



LEVERAGING  
THE POWER  
OF ARTIFICIAL  
INTELLIGENCE  
FOR THE  
BORDERPLEX  
REGION



C MINDS



Microsoft

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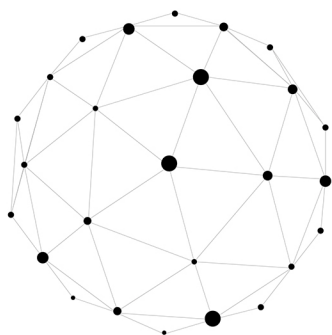
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# C MINDS

## C Minds

C Minds is a tech-for-impact action tank that designs and deploys bold initiatives for social change in Mexico and Latin America. The women-led international team seeks to future-proof communities, governments and companies in light of the Fourth Industrial Revolution by contributing to more inclusive and human-centered public policy and advancing the debate around ethical tech. This is achieved by collaborating with international organizations and all levels of government, from federal to state and municipal to co-design and implement pioneering strategies that place people at the center of the conversation.

The organization co-authored various important foundational efforts for Mexico to make the most of the AI Revolution, including the basis for an Open Banking standard and foundations for an AI strategy, which it is currently being strengthened via a collaborative effort carried out through IA2030Mx, Mexico's National AI Coalition, which C Minds co-founded in 2018. The organization also co-designed fAIr LAC, a platform to promote responsible AI adoption across Latin America and the Caribbean, together with the Inter-American Development Bank, which includes the development of national hubs that empower governments to harness AI for better social services. As of 2020, C Minds is leading the Latam Chapter for the IEEE's Global Initiative on Ethics of Autonomous and Intelligent Systems, ensuring Latin America is a part of the global conversations shaping our future.

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# EXECUTIVE SUMMARY

## EXECUTIVE SUMMARY

The Borderplex, strategically located along the United States (U.S.) - Mexico border, includes cities in three states: Ciudad Juárez (Chihuahua), El Paso (Texas) and Las Cruces (New Mexico). The region dates back to the XVII Century, when the first city, El Paso del Norte (now Ciudad Juárez) was founded by a Spanish franciscan priest. Its position along a key trade route allowed it to gain certain importance in the area, a growth which was then reinforced by the U.S. prohibition, World War II, and the development of the maquila industry. Nowadays, the region boasts an entrepreneurial community, particularly in the biotechnology and health industries, considering the promotion of an innovation-prone culture one of their priorities.

Artificial Intelligence (AI) presents a new opportunity for local entrepreneurs and startups to offer innovative products and services. The Borderplex region's companies, organizations, and institutions could profit from the following AI-enabled benefits in particular:

- Cost reductions and efficiency gains;
- Improved understanding and prediction;
- Enhanced customer service;
- Better public service provision.

That being said, such benefits will only be achieved with the correct strategy, which involves not only creating the right environment for AI-led innovation, but also mitigating potential risks related to its development and application. The Borderplex region's workforce will face important work-related challenges because of increasing automation. These need to be met with tailored transition strategies, gathered

under the term "Future of Work agenda", which includes the design and implementation of support methods for citizens to transition to the new labor market, from education (lifelong learning, upskilling, and reskilling, as well as a focus on core skills) to social safety nets. Although the World Economic Forum predicts that AI will have created more jobs by 2022 than it has eliminated,<sup>2</sup> it is important for every region to devise adaptation strategies to ensure a comprehensive and inclusive transition.

While automation is estimated to impact 62% of jobs in the entire region in the next five to 20 years, the report finds that the specific speed of automation will depend on the importance given to core skills in each occupation, given these are not replicable by machines to date, and on the occupational structure of the workforce in each city. A trend that is visible across industries and cities in the Borderplex is the concentration of the impact of automation in the short-term (next five to ten years).

Interviews with 36 local experts provided insight into the region's main challenges and opportunities when it comes to AI adoption. These include:

- Enhancing awareness regarding AI application and impact;
- Increasing AI resources and tools and shifting more power to the local level;
- Promoting a culture of innovation and local role models;
- Improving talent retention;
- Articulating actions and unifying Borderplex perception;
- Enabling greater binational and global visibility.

Using these insights, combined with an analysis of global trends and AI use cases, a blueprint was drafted to guide the Borderplex stakeholders to harness the AI Revolution in a responsible and ethical way. The authors of this report believe a people-centered approach is key for laying the ground for the region's transformation towards greater prosperity, which is why many of these proposals focus on the most valuable asset of the region: its people.

**Summary:**

- Delineate a regional identity and communicate it proactively;
- Upgrade skill sets and push for the development of core skills;
- Transform the region into a hub for high-quality data;
- Fight silos with binational projects;
- Incentivize the development of regional and scalable AI pilots;
- Develop and grow the AI entrepreneurial landscape;
- Develop a strategy for the Future of Work;
- Become a champion of the human rights and ethically-aligned AI movements;
- Combine or align international and regional efforts;
- Become a global AI-driven healthcare innovation powerhouse;
- Design and deploy a Borderplex AI Agenda for 2020-2030.

In the face of the structural changes accelerated by the Fourth Industrial Revolution, Ciudad Juarez, El Paso, and Las Cruces stand to gain considerable value from the execution of comprehensive AI and Future of Work strategies that build upon existing strengths and initiatives. Within their reach stands the opportunity to demonstrate to the rest of the world how one region can harness the digital age to overcome physical walls and become a success story with regards to binational collaboration and competitiveness.



## INTRODUCTION

*“The rapid transformation of our economy is driven in part by the pervasive use of new technology that is creating both challenges and opportunities for communities”*

**Brad Smith, President at Microsoft**

In the Fourth Industrial Revolution, emerging technologies, such as Artificial Intelligence (AI), are poised to change the world as we know it. As a general-purpose technology (GPT), AI has been compared to electricity in terms of its transformative power and its profound effects on society.<sup>3</sup>

Looking ahead to the many beneficial applications of AI and its potential risks, at least 26 countries have developed or are starting to develop national strategies to capture the economic benefits promised by its implementation and widespread adoption. Benefits include a potential 14% increase to the world’s GDP for 2030, which is approximately equivalent to adding two new Germanys and one new France to the world economy.<sup>4</sup> Such strategies also seek to prepare labor markets for a Future of Work<sup>5</sup> agenda. Internationally, there are also collaborative efforts and partnerships seeking to develop and promote the use of AI within specific regions, such as the Nordic-Baltic Region Declaration of Collaboration or the Memorandum of Understanding (MOU) between the United Arab Emirates (UAE) and India.<sup>6</sup> Regional collaboration across sectors and borders has become paramount to harnessing AI for economic development and social impact.

In light of this new paradigm in which accelerated technological change, climate change, and globalization are redefining humanity as we know it, it is essential for cities, countries, and regions to develop collaborative roadmaps to futureproof people.

This means providing them with opportunities to acquire the right skill sets to thrive professionally, keeping up with global economic competitiveness and mitigating the risks that could impact us all with special consideration for the most vulnerable.

The Borderplex region is a strategic area along the United States-Mexico border that includes cities in three states: Ciudad Juarez, El Paso and Las Cruces. It presents excellent conditions to test the way in which AI’s benefits can be collaboratively taken advantage of by an entire region. This vibrant geographical area, home to a bilingual workforce and culture, presents unique complexities, opportunities, and strengths including its location, allowing it to function as a doorway to binational commercial activities, workforce flow, and sophisticated manufacturing and service sectors. The understanding and leveraging of these factors are crucial for enabling the region to become the leading innovation center that it aspires to be. Such an achievement would allow the region not only to ride the wave of technological transformation but also to design it, ultimately creating a competitive binational landscape and raising the quality of life.



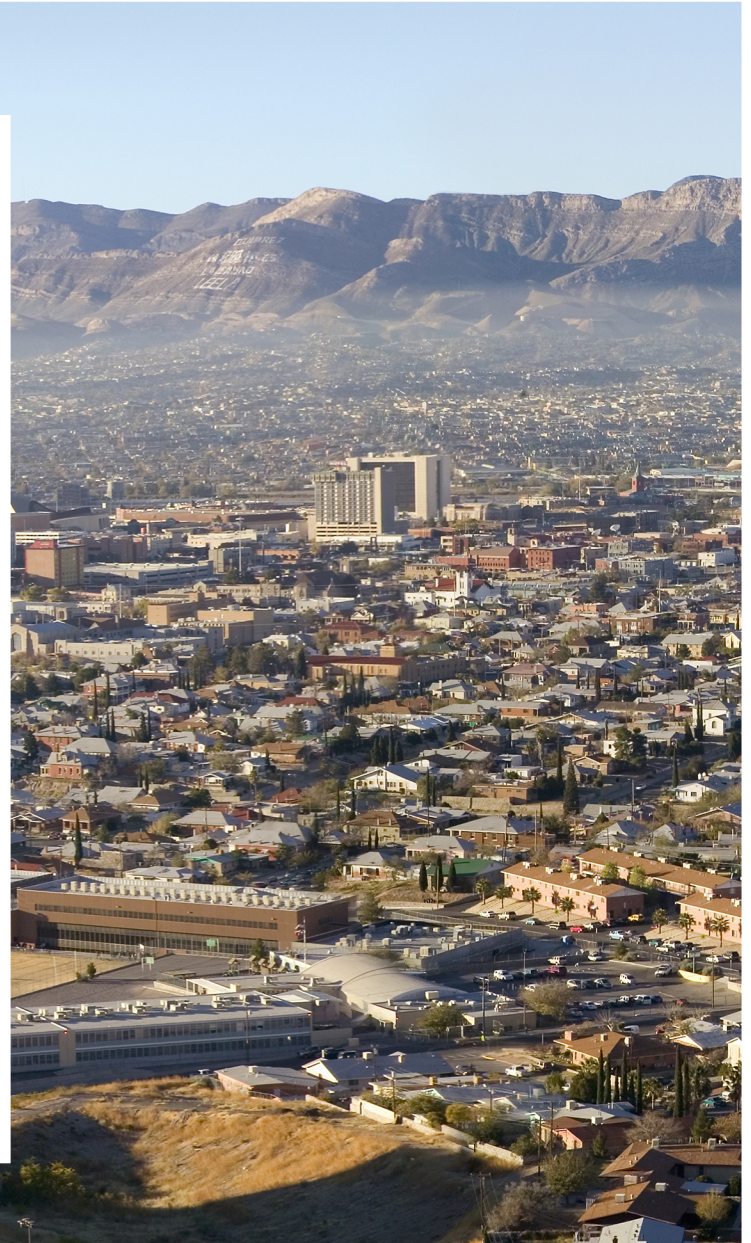


## INTRODUCTION CONTINUED

This report presents an overview of the Borderplex region, along with global trends in the use of AI and examples of potential applications in the context of the Borderplex cities' priority sectors. It also estimates the potential impact of automation in the region, provides insights from key actors, and offers a blueprint of recommendations to strengthen the region's ability to make the most of the AI Revolution.

This analysis was developed by C Minds with the support of the local Microsoft TechSpark team to learn about regional challenges, and understand how technology can help boost local economic growth. It includes desk research, on-the-ground analysis, and the valuable insight of 36 leading actors in Ciudad Juarez, El Paso, and Las Cruces' digital ecosystems.

The objective of this report is to serve as input to and offer a guide for decision-makers from all sectors in the Borderplex, promoting the consolidation of the region as an innovation powerhouse and a technology development hub centered on its historical philosophy of inclusive prosperity. In times of increasing divisions, the authors hope it will lead to more conversations about the need for multicultural, multi-sector, and cross-border collaborations to promote shared growth and fight potential AI divides together.

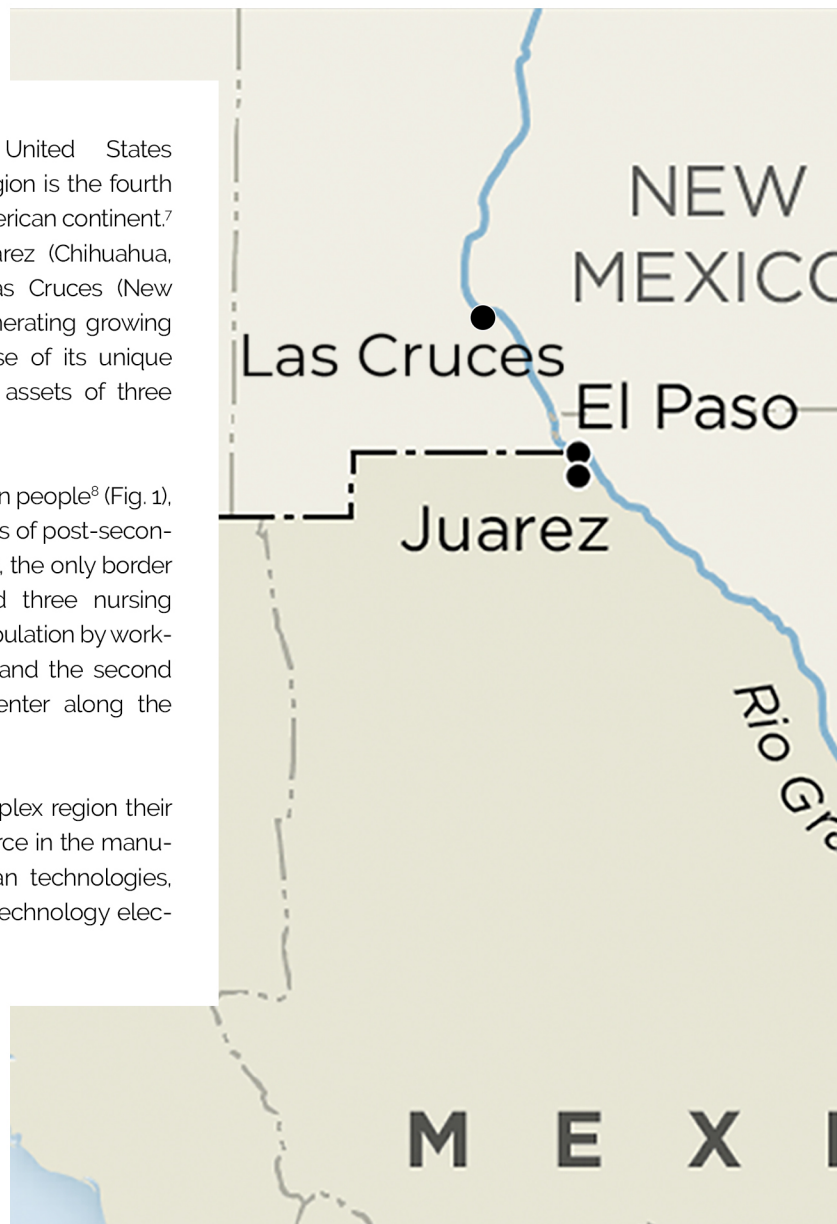


## CONTEXT: REGIONAL OVERVIEW

Strategically located along the United States (U.S.)-Mexico border, the Borderplex region is the fourth largest manufacturing center on the American continent.<sup>7</sup> Made up of the cities of Ciudad Juarez (Chihuahua, Mexico), El Paso (Texas, U.S.), and Las Cruces (New Mexico, U.S.). The region has been generating growing interest among new industries because of its unique economic advantages backed by the assets of three states and two countries.

