 Cologny/Geneva
Switzerland

Tel.: +41 (0) 22 869 1212
Fax: +41 (0) 22 786 2744
contact@weforum.org
www.weforum.org