With a population of more than 2.5 million people<sup>8</sup> (Fig. 1), it is the number one border area in terms of post-secondary education, with five top universities, the only border area with three medical schools and three nursing schools, the highest college student population by workforce per capita in any border region, and the second largest manufacturing employment center along the U.S.-Mexico border.<sup>9</sup>

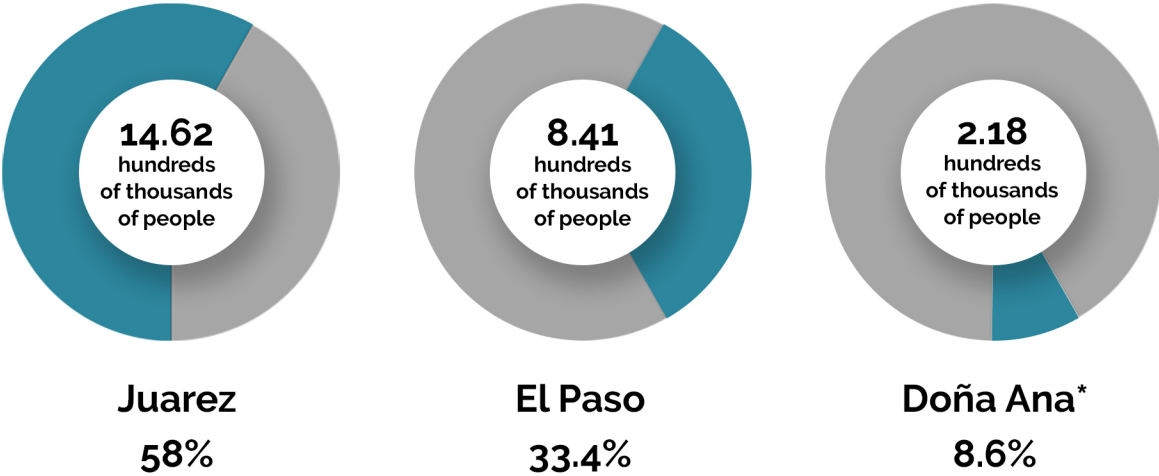
Industry giants<sup>10</sup> have made the Borderplex region their home, creating jobs for a skilled workforce in the manufacturing, automotive, biomedical, clean technologies, defense/homeland security, and high-technology electronics industries.



In terms of trade, the El Paso border crossing alone accounts for 12% of total U.S. trade with Mexico (\$44.59 billion U.S. dollars).<sup>11</sup> Thousands of people move back and forth daily over four bridges with nearly 80 lanes for pedestrians and vehicles.<sup>12</sup> In June 2019 alone, 2.1 million people crossed over to El Paso from Mexico in 791 thousand personal vehicles, 1.7 thousands buses, and 121 trains 32% of the crossings were pedestrian.<sup>13</sup> Beyond merchandise and people, a continuous flow of ideas and technology shape the economic and cultural dynamics of the region.



Figure 1. Borderplex Region Population by County, 2018 (hundreds of thousands)



Source: Own elaboration with data from CONAPO (2013) and the U.S. Census Bureau (2019).

\*Las Cruces county



# SHARED HISTORY

*In order to design a common regional vision of the future, one must first understand the region's past.*

## SHARED HISTORY

The twin cities of Ciudad Juarez and El Paso share a common history dating back to the seventeenth century, specifically, to the founding of El Paso del Norte (now Ciudad Juarez) in 1659 by a Spanish Franciscan priest as part of a mission to conquer and evangelize the area.<sup>14</sup> In 1860, Franklin changed its name to El Paso, creating confusion with the city south of the border called El Paso Norte. Only 28 years later would the latter change its name to Ciudad Juarez in honor to the Mexican President Benito Juarez who visited it twice (in 1867 and 1871).<sup>15</sup> Las Cruces was officially incorporated in 1907.

While the territory of El Paso originally belonged to the state of Chihuahua, under the Mexican Constitution of 1824, it became part of the U.S. in 1848, along with about half of the Mexican territory, at the end of the war between the two countries. It was at that point in time that the current border limits were established.<sup>16</sup>

Driven by the Camino Real de Tierra Adentro<sup>17</sup> trade route, the growth of New Mexico's territory attracted settlers looking to claim a portion of the undeeded land, a situation that led the U.S. Army's Lieutenant Delos Bennett Sackett to protect and organize emerging communities. The coming of the railroad (late 1800s), together with the opening of the New Mexico College of Agriculture & Mechanic Arts (1888), nowadays known as the New Mexico State University (NMSU), led the way to even more prosperity.

Following the Mexican Revolution (1910-1920), which devastated the country's economy, the Borderplex region began its boom years with three waves of growth impacted the U.S.-Mexico border cities of the Borderplex region, described below:<sup>18</sup>

1. The tourism and recreational services generated by American investors looking to overcome the U.S. liquor ban (Volstead Act, 1919-1933).
2. The military development and economic growth of the U.S. (World War II).

3. The development of the maquila industry (starting in 1960 with the state program PIF: Programa Industrial Fronterizo, or Border Industrial Program) and the consolidation of a border city system drove the development of northern Mexico, and served as a link to the U.S. economy.

### First Wave of Growth

During the prohibition era in the U.S. (early 1930s), Mexican border cities, including Ciudad Juarez, received a strong wave of tourism because of the production and sale of liquor and the operation of casinos and races.<sup>19</sup> After the dry laws, every single one of El Paso's 150 cantenas closed and were moved to Ciudad Juarez, where they continued to operate with the same owners and the same rationale.<sup>20</sup>

### Second Wave of Growth

From the 40s onwards, profound changes stimulated the development and growth of the border states in both countries: the participation of the U.S. in World War II, and the implementation of the import substitution model in Mexico.<sup>21</sup> World War II contributed to the region's prosperity by making Las Cruces an important military hub with several areas: the Tularosa Basin, one of the army's most important weapons testing grounds, and the Trinity Site, where the first atomic bomb was tested.<sup>22</sup> Moreover, important mining exploitation led this area to become a pole of commerce and services for the existing border population towards the east of the territory.<sup>23</sup>

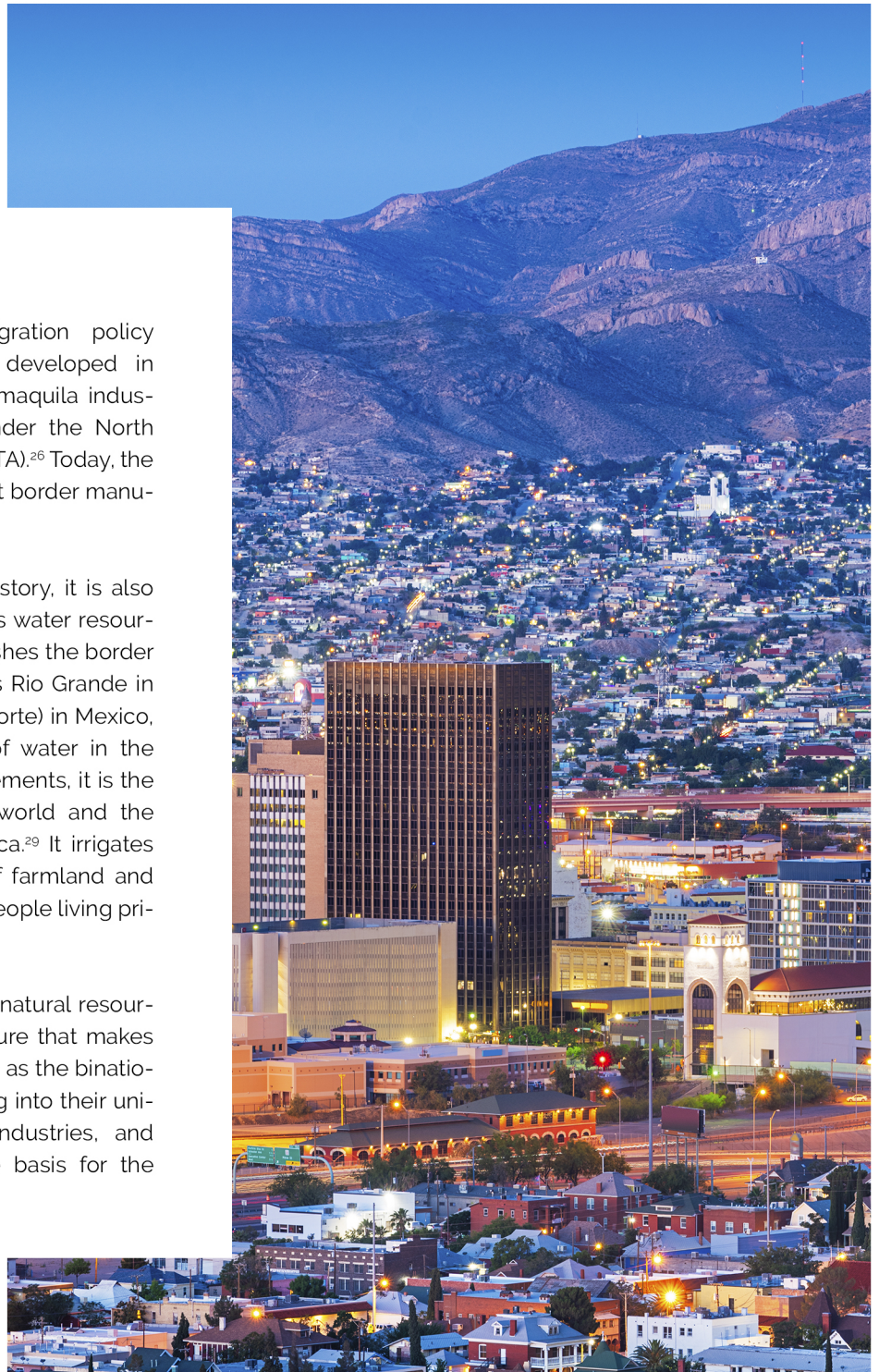
From the postwar period until the middle of the twentieth century, Ciudad Juarez became a hub for U.S.-hired labor in the agriculture and services industries. As of 1942, the Bracero Program allowed thousands of Mexican workers to enter the U.S. until it ended in 1964.<sup>24</sup>

### Third Wave of Growth

After this period, the U.S. immigration policy hardened, and structural changes developed in Mexican border states to house the maquila industry,<sup>25</sup> as well to promote exports under the North American Free Trade Agreement (NAFTA).<sup>26</sup> Today, the region has become the second largest border manufacturing employment center.<sup>27</sup>

Together with its shared economic history, it is also relevant to note that the region shares water resources coming from the river that establishes the border between the two countries. Known as Rio Grande in the U.S. and Rio Bravo (or Bravo del Norte) in Mexico, the river is the only major source of water in the region.<sup>28</sup> According to certain measurements, it is the twenty-second longest river in the world and the fourth or fifth longest in North America.<sup>29</sup> It irrigates approximately 200 thousand acres of farmland and covers the needs of over two million people living primarily in the region.<sup>30</sup>

Beyond its common past and shared natural resources, the region holds a promising future that makes the most of the cities' similarities, such as the binational and bilingual culture, while tapping into their uniqueness, advancing their specific industries, and weaving them together to form the basis for the region's economy.





# THREE CITIES AT A GLANCE

Each city in the Borderplex, Ciudad Juarez, El Paso and Las Cruces, presents unique assets and opportunities for joint development. The following sections seek to review each city's particularities.



### Ciudad Juarez, Chihuahua

A multicultural city and the manufacturing heart of the Borderplex region, Ciudad Juarez has a strong manufacturing sector that employs 293,434 people<sup>31</sup> in over 220 maquila and manufacturing<sup>32</sup> operations. They are responsible for a massive transformation of resources into products and services catered to local and international companies, an industry worth \$48.1 billion U.S. dollars in exports.<sup>33</sup> During the past years, the Chihuahua State Government (the state where Ciudad Juarez is located) has deployed several key local branding efforts, such as Chihuahua Exponencial,<sup>34</sup> with the aim of overcoming its violence-related image and to transform its narrative to one of opportunities, resilience, and hardworking people.

The city is home to individuals from all over Mexico and the world that have enriched the area with cultural diversity an entrepreneurial spirit, creating a thriving ecosystem for innovation and economic development.

Ciudad Juarez, also known as simply Juarez, is a family-friendly city rich in entertainment and cultural activities, where one can visit one of the largest interactive museums in Latin America,<sup>35</sup> explore the sandy dunes of the natural reserve of Samalayuca, and enjoy a variety of gastronomic experiences in its historical center.

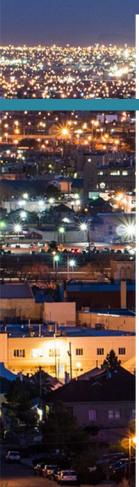


Table 1

| JUAREZ METROPOLITAN MUNICIPALITY   |
|--|
| CHIHUAHUA, MX  |
| <p><b>City facts:</b></p> <ul style="list-style-type: none"> <li>• Main city in the state of Chihuahua</li> <li>• 8th largest metropolitan area in Mexico</li> <li>• Capital of the Juarez Municipality</li> <li>• 1.5 million people (or 58% of Borderplex region's population)<sup>1</sup></li> </ul> <p><b>Workforce and employment:</b></p> <ul style="list-style-type: none"> <li>• Labor force size: 719,544 people<sup>2</sup></li> <li>• Municipality with the lowest unemployment rate in the Borderplex<sup>2</sup></li> <li>• Job distribution:               <ul style="list-style-type: none"> <li>- 293,434 jobs in the manufacturing industry (or 42% of the employed population)<sup>2</sup></li> <li>- 349,010 jobs in the services sector (or 50% of the employed population)<sup>2</sup></li> </ul> </li> </ul> <p><b>Economy and local assets:</b></p> <ul style="list-style-type: none"> <li>• High &amp; medium-high technology manufacturing exports, focused on automotive and electrical products, well-developed appliances, industrial machinery, metalworking, and transportation equipment<sup>3</sup></li> <li>• The Juarez manufacturing industry value added is \$43.2 billion Mexican pesos, 58.26% of the total value added of Chihuahua's manufacturing industry<sup>4</sup></li> </ul> |







### El Paso, Texas

The U.S.' main commercial hub, El Paso, also known as "Sun City," is the largest city along the U.S.-Mexico border and one of the top ten places to live in the U.S.<sup>36</sup> Its border crossing is the 2nd most important trading port in binational commerce, generating \$44.59 billion U.S. dollars and accounting for 12% of the total trade value with Mexico.<sup>37</sup> It is home to thirteen Third Party Logistics (3PL) warehouses that provide free trade and logistics services to importers and exporters in El Paso, Ciudad Juarez, and the southern New Mexico region.<sup>38</sup>

In addition to being a leading point of shipping and distribution, the city has diversified into a wide diversity of industries, including the automotive, biomedical, electronics, and defense ones, the latter employing over 41,000 people and producing approximately \$6 billion U.S. dollars yearly.<sup>39</sup> Companies tend to own plants both in El Paso and Ciudad Juarez and to adopt an extensive use of machines and automation of processes, which has resulted in a faster rate of growth for the local manufacturing sector. The presence of federal agencies such as the Department of Homeland Security and military bases has boosted the growth of its local aerospace and cybersecurity industries. The city is also home to the Medical Center of the Americas, the region's first private biomedical research facility and commercialization institute. El Paso is a community-based and entrepreneurial city where opportunities abound.

American, Mexican, and Native American cultures have shaped the city's identity, creating spaces for cultural exchange such as museums, botanical gardens, churches, and theaters.<sup>40</sup>



Table 2

## EL PASO METROPOLITAN AREA TEXAS, U.S.

**City facts:**

- Largest city on the U.S.-Mexico border
- Sixth most populous city in Texas
- Second most important trade port for binational trade in 2019
- Population: 841,000 (or 33% of the Borderplex region's population)<sup>1</sup>

**Workforce and employment:**

- Labor force size: 361,000 people<sup>2</sup>
- Unemployment rate: 3.9%<sup>3</sup>
- Job distribution:
  - 68,800 jobs in trade, transportation, and utilities sectors (19.9% of the employed population)<sup>4</sup>
  - 71,300 jobs in the government sector (or 20.6% of the employed population)<sup>4</sup>

**Economy and examples of local assets:**

- Size of economy: \$29.03 billion U.S. dollars or equivalent to 1.75% of Texas' GDP<sup>5</sup>
- Health-focused Education and Research centers: The University of Texas at El Paso (UTEP), Texas Tech University Health Sciences Center El Paso (TTUHSC), the University of Texas School of Public Health-El Paso Regional Campus (EPRC), the Medical Center of the Americas



## Las Cruces, New Mexico

Its focus on aerospace, energy, natural resources, and biomedicine research and development sets Las Cruces apart from the other Borderplex cities. Powered by NASA's White Sands Missile Range, an increasing number of private companies and light manufacturing facilities have been settling in the city, creating approximately 8,000 businesses and many more jobs for the New Mexico workforce, ranked top U.S. state in the west for manufacturing.

Moreover, the cluster of government facilities in Las Cruces has attracted a growing aerospace industry, the city now preparing to become the first gate to space for commercial space flights. It also boosted the growth of the local cybersecurity industry, strengthening the region's technological adoption.

The city's ideal climate conditions to cultivate a wide variety of crops, including hemp, has led to the accelerated growth of a local agroindustry. The economic impact of recent investments is expected to reach of \$247 million U.S. dollars alone in the hemp industry. In 2017, the agriculture, forestry, fishing, and hunting industries produced \$298.3 million U.S. dollars, representing 4.13% of the value of Las Cruces' local production.

The New Mexico State University (NMSU) is the city's academic hub, equipping youth with key skills with over 180 degrees across its 5 campuses and 12 research and science centers. In 2018, the National Science Foundation awarded NMSU with a \$3.9 million U.S. dollars grant to prepare students for careers in Science, Technology, Engineering, and Math (STEM). The university also received a grant to develop an AgriTech hub, strengthening its competitive advantage with regards to its agricultural focus and use of technological tools.

Mountains and deserts have created a contrasting outdoor experience that allows families to snow-board, camp, hike, and connect with nature. Cultural identity has deep Native American roots as 23 tribes still call New Mexico home.

**Table 3**

### LAS CRUCES METROPOLITAN AREA

#### NEW MEXICO, U.S.

##### City facts:

- Second largest city in New Mexico
- Houses NASA's White Sands Test Facility
- Headquarters of New Mexico State University (NMSU), with a student population of approximately 15,000<sup>1</sup>
- Population of 218,000 (or 9% of the Borderplex region's population)<sup>2</sup>

##### Workforce and employment:

- Labor force size: 99,000 people<sup>3</sup>
- Unemployment: 6.3%. Las Cruces has the highest unemployment rate in the Borderplex<sup>3</sup>
- Job distribution:
  - 16,200 jobs in the education and health services sectors (or 17.5% of the employed population)<sup>4</sup>
  - 18,800 jobs in the government sector (or 20.3% of the employed population)<sup>5</sup>

##### Economy and local assets:

- Part of the Mesilla Valley agricultural area: top producer of chili peppers and pecans in the entire U.S. It leads the state's production of onion and pima cotton, and is among the main New Mexico producers of cabbage, lettuce, and watermelons, among other agricultural products<sup>6</sup>
- Size of Economy: \$7.23 billion U.S. dollars, or 7.67% of New Mexico GDP<sup>7</sup>

## TECH & ENTREPRENEURIAL SCENE

The past years have seen the growth of an entrepreneurial community in Ciudad Juárez, El Paso, and Las Cruces. Innovation hubs such as the Technology Hub in Ciudad Juárez, the Hub of Human Innovation and Joseph Advisory Services (JAS) in El Paso, and Arrowhead Center in Las Cruces, have become key to provide entrepreneurs and startups with resources such as mentorship, funding, and networking opportunities. Such opportunities are increasingly taking place in the region's thriving biotechnology and health industries.<sup>47</sup>

### The Scene in Ciudad Juárez

Various local startups are transforming the Ciudad Juárez landscape by boosting tech adoption in the city, such as IT Lab and Mechatronics, both companies focused on advancing the use of new technologies (such as AI) for industry efficiency. One can also point out Botcake, a data analytics coffeeshop, and Bixelium, an indie VR videogame studio led by young women. The local ecosystem is growing to encompass the needs of children and youth, with Mech Robotix offering low-cost robotics classes, of the industry, with the AI Cluster and the Advanced Manufacturing Cluster organizing the industry to tap into the benefits of exponential technologies, and of startups, with the Juárez Technology Hub alone accompanying the growth of more than 60 companies. It provides them with modern facilities, together with tools to strengthen their business profitability. In addition, FabLab Ciudad Juárez offers an open digital fabrication makerspace lab to learn about the use of 3D printers, laser cutters, design software, and electronics.<sup>48</sup>



## TECH & ENTREPRENEURIAL SCENE

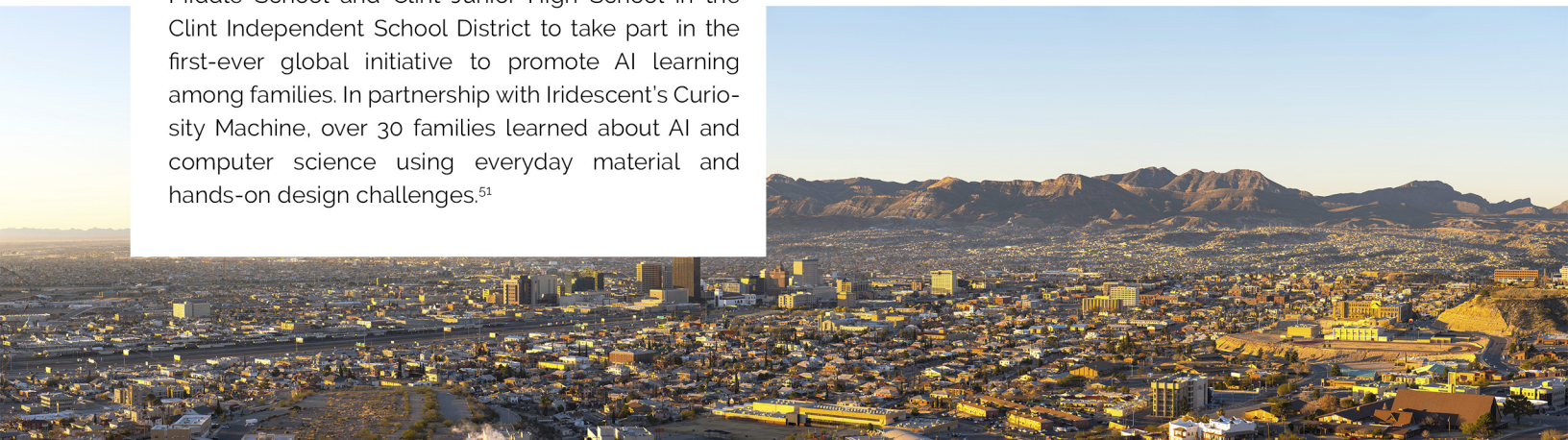
### The Scene in El Paso

On the U.S. side of the border, organizations such as the El Paso County IT Cluster gather 35 different occupations involved in the development, maintenance, and use of computer systems, software, and networks for the processing and distribution of data. According to the cluster's studies, the number of IT workers across all industries is estimated at 9,400, with a 9% growth rate in the next 5 years. The city is betting on innovation, with various spaces to support exploration and entrepreneurship or startups. For instance, the Hub of Human Innovation incubates promising startups and helps them succeed,<sup>49</sup> while the Medical Center of the Americas acts a life sciences hub. FabLab El Paso, the first in west Texas (open since 2013), provides the community with access to digital fabrication tools and resources for skill set learning, workforce training, creative collaboration, prototype development, and product manufacturing.<sup>50</sup>

Beyond seeking to enhance the region's entrepreneurial climate and grow the innovation economy, the city also promotes science and education. The Insights El Paso Science Center, founded in 1980 as a private, nonprofit organization, is promoting Science, Technology, Engineering, Arts, and Math (STEAM) education through exploratory, interactive learning experiences. The nonprofit has partnered with Ricardo Estrada Middle School and Clint Junior High School in the Clint Independent School District to take part in the first-ever global initiative to promote AI learning among families. In partnership with Iridescent's Curiosity Machine, over 30 families learned about AI and computer science using everyday material and hands-on design challenges.<sup>51</sup>

### The Scene in Las Cruces

In Las Cruces, the Arrowhead Center is supporting innovators, entrepreneurs, and small businesses at every stage to start and grow through a comprehensive offering of services, resources, expertise, and connections. The organization is also the technology transfer and commercialization arm of the New Mexico State University, working with campus inventors and innovators to protect their work and ensure it reaches the broadest possible markets.<sup>52</sup> Through the Arrowhead Innovation Fund Venture Capital, it is providing seed and early investment to commercialize promising technologies developed and/or licensed by New Mexico startup companies.<sup>53</sup> The gaming, visual arts, and healthcare industries are also growing, with companies looking for a mix of skills between arts and computer science. There are also education-oriented organizations such as the Bridge of Southern New Mexico, which focuses on building a skilled workforce by closing the soft skills gap, helping families transition from high-school to college, and increasing graduation rates from high school, community college, and university.<sup>54</sup>





## The Region's Scene as a Whole

In 2017, Microsoft launched its TechSpark initiative, a civic program aimed at learning about regional challenges and understanding how technology can be used to foster economic opportunity and job creation by partnering with local leaders.<sup>55</sup> In 2019, in order to promote regional cohesion and entrepreneurship, the Microsoft TechSpark team in El Paso and Ciudad Juárez, together with Bosch, Transtelco, Chihuahua's local Ministry of Innovation and Economic Development (SIDE), and Juárez' Economic Development nonprofit sponsored The Bridge Accelerator, a program implemented by the Technology Hub in Ciudad Juárez and the Hub of Human Innovation in El Paso that seeks to include local businesses into the manufacturer's value chain as service suppliers.<sup>56</sup>

The region has also implemented efforts to promote an entrepreneurship culture through hackathons and events such as the RESET binational meeting in 2018, which sought to inspire young generations and promote creative industries, new technologies, and innovation.<sup>57</sup> Other important regional events include the BorderTech innovation and exponential technology event, which gathers entrepreneurs and investors from the Borderplex region.<sup>58</sup> It is also worth pointing out the first Annual El Paso Día de Los Muertos Pitch Competition, which will take place in November 2019 and is focused on promoting local businesses by offering a \$10,000 prize to help the winner spur his or her business' growth.<sup>59</sup>

At a regional level, the Borderplex Alliance, a nonprofit organization, is dedicating itself to accelerating economic development and carrying out policy advocacy, in addition to seeking to develop a 2020 agenda to unify the region.<sup>60</sup> Other regional initiatives to promote more economic growth include a move in June 2019 by business leaders from the Information Technology (IT) sector, who formed the Borderplex Technology Council to identify opportunities and actions needed to drive growth. The new council will focus on identifying and taking advantage of unique regional strengths and on addressing the need for new products and more advanced technologies in light of growing markets and demand from emerging industries such as the biomedical and aeronautical ones. The council strives to become a base, lead, and articulator of initiatives to channel the development of regional value chains based on technology development. In the near future, it will seek to address the technology talent pipeline and to transform the region into a technology hub.

The region presents solid foundations to build upon in order to further develop its nascent AI ecosystem. Companies such as Electronic Caregiver in Las Cruces, an AI-based virtual caregiver,<sup>61</sup> is an example of the potential added value AI can bring to a service and of the kind of AI applications that can be interesting to tap into for Borderplex actors.

## ARTIFICIAL INTELLIGENCE & THE BORDERPLEX REGION

AI is a machine's ability to recognize sounds, images and words, and to learn and reason in ways that are similar to what people do. AI isn't new. In the last few years, AI has moved into mainstream products due to a confluence of factors: the massive computing power of the cloud, the availability of large datasets that can be used to teach AI systems, breakthroughs in developing AI algorithms and improvements in AI methods such as Deep Learning to create products and services that use AI to better understand, anticipate and respond to people's needs. Moreover, there are many discussions on the meaning and scope of AI, its subfields of study, and application. For the purpose of this report, we use the following definition proposed by the AI Now Institute at the New York University:

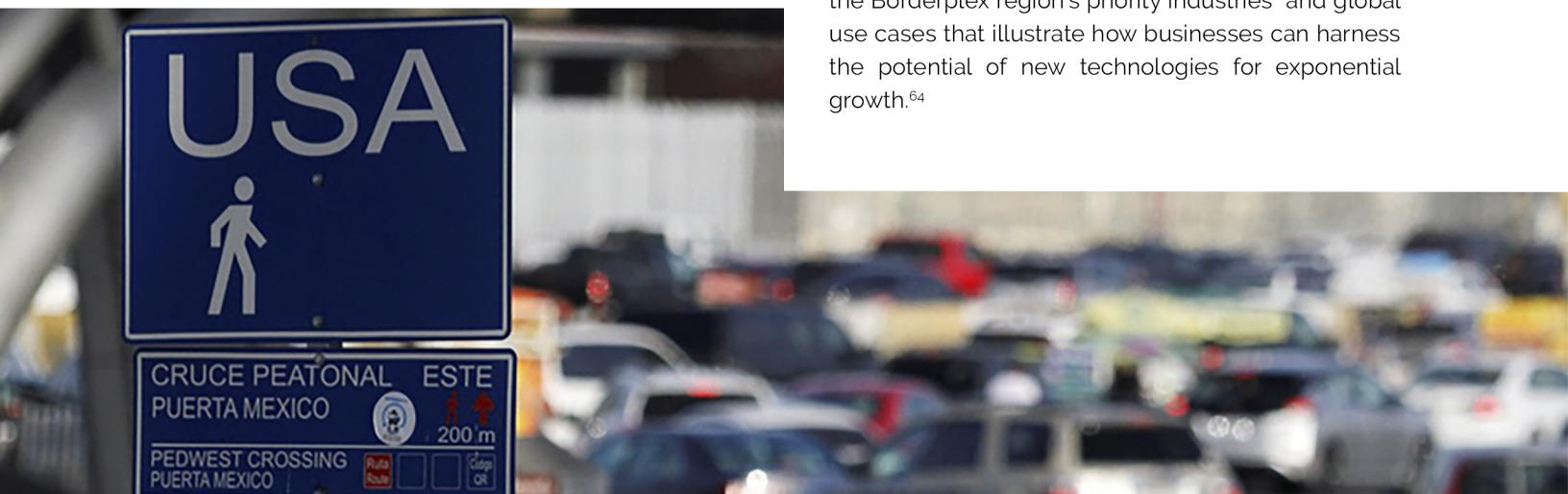
*"AI can include a wide range of methods and tools, including Machine Learning, facial recognition, and natural language processing. But more importantly, AI should be understood as more than just technical approaches. It is also developed out of the dominant social practices of engineers and computer scientists who design the systems, and the industrial infrastructure and companies that run those systems. Thus, a more complete definition of AI includes technical approaches, social practices and industrial power."<sup>62</sup>*

In the context of the Borderplex region, AI has the potential to augment business capabilities in at least three concrete areas:

- **Cost reductions and efficiency gains: automating business processes with Robotic Process Automation (RPA).**
- **Better understanding and prediction: gaining insight through AI-improved data analytics.**
- **Improved customer service: engaging with customers and employees using Natural Language Processing (NLP) chatbots, intelligent agents, and Machine Learning to offer improved customer service and expedite internal communication, as well as for product and service recommendation systems.<sup>63</sup>**

In addition to being a tool that can be used to drive efficiency in the industry and governments (for instance, by providing customized programs and services to citizens), AI can also be used for social impact. Indeed, it can help us devise innovative solutions to tackle some of our most pressing issues, such as poverty, inequality, and climate change, to name a few.

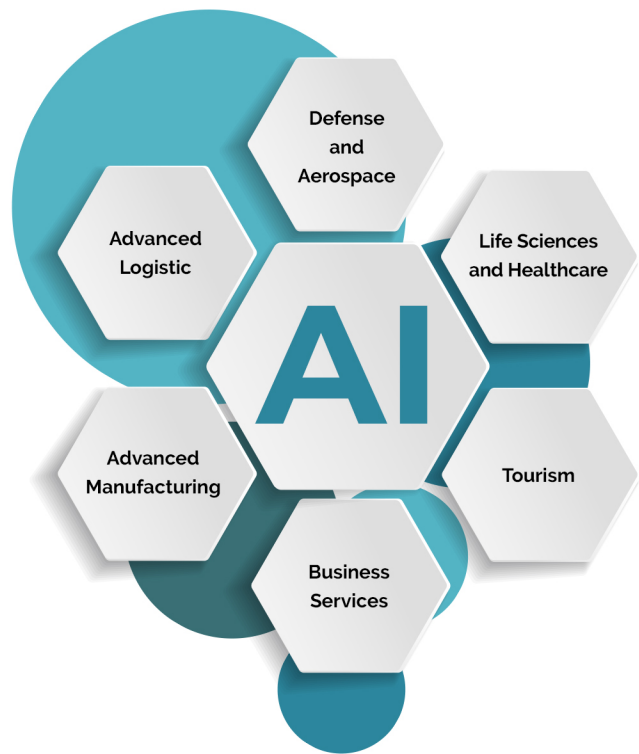
The section below presents global AI use trends for the Borderplex region's priority industries and global use cases that illustrate how businesses can harness the potential of new technologies for exponential growth.<sup>64</sup>





This section focuses on the industries of Defense and Aerospace, Life Sciences and Healthcare, Tourism, Business Services, Advanced Manufacturing, and Advanced Logistics. These sectors were selected for their relevance in the Borderplex region with the purpose of illustrating potential AI applications and their positive effects, such as added economic value.

**Figure 2. Strategic Industries Powered by AI**



## GLOBAL AI TRENDS AND INTERNATIONAL CASE STUDIES



**Source:** Own elaboration based on the key industries identified by the Borderplex Alliance (2019)<sup>67</sup>

## 1. ADVANCED LOGISTICS

The logistics sector provides employment to over 74,000 workers<sup>68</sup> in the Borderplex region. Industry components include warehousing & distribution, durable goods wholesalers, truck transportation, support activities for transportation, and logistics consulting services.

The following list presents areas of opportunity for the region based on key global AI trends:<sup>69</sup>

- **Warehouse Support:** Key technological advancements in this field cover conveyors, automated forklifts and storage and retrieval systems, radio-frequency identification, automation-friendly plastic pallets, autonomous robots, optimal routes in warehouses, and programmable logic controllers.
- **Supply Chain Analytics:** This niche is becoming increasingly important to the success of manufacturers in the region. Changes will come from cloud technology, customized best-practice, and Big Data analytics, together with innovation software.
- **Over the Road Transportation:** Because freight trucks are the main means of transportation for goods across the border, demand for this service will increase as the manufacturing sector grows. The expansion of bimodal facilities, along with the expansion of manufacturing and warehousing operations could further boost demand. Exploration and development in the oil and gas industry in the region, if successful, could place even greater demand on freight trucking.
- **Packaging Design and Services:** Packaging design has become increasingly important to manufacturers as they seek to reduce costs and increase the efficiency of transporting goods over long distances to face growing competition. Technology has improved the design options of packaging. Demand for this niche is estimated to grow steadily in the region.
- **Bimodal Support Services:** The bimodal transportation hub will spur demand for related support services, ranging from maintenance to supplies and freight logistics.



Logistics is a data-driven business. AI is ramping up logistics company efficiencies in the areas of predictive demand and network planning and can provide an unmatched analysis of supply chain management performance. The potential added value of AI for the transport and logistics sector is estimated to be between \$0.4–0.8 trillion U.S. dollars, or 4.9–6.4% of the global industry's revenue.<sup>70</sup>

The following case studies (CS) provide international examples of how AI is being adopted for a wide range of purposes within the logistics industry.

### CS: Predictive Network Management

#### Implementer: DHL

**DHL has developed a Machine Learning-based tool to predict air freight transit delays in order to enable proactive mitigation.**

- By analyzing 58 different parameters from internal data, the Machine Learning model is able to predict if the average daily transit time for a given lane is expected to rise or fall up to a week in advance.
- The solution is able to identify the top factors influencing shipment delays, including temporal factors like departure day and operational factors such as airline punctuality. This helps air freight companies to plan ahead by removing subjective guesswork around when or how their shipments should fly.
- The solution promotes speed and efficiency within global supply chains and express networks where even a few weeks' lead time provides significant advantage to merchants facing unexpected spikes in demand.<sup>71</sup>

According to the Gartner Hype Cycle<sup>72</sup> for AI 2019, Machine Learning will reach its plateau of productivity in 2–5 years.<sup>73</sup>



## CS: AI Instructions for Warehouse Employees

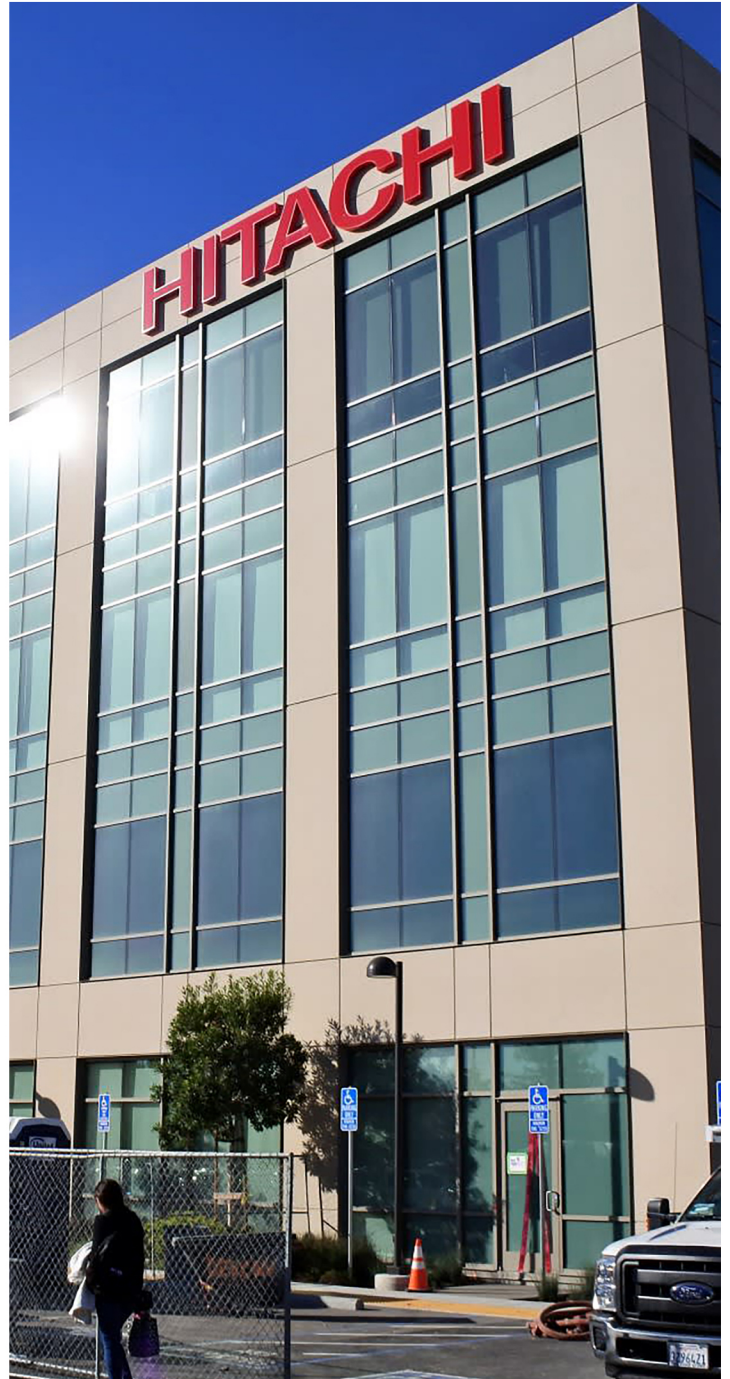
Implementer: Hitachi

Japanese electronics group Hitachi developed a technology called “H” that can be adapted for various applications and facilitates the continuous improvement of working processes using AI.<sup>74</sup>

- The system analyzes how the employees deal with problems and evaluates the efficiency of an individual's approach. If a particular approach helps increase efficiency, it is analyzed in greater depth and then passed on to other employees as a work instruction.
- “H” is able to react to short-term changes and issue instructions for events arising from specific situations. The system can also incorporate weather data and fluctuations in demand into its analyses. For example, it can anticipate that a period of poor weather can lead to delays in the arrival and departure of heavy goods vehicles, while the demand for waterproof clothing may rise.
- “H” operates without any prior feedback from human supervisors and issues its instructions directly to the employees or to connected systems. This enables a rapid response and increases efficiency without delay.

By using “H”, Hitachi has increased productivity by 8% compared to similar warehouses without AI.

According to the Gartner Hype Cycle for AI 2019, Deep Learning (Deep Neural Networks) will reach its plateau of productivity in 2-5 years.<sup>75</sup>



## 2. ADVANCED MANUFACTURING

In Ciudad Juarez alone, the maquila and manufacturing sector provides employment to over 293,434 workers.<sup>77</sup> Key industry sectors include: automotive parts, medical devices, consumer products, electric motors, electronic components and more products, together with aerospace, high-technology, food processing, and electronics

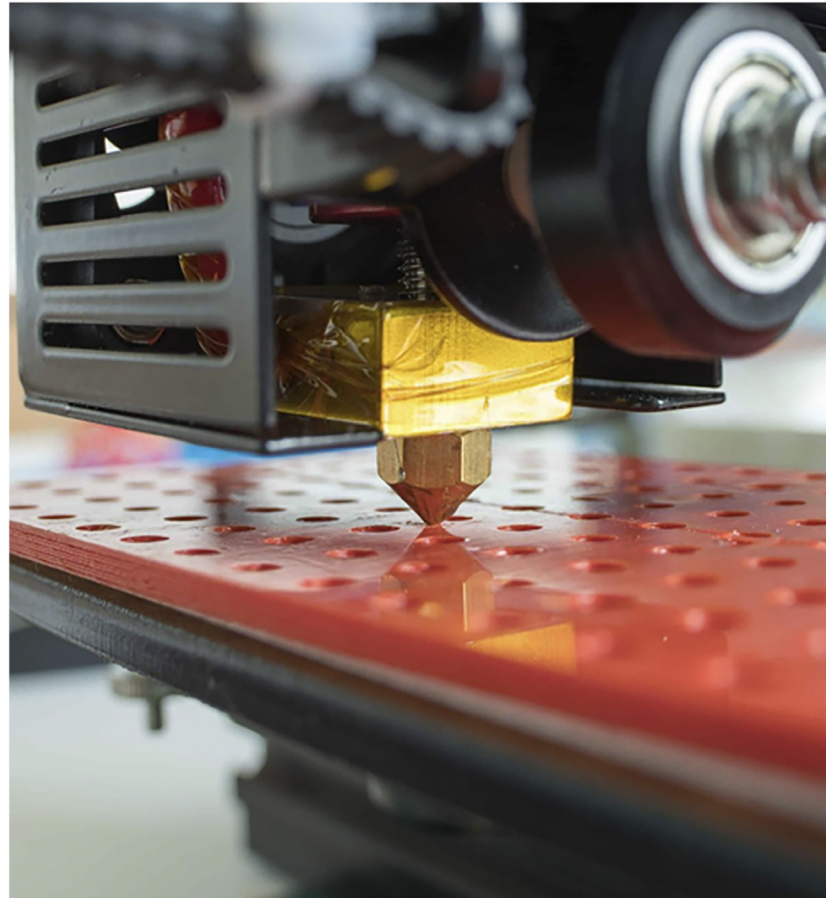
The automotive and assembly sector could achieve AI-driven benefits worth 2.6–4.0% of global industry revenue, or an aggregate impact of \$0.3–0.4 trillion U.S. dollars, while the value created for the advanced electronics/semiconductors industry could be between \$0.2–0.3 trillion U.S. dollars, representing 3.3–5.3% of the sector's income.<sup>78</sup>

The following list presents areas of opportunity for the region based on key global AI trends:

- **Collaborative robots (Cobots).** These refer to robots that work together as robot teams or alongside humans. They can communicate with each other independently, finding the optimal moment to carry out different activities or even to ask what to do.<sup>79</sup> According to the Gartner Hype Cycle for AI 2019, Smart Robotics is on its peak of inflated expectations, and will reach its plateau of productivity in 5–10 years.<sup>80</sup>
- **IIoT & 5G:** The Industrial Internet of Things (IIoT), together with 5G networks, allows for instantaneous connectivity between devices on a network, enabling heavy manufacturing companies and utilities to automate their core processes even more efficiently than was possible to date.<sup>81</sup>

- **3D Printing:** Over the years, 3D printing technology has matured enough for its use in industrial spaces. Soon, it is expected to be able to print using different polymer materials. The growth in new materials printing has made the technology a viable resource in the aerospace and automotive industries, which must meet stringent requirements.<sup>82</sup>

The following case studies (CS) provide international examples of how AI is being used for a wide range of purposes within the advanced manufacturing industry.





### CS: Brilliant Factory Program

Implementer: General Electric

There are 20 Brilliant Factories worldwide, spanning 9 industry sectors and linking real-time data from design, engineering, manufacturing, supply chain, distribution, and service activities into one intelligent system.

- General Electric's (GE) Predix cloud-based software platform processes factory data and predicts defects and failures.
- Using AI has enabled GE to reduce unplanned downtime on the shop floor by 20% and significantly improved product quality, throughput, and yield.<sup>82</sup>

According to the Gartner Hype Cycle for AI 2019, AI Platform-as-a-Service (PaaS) will reach its plateau of productivity in 5-10 years.

## CS: Flexibility implementing AI and IoT in Manufacturing

Implementer: Oil and gas industry

The steel manufacturer giant Schneider Electric is incorporating AI into its processes in order to continue pursuing its mission and remain relevant, together with help from Microsoft. Schneider Electric is now using technologies like AI and the IoT to transform the breadth of its offering, staying away from the one-size-fits-all approach.

- Microsoft and Schneider collaborated to embed Machine Learning in Realift Rod Pump Control, a solution for lifting liquids in the oil and gas industry that incorporates Azure Machine Learning and Azure IoT Edge, providing it with predictive capability.<sup>83</sup>
- Realift enables operators to identify and better understand pump abnormalities, even if those abnormalities occurred two miles underground. Ruling out false positives, predictive analytics can power a 15% increase in productivity when pumps are functioning optimally, for longer periods of time.<sup>84</sup>

According to the Gartner Hype Cycle for AI 2019, Edge AI will reach its plateau of productivity in 2-5 years.<sup>85</sup>



### 3. BUSINESS SERVICES

Regionally, the business sector provides employment to over 19,500 people.<sup>86</sup> Main components include: contact centers, technical support, and back-office operations.

The internal functions of global corporations such as accounting, finance, human resources, legal, and information technology are plagued by large amounts of detail-oriented and repetitive tasks. In these cases, AI presents a significant opportunity to save time, reduce costs, and increase productivity and accuracy with cognitive automation.<sup>97</sup> According to a survey exploring how companies use AI, 51% of AI leaders predicted that, by 2020, AI's biggest impact will be on the back-office functions of IT and finance/accounting.<sup>98</sup>

Investing in and adopting AI for routine back-office functions does not necessarily have to reduce the headcount. The technology can also be employed to improve the effectiveness of the personnel that directly deals with clients.<sup>97</sup> Global marketing and sales, as well as international supply chain management and manufacturing are the areas with most to gain from the use of AI. Potential aggregate value is estimated to reach \$1.4–2.6 for marketing and sales and \$1.2–2.0 trillion U.S. dollars for international supply chain management.<sup>88</sup>

The following list presents areas of opportunity for the region based on key global AI trends:

- **AI for Hiring:** AI and Machine Learning tools are being implemented in the hiring process with the hopes of identifying more qualified candidates, reducing human bias, and decreasing the time spent on automatable tasks.<sup>89</sup>
- **Productivity Bots:** Productivity bots aim to help teams and individuals operate more productively by automating time-consuming and often mundane tasks.<sup>90</sup>
- **Retail APIs:** There are now hundreds of Application Programming Interfaces (APIs) built for marketing and retail operations. These are tools to build software applications by facilitating the flow of data from one entity to another. Retailers are making their data available to developers and marketers via APIs in order to provide them with insights that allow them to offer new and better services to consumers and partners.<sup>91</sup>

The following case studies (CS) provide international examples of how AI is being used for a wide range of purposes within the business services industry.

**CS: Augmenting Customer Service Agents in Contact Centers**

**Implementer: DigitalGenius**



**DigitalGenius is offering AI-powered technology to scan and tag emails in order to direct them to the right office. The system also provides agents with macros and clips from the best past scenarios to quickly create a response.<sup>92</sup>**

- Learning provider Magoosh has augmented their customer experience and increased efficiency by implementing DigitalGenius in their Zendesk agent interface. DigitalGenius helps service agents with case classification, tagging, and re-routing, with a 92% accuracy rate when it comes to tagging predictions. 83% of all reported cases are now supported by DigitalGenius, with 10% of total ticket volume now resolved from end-to-end without agent involvement.<sup>93</sup>
- KLM Royal Dutch Airlines also uses the tool. It now supports over 50% of all KLM inquiries. When agents need to answer customer questions, the system provides them with a suggested answer. The AI system learns from the agents' actions and is able to make better recommendations over time. The latest data shows a 55% increase in accuracy between the months of January and June of 2018.<sup>94 95</sup>

According to the Gartner Hype Cycle for AI 2019, Machine Learning will reach its plateau of productivity in 2-5 years.<sup>96</sup>

**CS: Automating Back Office Operations**

**Implementer: Walmart**

**Walmart has deployed more than 500 bots in its internal environment to automate processes and drive efficiencies. Early use cases focused on automating processes such as accounts payable, accounts receivable, and compensation and benefits.<sup>100</sup> With more than 200 million invoices handled, Walmart presented an environment ripe for automation and AI.<sup>101</sup>**

- AI-based systems are speeding up and increasing the efficiency and reliability of the processes organizations use to procure for products and services while also ensuring compliance with corporate and regulatory policies.<sup>102</sup>
- AI software tools spot anomalies, identify relevant data to enhance procurement systems, assign procurement items to the right people for approval, and expedite purchasing processes.
- AI software tools are helping turn internal procurement processes into efficient, high powered operations that reduce or eliminate bottlenecks, spot opportunities for bulk purchase discounts, consolidate purchases across departments, reduce waste, fraud, and abuse, and keep purchasing in compliance with various rules and regulations.

According to the Gartner Hype Cycle for AI 2019, Robotic Process Automation (RPA) will reach its plateau of productivity in less than 2 years.<sup>103</sup>



## 4. DEFENSE AND AEROSPACE

The defense industry employs approximately 40 thousand people,<sup>103</sup> mainly in Las Cruces and El Paso. Industry components include: the largest military complex for homeland-security research and development of the Department of Defense, the Fort Bliss Regional Military Complex, the White Sands Missile Range, and the Holloman Air Force Base. With the promise of adding around \$50 billion U.S. dollars to the global aerospace and defense sector, the use of AI could enable an annual value creation equivalent to Lebanon's GDP.<sup>104</sup>

The Borderplex is home to a global hub for the commercial space transportation industry with a number of unique assets. The region has a focus on research and development in the White Sands testing facility, has state-of-the-art infrastructure and corporate presence (Spaceport America and Virgin Galactic global operations), is home to the International Symposium for Personal and Commercial Spaceflight and the Las Cruces Space Festival, and has developed a 2020 Commercial Space Taskforce.

The following list presents areas of opportunity for the region based on key global AI trends:

- **Space Tourism:** Commercial crew test launches for commercial space flights are now underway, ushering in a new era of space tourism.<sup>105</sup>
- **Galactic Ride Sharing:** Companies will be sharing rides to send products to space.<sup>106</sup>
- **MicroSats and CubeSats:** Entrepreneurs are building and preparing to launch thousands of low-cost, high-value satellites in 2020. These satellites are small, capable of communicating with each other, and will photograph every inch of the Earth's surface every day of the year.<sup>107</sup>

The following case studies (CS) provide international examples of how AI is being used for a wide range of purposes within the defense and aerospace industry.

## CS: AI-Enhanced Military Training

Implementer: Army Research Lab

In December 2018 the Army Research Lab issued a call for whitepapers,<sup>108</sup> seeking input on data and automation capabilities to improve its current Synthetic Training Environment. The latter specifically looks at AI capabilities, data analytics, Machine Learning, augmented reality, and distributed computing for simulated training.

- The use of Machine Learning will create customized training simulations that are more dynamic and responsive than what is possible in real-world training scenarios.
- Data collected from countless simulation iterations will be able to provide insight that can be used to refine tactics for real-life operations and in turn be tested again in a virtual reality environment.
- This feedback loop of information will offer new ways to refine strategies and find best practices in a way never before possible. Programs will identify patterns in a soldier's actions and employ Machine Learning to adapt the behavior of opposing non-player characters in real time.<sup>109</sup>
- AI has already beat tactical experts in combat situation programs. ALPHA, an AI that controls flights of unmanned combat aerial vehicles in aerial combat missions within a high-fidelity simulation environment, coordinates accurate tactical plans and precise responses within a dynamic environment, over 250 times faster than its human opponents.<sup>110</sup>

According to the Gartner Hype Cycle for AI 2019, Machine Learning will reach its plateau of productivity in 2-5 years.







### CS: Predictive Maintenance for Military Vehicles

Implementer: Army Research Lab

**The army is testing AI for the predictive maintenance of their vehicles:**

- It is monitoring several dozen Bradley M2A3 vehicles using a Machine Learning algorithm from Uptake Technologies that predicts when components will fail.<sup>112</sup>
- The system allows the army to move from corrective to predictive maintenance, addressing issues before they become serious problems and complementing (or augmenting) the work of humans.
- The software monitors engine data points such as temperature, coolant, and RPM, and compares them to those from similar engines that have failed in order to identify patterns. The company has over 1.2 billion hours of operating data the AI can draw from to make predictions.<sup>113</sup>

According to the Gartner Hype Cycle for AI 2019, Machine Learning will reach its plateau of productivity in 2-5 years.<sup>114</sup>

## 5. LIFE SCIENCES AND HEALTHCARE

The medical devices industry alone employs over 40,000 people<sup>115</sup> throughout the Borderplex. It is highly sophisticated and presents considerable potential for integrated growth. Some of the specialties and main focus areas include: post-traumatic stress disorder, traumatic brain injury, prosthetics development, and advanced operative procedures, device manufacturing (particularly in specialty fields such as cardio and general/plastic surgery), research and clinical trials. The use of AI in healthcare systems and the services sector could produce value between 2.9-3.7% of global industry revenue, or an aggregate impact of \$0.2-0.3 trillion U.S. dollars, while the potential value of AI in the pharmaceutical and medical products industry could be worth 4.2-6.1% of the global sector's income, meaning \$0.1 trillion U.S. dollars as estimated impact.<sup>116</sup>

The following list presents areas of opportunity for the region based on key global AI trends:

- **AI in medical procedures:** AI brain surgery, AI operations, AI research and clinical trial. Researchers and healthcare providers are increasingly using Machine Learning, Deep Learning and other types of AI to pore over data and harness analytics. They are spotting patterns that help healthcare providers treat at-risk groups more effectively.
- **AI for improved medical design:** Pharmaceutical companies and biomedical device makers are tapping into AI to develop algorithms that produce more effective drugs, smart prosthetics, robotic surgical systems, and virtual reality applications that help treat conditions such as depression and Post-Traumatic Stress Disorder (PTSD).

• **Clinical research:** AI applications in clinical research are seen in:

- **Recruitment:** The lengthy process of finding and enrolling the right patients for a clinical trial can be significantly shortened by using electronic health records together with other sources of patient information to quickly identify the right patient population.
- **Adherence:** A lot of clinical trials fail because of non-adherence, resulting in huge losses in time and money. AI can significantly increase adherence rates and thus elevate the success rate of clinical trials via different formats. For instance, smartphone apps can remind patients to take their medication and even check whether they have done it or not.
- **Decision-making Process & Diagnostics:** When deciding on the right course of action before or during a trial, AI can be helpful as it can consider current and historic information from numerous resources such as monitoring devices, other clinical trials, doctor's notes, publications, etc. For diagnostics there is a whole range of different areas where AI can assist doctors. These include image analysis, voice analysis, keystroke analysis, analysis of EEGs, ECGs, breathing rate, heart rate, sleep pattern and movement. The monitoring and analysis of all these functions is much more efficient with AI as it is able to monitor parameters around the clock.

The following case studies (CS) provide international examples of how AI is being used for a wide range of purposes within the life science and healthcare industry.



### CS: AI-enhanced Diagnosis of PTSD

Implementer: Army Research Lab

**Research shows that soldiers are more likely to open up about PTSD when speaking with an AI-based virtual avatar than with a human or when taking a survey.<sup>117</sup> A common barrier to healthcare for psychiatric conditions is the stigma associated with these disorders, which prevents many soldiers from reporting symptoms.**

- After-duty mental health assessments rarely collect honest responses.<sup>118</sup>
- An avatar provides the advantages of anonymity, while also providing a degree of social connectivity.<sup>119</sup>
- AI can diagnose PTSD by analyzing voices.<sup>120</sup>
  - AI devices are able to tell the difference between the voices of patients with PTSD and healthy individuals with an 89% accuracy rate.<sup>121</sup> Characteristic features of PTSD-affected patients include a metallic, emotionless tone, and deterioration of speech clarity overall.<sup>122</sup>

- The use of the random forest statistical/Machine Learning methods, helpful for classification, among other applications, increases accuracy as more and more data is added to the pool.<sup>123</sup>
- The software identified 40,526 particular vocal features that were examined for commonalities.<sup>124</sup>

According to the Gartner Hype Cycle for AI 2019, Speech Recognition is already on its plateau of productivity, which means that its mainstream adoption has started.<sup>125</sup>



**CS: Premera Scout powered by Microsoft Healthcare Bot**

**Implementer: Premera Blue Cross**

**A service that empowers healthcare organizations to build and deploy an AI-powered, compliant and conversational healthcare experience at scale.**

- The bot gives authorized access to medical information and combines built-in medical intelligence with natural language capabilities, extensibility tools, and compliance constructs.<sup>126</sup>
- Premera Blue Cross has enabled a virtual assistant to:
  - Help customers quickly know where to get information on claims, benefits, and other Premera services on Facebook Messenger.
  - Help customers "self-serve" basic questions at any hour, giving customer-service employees more time to handle complicated requests.
  - Premera Scout is built with frequently asked questions in mind. It is not intended to give or receive customer-specific health information.<sup>127</sup>
  - The Premera Scout health plan is already benefiting 2 million customers in Washington and Alaska. As it matures, it will help improve the Microsoft Health Bot service.

According to the Gartner Hype Cycle for AI 2019, Chatbots will reach the plateau of productivity in 2-5 years.<sup>128</sup>

## 6. TOURISM

The tourism sector employs about 88 thousand people throughout the Borderplex region.<sup>129</sup> Industry areas include: cultural tourism, eco tourism, shopping tourism, sporting events and entertainment, and medical tourism. In the regional context, it represents 6 million tourists per year.<sup>130</sup> AI has the potential to add value equivalent to 7.2-11.6 % of its revenues to the tourism sector, an aggregate impact of \$0.3–0.5 trillions U.S. dollars.<sup>131</sup>

The following list presents areas of opportunity for the region based on key global AI trends:

- **Big Data and AI:** They can help cities and tourism organizations better understand the needs of locals and tourists for strategic decision-making with regards to marketing, policy, and recommendations based on real evidence, thus improving the visiting experience.
- **AI and hospitality:** The hotel industry sees AI as a key technology with the ability to make hospitality more guest-centric. Beyond chatbots, the use of which is increasing in the industry, hotels are gradually adopting the latest trend of robots for customer service.<sup>132</sup>
- **Customer service:** Retaining customers and responding to their increasingly complex expectations is an industry-wide challenge that can be tackled by the adoption of recommendation systems powered by AI. These can be trained with real-time and historical data from guests, such as previous reservations and behavior to adapt service to the context of each specific guest, providing a superior experience.<sup>133</sup>

The following case studies (CS) provide international examples of how AI is being used for a wide range of purposes within the tourism industry.





### CS: Analyzing Tourist Insights with AI tools

Implementer: Citibeats AI<sup>134</sup>

AI text analytics can help analyze emotions, feelings, and other valuable information, identifying trends that can help take advantage of and power local tourism. For instance, tourism in Cork (United Kingdom)<sup>135</sup> used Citibeat AI to generate the following insights:

- In January 2019, an analysis using language segmentation found that the number of locals outnumbered tourists at tourist sites by 3:1, leading to more local targeting during the rest of the winter season.
- Using sentiment analysis, more emotions (both positive and negative) were found to be shared at the Cork airport than at the next 4 top tourism sites combined. Because the holiday starts in the airport, this presents an opportunity to develop early interventions for unhappy tourists.

According to the Gartner Hype Cycle for AI 2019, Machine Learning is on its peak of inflated expectations, and will reach its plateau of productivity in 2-5 years.<sup>136</sup>

## CS: AI-powered Virtual Assistant for Tourists

Implementer: SmartEco Map

**SmartEco Map is a virtual assistant for tourist destinations powered by IBM Watson that talks to the traveler, understands his or her preferences and needs, recommends activities, routes and places to visit, and gives information about the destination.<sup>137</sup>**

- Lanzarote, one of the Canary islands, gives users visiting personalized recommendations:
  - When picking a beach, for example, the program will take into consideration weather factors like wind speed and direction to make the optimal recommendation.
  - SmartEco learns more about the destination every day, allowing the assistant to answer a broader range of questions each time.

According to the Gartner Hype Cycle for AI 2019, Virtual Assistants will reach their plateau of productivity in 2-5 years.<sup>138</sup>



# WORKFORCE DEVELOPMENT AND FUTURE OF WORK AGENDA



*“Technical preparation is important, but we also need to build soft skills. How to be confident and ambitious. How to communicate effectively and conduct a job interview successfully”*

**Enrico Pontelli, New Mexico State University**

Accelerated technology development and implementation has historically gone hand-in-hand with changes and adjustments to the labor market and to industrial processes. As shown in the analysis below, the Borderplex region’s workforce will face important work-related challenges because of increasing automation, which need to be met with tailored transition strategies, including social safety nets for people during periods when they are unable to find a new job with their current skills. Although the World Economic Forum predicts that AI will have created more jobs by 2022 than it has eliminated,<sup>139</sup> It is important for every region to devise adaptation strategies to ensure a comprehensive and inclusive transition. The collection of these strategies is called a Future of Work agenda. It paves a careful way to a future with new, humanistic jobs and human-machine teams (a concept known as cobotization) powering the AI revolution. More and more, AI is taking charge of routine tasks, making way for humans to take on jobs that require more soft skills,<sup>140</sup> although many of us will be needed to oversee and ensure adequate control of algorithmic models and their outputs. The sudden increased need and value of soft skills will offer a whole new range of roles available for workers and their unique human abilities.

A Future of Work agenda also invites us to rethink the role of educational institutions. Universities in the Borderplex region have yet to adapt their curricula and become more flexible to the current and future needs of the region. This could involve widening their offer of STEAM careers (with a special focus on the arts and social sciences career paths, as well as subjects such

as Artificial Intelligence and related technologies). Given the predominance of the manufacturing sector in the region, it will be important to continue focusing on the development of technical professionals, but this cannot be done at the expense of careers that provide students with soft skills. It will be important for the universities to provide more social science degrees, equipping the new generation with strong core skills such as the ability to learn, problem solving, communicating ideas, sharing information and collaborating as a team.<sup>141</sup> The future will require a much more rounded workforce, able to think exponentially and work in multi-disciplinary teams.

The authors’ analysis concludes that the region would benefit from further strengthening and encouraging collaborations between academia and industry. Organizations such as The Bridge of Southern New Mexico have successfully linked educational institutions with the business community, focusing on two main objectives: increasing high school and college graduation rates, and building a skilled and ready workforce. Such initiatives help students prepare more effectively for entering the workforce and can help them attain job security.



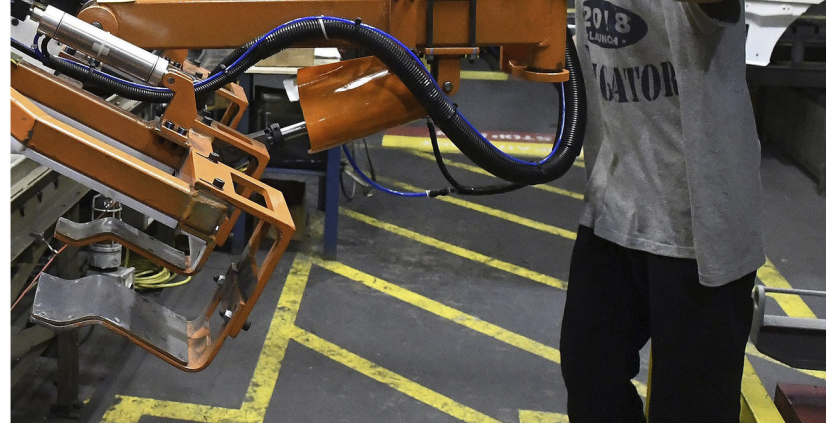


## POTENTIAL IMPACT OF AUTOMATION ON EMPLOYMENT

As fields such as Machine Learning and robotics continue to develop, so does our ability to improve processes and automate certain tasks, impacting jobs. The research developed for this report found that approximately 711,000 jobs (around 62% of total jobs) in the Borderplex region could be impacted by automation to varying degrees in the next five to 20 years, depending on the occupational structure of the workforce in each city.<sup>142</sup>

In their preeminent work *The Future of Employment*, Frey and Osborne examines the susceptibility of jobs to computerisation, estimating the probability for 702 occupations to be automated.<sup>143</sup> The authors found that 47% of jobs in the U.S. are considered at high risk of automation in the next coming years (five to ten years).

Estimates for Mexico indicate that 19% of the labor market (or 9.77 million jobs) will be impacted by automation in the next 20 years and that 16% of occupations will be affected by automation in the short term (five to ten years).<sup>144</sup> According to a report from CIPPEC (2018), the ten occupations most likely to be fully automated in Mexico represent about 1.3 million jobs, which calls for an urgent upskilling and reskilling cross-sector strategy. It is also interesting to note that figures from Banco de Mexico indicate that between 2005-2017, approximately two thirds of the population employed in Mexico worked in an occupation at high risk of automation.



A Future of Work agenda is important for all stakeholders (students, workers, the unemployed, employers, entrepreneurs, the industry, and different levels of government), as it strives to proactively prepare them for the impact of accelerated technological change on the workforce, ensuring the entire ecosystem is able to make the most of the new dynamics.

Despite uncertainty with regards to the pace of technological adoption and the impact that disruptive technologies will have on the Borderplex region jobs, the importance given to intrinsic human skills within a certain job can provide insight into the timing of automation (short, medium or long-term). The more important soft skills, such as awareness and manipulation in complex contexts, creative intelligence, and social intelligence, are in a job, the more difficult it will be to automate, meaning that automation will take longer to happen.<sup>145</sup>

Using current data on the level of employment, the following section estimates the automation risk at a Borderplex region level and at a city level. The analysis can be found in Annex 1 together with the methodology used. The following section highlights the main findings.

## AUTOMATION IN THE BORDERPLEX REGION

The findings presented in the assessment of the potential job automation for the region show that the greatest impact could occur in the short-term (next five to ten years), with the total number of jobs impacted decreasing over time.

As employment in the Borderplex region is concentrated in occupational schemes that are prone to automation, there is a need for short-term strategies

to offer the vulnerable working population job reinsertion opportunities through upskilling and reskilling programs. The latter should develop abilities that lead the way to more human-machine collaboration, and should be accompanied by proper safety nets for workers that cannot be relocated immediately. Table 1 summarizes the findings for the Borderplex region as a whole.

**Table 1. Borderplex Region: Potential Automation Risk and Impact on Employment**

| City              | Jobs at risk ( as a % of total jobs) | Estimated Jobs Impacted | Most impacted occupations                                    | Jobs at high risk (short-term automation) (%) |
|-------------------|--------------------------------------|-------------------------|--|---|
| Las Cruces        | 53.04                                | 44,742                  | Office and administrative support                            | 59.88   |
| El Paso           | 55.70                                | 198,882                 |  | 60.24   |
| Ciudad Juárez     | 66.72                                | 467,739                 | Assemblers and assemblers of electrical and electronic parts | 83.93   |
| <i>Borderplex</i> | <i>62.27</i>                         | <i>711,363</i>          | <i>Average</i>   | <i>68.02</i>                                  |

Source: Frey & Osborne (2017), U.S. Census Bureau (2019), INEGI (2019).

It is important to note that each city has specific particularities that must be taken into account when designing Future of Work strategies. In terms of the number of potential jobs impacted, service occupations, and sales and office occupations are particularly vulnerable in U.S. cities, followed by food preparation

land serving related occupations. Industrial machinery operators, assemblers, drivers and transport drivers are the most vulnerable in Mexico, as well as auxiliary workers in administrative activities and merchants, sales employees, and sales agents.

## CHALLENGES AND OPPORTUNITIES

The previous sections offered a view of the possibilities that AI offers for the Borderplex region, along with potential risks. Many challenges still lie ahead, and the following section turns to local experts and practitioners to highlight them and offer specific mitigation strategies in order to fully take advantage of the promise of the AI revolution.

### LOCAL INSIGHTS

The research behind this report includes the interview of 36 key actors across a range of sectors in the Borderplex region (the full list of interviewees is provided in Annex 2). The following section offers a summary of the main insights they provided, pinpointing specific opportunities for a Borderplex AI strategy.

#### Awareness regarding AI application and impact

The Borderplex population presents a lack of understanding about AI, its applications, and the growth that it could unleash for the economy. As the foundation for any AI development, data is an increasingly valued asset in today's economy. Interviewees pointed to the enormous opportunity this creates for local companies to collect and analyze data in order to obtain insights that can help them improve processes, develop products, and, ultimately, better understand customer needs, provided they understand the opportunity. While the number of people in the Borderplex recognizing the power of new technologies and aware that AI will become a fundamental part of the economy is slowly rising, it is important to continue pushing for more promotion of this information. This could be done by sharing existing use cases and ensuring local businesses interested in the power of AI receive the support they need to get a sense of how AI could add value to their business. In fact, local businessmen and women report they do not perceive an evident value from exploring AI's potential impact and believe they do not have the appropriate background to take advantage of it.



### Resources, tools, and decision-making power

One of the big challenges in the Borderplex region is related to the structure of decision-making. C-Level executives in the maquila and manufacturing industry are based at the corporate headquarters in cities outside the Borderplex, leaving little room for the operative staff to discuss and suggest innovative ideas or experiments with new technology. While these ideas could be carried out through a local business, a lack of resources usually puts pilot projects to a halt.

For local businesses to innovate and take advantage of the local context, they would require more mentoring, networking opportunities, investment funds, and better tools for business plan and skills (technical and core) development. The lack of such resources act as a barrier to local innovation.

### Culture and local role models

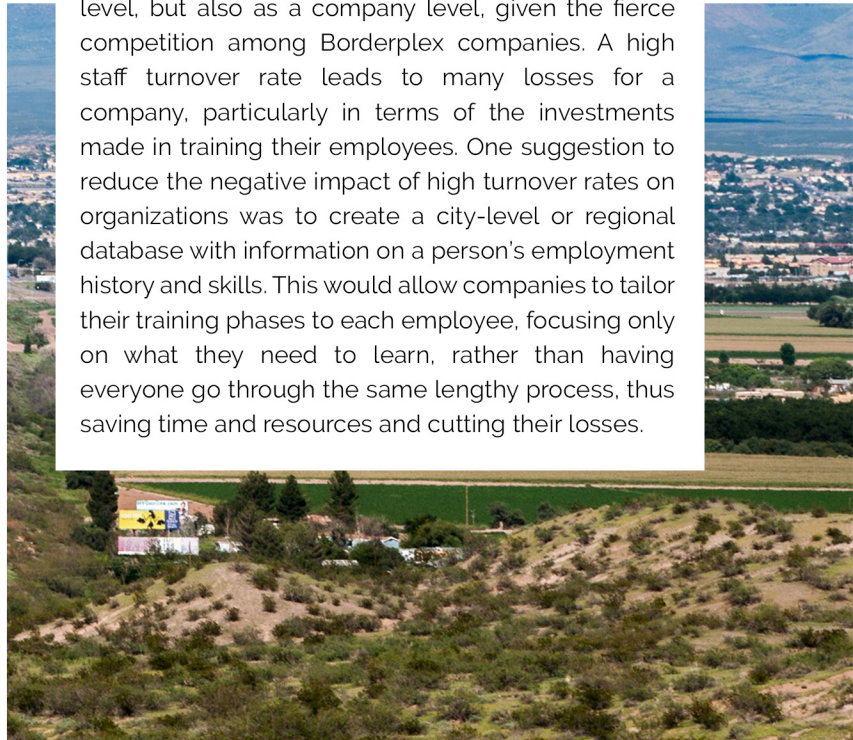
Despite the initiatives focused on generating specialized IT talent, local youth continues fleeing towards traditional careers such as Law and Medicine. Interviewees believe this is due to pressure from older family members who fail to see the benefits of pursuing a career in fields such as AI, Data Science and/or Mathematics. This challenge is further amplified among young girls, who are encouraged to partake in more art-related activities than technology-related ones, as observed by various interviewees. Actively increasing cross-generational awareness with regards to the needs of Industry 4.0 and implementing tailored strategies to advertise these careers among girls and young women would contribute to increasing local IT talent and reducing the gender gap. Interviewees also suggested promoting local role models, which could help boost the confidence of local youth, and encourage them to develop the

technical and core skills that will provide students with future job security and social mobility. Because many students are first-generation high-school or college graduates, it is important to feed their ambition.

### Talent retention

Universities in the Borderplex are creating talented professionals, but the region's low wages act as a disincentive for them to stay and build local careers, leading the region's young educated population to seek opportunities elsewhere, in neighboring cities or states that offer higher salaries. Interviewees reported that, although the ecosystem might present interesting opportunities for entrepreneurship, most of these recent graduates prioritize job security over building their own startup.

Talent retention is not only a challenge at a regional level, but also as a company level, given the fierce competition among Borderplex companies. A high staff turnover rate leads to many losses for a company, particularly in terms of the investments made in training their employees. One suggestion to reduce the negative impact of high turnover rates on organizations was to create a city-level or regional database with information on a person's employment history and skills. This would allow companies to tailor their training phases to each employee, focusing only on what they need to learn, rather than having everyone go through the same lengthy process, thus saving time and resources and cutting their losses.



### Articulation of actions and unifying Borderplex perception

Geographical barriers such as the U.S.-Mexico border and the considerable distance between cities, together with the restrictive immigration policies that prevent swift border crossings, are challenges that hinder the integration of the region. Another regional challenge is related to meaningful collaborations and common-grounds. For companies, it is difficult to share the specifics of their processes, methods, and use of technologies because of the high-levels of competition that exist in the region. However, there is a desire to close learning curves around common successes and failures to support the growth of the industry in general. Therefore, It is important to raise awareness about the benefits of collaboration and to develop collaboration frameworks, including best practice sharing without revealing proprietary processes and information, that provide the Borderplex region with added value.

### Greater binational and global visibility

There is a deficiency in highlighting on a national and global scale best case studies and key initiatives of the Borderplex region. A greater promotion and positioning, which could help attract more foreign investment.

One of the main challenges the three cities face is the development of an uplifting narrative telling the Borderplex story as one of opportunity and social mobility. A narrative anchored to family values as a regional identity and sense of belonging. This challenge goes in hand with a common sentiment from interviewees: the need to build confidence and leadership skills in students through experiential learning, so they realize they are well equipped to join the workforce.



### U.S. - Mexico Border Agencies

According to a report by Accenture<sup>146</sup>, AI is the next breakthrough technology for border ecosystems, which will allow border agencies to react faster to the evolving nature of travel and trade in a more automated way, as well as to detect illicit behaviors and patterns through big data analysis.

Even though the authors recognize the opportunity AI presents for border management and a number of potential applications to expedite border crossing and trade in the Borderplex region, these attributions fall before federal authorities both in the United and Mexico and have national security implications. In this regard, the focus of the following regional blueprint is not solely on policy recommendations, but rather on a series of actionable recommendations from a regional key actors perspective, including academia, civil society and private sector.

# A BLUEPRINT FOR HARNESSING THE AI REVOLUTION

*“Resilience is the capacity to persist, adapt or transform in the face of change in a way that maintains the main identity of a system.”*

**Lisen Schultz, Stockholm Resilience Center**

The size of the opportunity enabled by AI and new technologies, both for social and economic development, requires us to rethink the role of institutions and to align efforts and strategies within the ecosystem to one common vision. This systemic change is a challenging one to implement, especially because the shift in mindset it calls for is much slower than the pace of technological innovation. The time to get started is now.

Beyond the countless benefits the application of AI is already starting to generate, there are also potential risks that need to be mitigated in order to avoid the region falling behind in terms of competitiveness, technology development and adoption and to guarantee a smooth transition to the new labor market, especially for the most vulnerable groups.

The summary of recommendations offered below and developed in the following pages offer a guide for the Borderplex region to untap development opportunities by harnessing new technologies such as AI in a responsible and ethical way. The authors of this report believe a people-centered approach is key for laying the ground for the region's transformation towards greater prosperity, which is why many of these proposals focus on the most valuable asset of the region: its people.

## Summary of recommendations:

- Delineate a regional identity and communicate it proactively.
- Upgrade skill sets and push for the development of core skills.
- Transform the region into a hub for high-quality data.
- Fight silos with binational projects.
- Incentivize the development of regional and scalable AI pilots.
- Develop and grow the AI entrepreneurial landscape.
- Develop a strategy for the Future of Work.
- Become a champion of the human rights and ethically-aligned AI movements.
- Combine or align international and regional efforts
- Become a global AI-driven healthcare innovation powerhouse.
- Design and deploy a Borderplex AI Agenda for 2020-2030.





### Delineate a regional identity and communicate it proactively

The Borderplex region shares a common history and strong economic ties. The starting point to developing a common vision on top of which a regional identity can be built is understanding the shared values, attitudes, fears, and hopes together with the unique economic and social assets each city contributes. Being marketed and acknowledged as a united economic region can further attract opportunities and investment, in turn impacting the quality of life in the area.

#### Key recommendations:

- **Design and implementation of a regional identity campaign that focuses on the unique regional strengths.** For people, these would be the importance of family values, the good quality of life, and low costs. For businesses, it would include strong loyalty; the binational, bicultural and bilingual aspects; access to talent; a growing high-quality manufacturing ecosystem; resilience and proactivity. Both hard work and diversity are ingrained into the region's lifestyle, powerful assets for innovation ecosystems.
- **Creation of an annual Borderplex AI Champion Award** to increase the visibility of local talent and inspire and incentivize others into action.
- **Coordinate an annual visit/tour by media and relevant bloggers from Mexico and the U.S.** so they get to know the region on a firsthand basis and write about the opportunities and advantages of it.

### Upgrade skill sets and push for the development of core skills

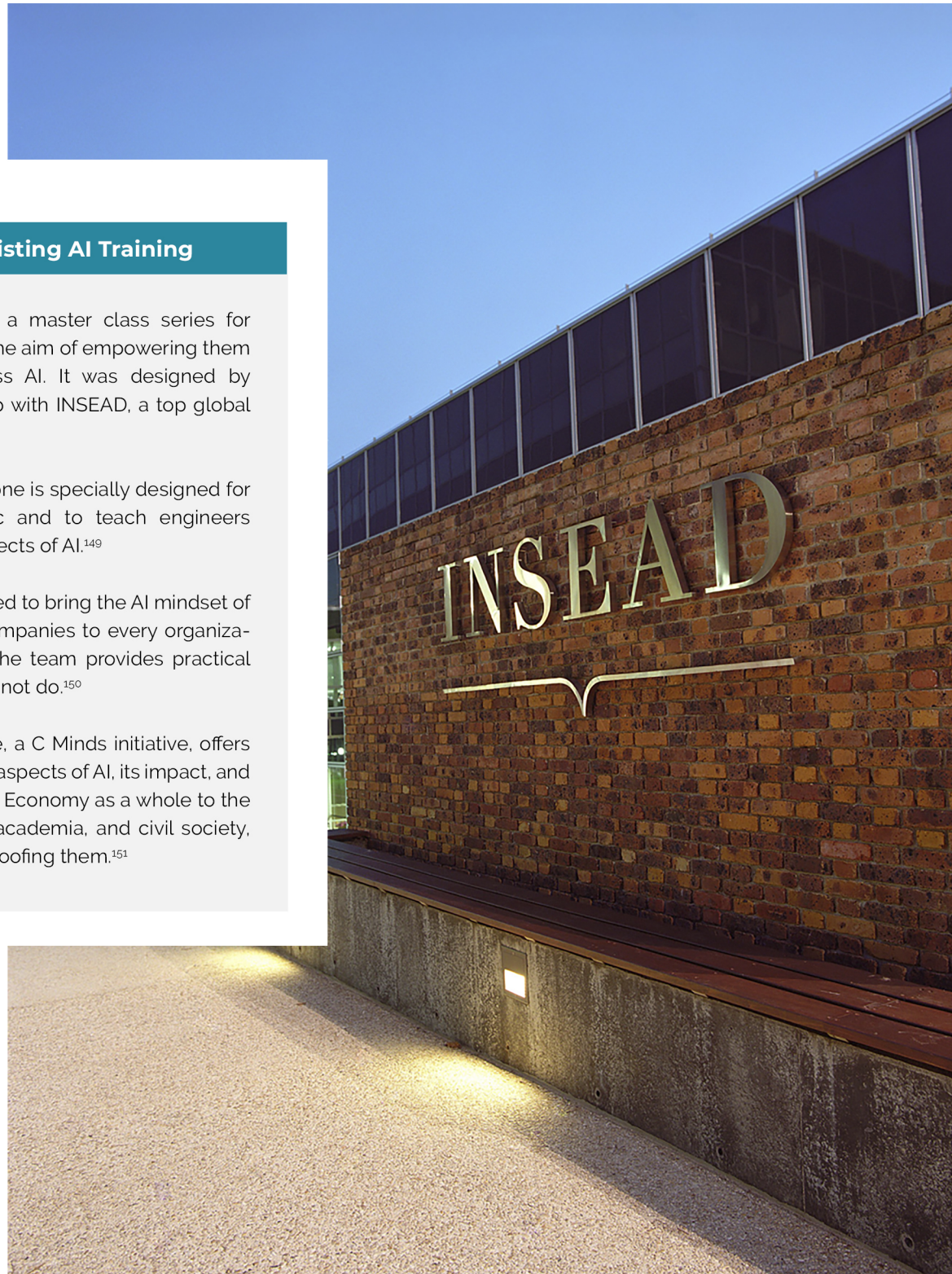
Before upgrading workers' skills, it is important to reach a better understanding of the new skills that Industry 4.0 will require. While technical capabilities are in growing demand, core skills (also referred to as soft skills), are unique human characteristics that will be increasingly in demand. critical thinking, problem solving, empathy, curiosity, and creativity are a few examples of skills that need to be proactively developed in formal and informal education programs. The region should also push for lifelong learning opportunities, which is becoming the new norm. It is understood as developing the ability to respond and adapt to a fast-changing environment.

#### Key recommendations:

- **Develop free or low-cost bilingual in-situ and online educational programs about AI and for core skill development,** in addition to harnessing existing programs. For increased effectiveness, these should be tailored to key groups such as industry leaders, non-technical executives, technical executives, workers, and policy makers. Both the Borderplex Alliance and the newly created Border IT Council should work hand-in-hand to lead the development of education and awareness campaigns, as well as online tools, around Industry 4.0, AI, and Future of Work, helping the population understand the opportunities and challenges brought about by the 4th Industrial Revolution.

### Examples of Existing AI Training

- AI Business School is a master class series for business leaders with the aim of empowering them to successfully harness AI. It was designed by Microsoft in partnership with INSEAD, a top global business school.<sup>148</sup>
- Coursera's AI for Everyone is specially designed for a non-technical public and to teach engineers about the business aspects of AI.<sup>149</sup>
- AI Academy was founded to bring the AI mindset of Silicon Valley's tech companies to every organization. With a free call, the team provides practical tips on what AI can/cannot do.<sup>150</sup>
- Academy for Resilience, a C Minds initiative, offers workshops on different aspects of AI, its impact, and on the new Global Data Economy as a whole to the industry, government, academia, and civil society, with the aim of futureproofing them.<sup>151</sup>





- **Work with universities and schools in the region to create joint skilled-based curricula for students and promote a project-based learning approach for AI**, partnering with key companies to allow students and researchers to work with the industry. They can be particularly helpful in developing solutions that harness advanced data analytics and AI.

### Promoting Computer Science teaching in schools with tech industry volunteers

**The Technology Education and Literacy in Schools (TEALS) program, from Microsoft Philanthropies connects classroom teachers with volunteers from the technology industry to create sustainable computer science programs. Volunteers support teachers as they learn to teach computer science.**<sup>152</sup>

- During the 2018-2019 school year, TEALS reached nearly 16,000 students at 494 high schools in the United States and British Columbia, Canada, powered by 1,450 tech volunteers from nearly 700 companies. TEALS students scored 8% higher than the national average on the 2018 AP Computer Science A exam.
- In the fall of 2018, El Paso students at Clint ISD Early College Academy, Eastlake High School, Eastwood High School, and Loretto Academy had the opportunity to learn to code with the help of the TEALS program.<sup>153</sup>
- Businesses based in El Paso are promoting the TEALS program among their employees and supporting them in their volunteer work. The University of Texas at El Paso is also promoting it among students interested in volunteering through the program.

- **Incentivize knowledge transfers between academic institutions around opportunities and challenges to offer flexible education programs suited for the AI revolution.** Further explore the growing trend of stacking credentials/education.<sup>154</sup>
- **Work with elementary schools to include the development of core skills from an early stage.** Children's belief systems, trust in their own abilities, and intrinsic motivation are key drivers that can become predictors of success. A growth and resilience mindset embraces challenges, views others' success as inspirational, believes mistakes and failures are part of the learning process, and values effort as a means to achievement. Exposing children to AI principles, computational thinking and STEAM programs from a young age can also help boost their interest in these fields.
- **Expose families to AI education.** Civil society to play its role in closing knowledge gaps through programs such as the AI education for families program implemented by Insights El Paso's Science Center.
- **Offer youth different career development paths, encouraging interest in STEAM careers,** with specialized marketing for women in order to reduce the gender gap.
- **Promote a mentorship system** in which successful practitioners in and beyond the Borderplex can inspire young people by providing them with relatable examples (e.g. latina business owners).

### STEAM Learning: A Mentorship System of Successful Practitioners Programs

Supported by a unique partnership in the UK between the government, charitable trusts, and employers, STEAM Learning is dedicated to raising young people's engagement and achievements in STEAM subjects and careers<sup>155</sup> STEAM Ambassadors (the mentors) are volunteers from a wide range of science, technology, engineering, arts, and mathematics backgrounds across the country that bring a fresh and inspiring perspective. To achieve their goals, STEAM Ambassadors deliver a range of activities such as career talks, mentoring, practical workshops, and exhibitions.

The system has succeeded in helping and encouraging young people, increasing engagement, importance awareness and understanding of STEAM.

- **Promote a Quadruple Helix Approach: collaborations between industry sectors, academia, civil society,** and the government to align training programs and strategies provided by educational institutions, with the needs of industry. One example of such undertakings are externships, which are programs that offer teachers an opportunity to spend a week during the summer in a company, supplying them with a deeper understanding of workplace needs, which they can then convey to their students.
- **Develop an annual survey assessing the new skill sets needed in the industry** and communicate the results to the local chambers of commerce, universities, and other interested parties to align training efforts with real industry needs.<sup>156</sup>



- **Design an incentive mechanism (in the form of tax policies, public recognition, or industry rewards)** for companies and other institutions to implement upskilling, reskilling and continuous training programs (core and technical skills) to help the population keep up with the latest tools and trends.

### Transform the region into a hub of high-quality data

The Borderplex's abundance of data must be harnessed for social and economic development. To date, there has been no successful coordinated effort to position the region as a source of economic data, nor a push for data interoperability for business intelligence purposes. A data-driven economy requires shifting away from traditional industrial activity towards data analytics as a tool for competitive advantage.

#### Key recommendations:

- **Foster a data culture in the public and private sectors.** Train teams to understand anonymization, security techniques, and ethical guidelines to guarantee that data privacy rights are respected.
- **Develop a regional** open data portal that publishes government data in open formats according to international standards.

## Open Data Standards

These include, for instance, the work of The Internet Engineering Task Force (IETF), W3C's data recommendations in the Web Best Practices<sup>157</sup> report, ISO/IEC 20802-2:2016 standards, among other international open data standards and best practice guidelines.

The Open Data Standards Directory, a joint effort by the universities of McGill and Johns Hopkins, created more than 60 Open Data standards on how governments could publish open data. It includes categories like finance, services, transportation, public facilities, environment, and many others.<sup>158</sup>

- **Prioritize the publishing of public and private data based on industry needs.** Connect and align the regional open data portal with Mexico's and the United States' national open data portals and strategies.

## National Open Data Strategies in the U.S. and Mexico

The U.S. Federal Data Strategy has the mission to fully leverage the value of federal data for mission, service, and the public good by guiding and encouraging governments to practice ethical governance, conscious design, and adopt a learning culture.<sup>159</sup>

In Mexico, the Estrategia Digital Nacional (National Digital Strategy) is the governmental action plan implemented to build a Digital Mexico, including Datos Abiertos (Open Data) site.<sup>160</sup>





- **Collaborate with initiatives such as the Borderplex Alliance** on their goal to become the regional source of economic data.
- **Pilot industry specific Data Trusts as data governance mechanisms to share data between public and private institutions** in a safe and ethical way, helping to generate large pools of local data to train AI algorithms.

### What is a Data Trust?

According to the Open Data Institute (ODI), the aim of a data trust is to give people and organizations confidence when enabling access to data in ways that provide them with value. It is understood as a way to "share data in a fair, safe and equitable way"<sup>161</sup>

### Fight silos with binational projects

There is a need to develop more cross-border projects, helping cities identify opportunities to collaboratively reinforce their economies and thus, the Borderplex economy as a whole.

### Key recommendations:

- **Promote experiential learning internships and exchange programs**, making them binational when possible.
- **Organize AI-related regional contests and pitch competitions** as a means to promote innovative solutions to social or industry challenges from within the region and to strengthen the entrepreneurial culture. Harness the existing innovation hubs in the three cities for the ideation, promotion, and execution of these contests. Promote online challenges along the ones that require physical presence in order to avoid migration-related issues.
- **Develop a repository of best AI use cases in the Borderplex**, allowing people and organizations from other cities to learn about existing efforts and lessons, share resources, and to promote collaborations.
- **Coordinate a bilingual newsletter or social media initiative** to consolidate communication for events, resources, and opportunities related to innovation, entrepreneurship, the AI revolution and digital transformation of Ciudad Juarez, El Paso, and Las Cruces. Partner with key stakeholders of the three cities to promote it.

## Incentivize the development of regional and scalable AI pilots

It is important to give more visibility to local success stories around innovative and beneficial applications of AI, both from the entrepreneurial and industrial realms. As mentioned in the section above, making these pilot projects binational can help fight silos and foster regional collaboration from the beginning.

### Key recommendations:

- **Market the Borderplex as the first binational AI Living Lab.** The Borderplex AI Living Lab can serve as an umbrella branding effort to unite emerging pilots under a common narrative and gain local traction and international recognition.

### What is a Living Lab?

A living laboratory or lab operates in a real-life context with a user-centric approach. It is a research concept that functions in open-innovation ecosystems in a territorial context, integrating concurrent research and innovation processes within a public-private-people partnership.<sup>162</sup>

- **Create a fund to kickstart key pilot projects in alignment with regional industry priorities in each of the six key Borderplex sectors** (advanced logistics, advanced manufacturing, business services, life sciences and health, aerospace and defense, and tourism).
- **Prioritize the documentation of AI pilot projects through their different phases** (ideation, development, implementation, evaluation)
- **Champion the development of AI-based projects for key border social topics such as migration and human rights**, advancing the UN Sustainable Development Goals (SDGs) and positioning the Borderplex as a leader in AI for impact.



## Develop and grow the AI entrepreneurial landscape

For the region to harness the power of AI beyond academic research, it must support the development of an entrepreneurial ecosystem where entrepreneurs team up with AI experts to deliver solutions. For this purpose, it is paramount to develop a culture of digital skills and offer the necessary resources.

### Key recommendations:

- **Create a unified, regional soft landing program for AI-driven startups** in collaboration with the leading innovation and entrepreneurship hubs of El Paso, Ciudad Juarez and Las Cruces. This can help attract innovation-based companies and high-skilled talent to the region and allow them to effectively start operations.
- **Create a regional Angel Fund or Venture Capital (VC) Fund** for the development and scaling of AI-driven startups. Attract existing U.S. and Mexico AI-focused VC funds to the region.



## Examples of Existing VC Funds

There are several examples of existing funds supporting entrepreneurs,<sup>163</sup> such as:

- Softbank Group, a multinational holding group based in Japan, has the largest private equity fund in the world, with \$93 billion U.S. dollars dedicated to technological development (Softbank Vision Fund).
- Intel Capital invests in a range of technological start-ups and controls mergers and acquisitions. By 2011 it had invested in over 1,280 companies across 54 countries, dedicating over \$10.83 billion U.S. dollars to capital investments.
- Institutional Venture Partners, a U.S.-based private equity fund, has invested in well-known companies such as Slack, Github, Pindrop, Soundcloud, and Indiegogo, with total committed capital reaching \$7 billion U.S. dollars.
- Mountain Nazca is a venture capital firm focused on supporting bold entrepreneurs who seek to develop new technologies and transform existing business models using technology.<sup>164</sup>
- Alta Ventures, a venture capital fund based in Monterrey, Mexico, has helped launch more than 80 companies in the realm of the internet of things, mobile devices, consumption, security, health, and communications.<sup>165</sup>
- Latin Idea Ventures is a Mexican venture capital fund that has raised over \$200 million U.S. dollars to date in four investment vehicles for startups in advanced phases within the technology and media and telecommunications sectors.<sup>166</sup>

- **Develop a regional program that offers international mentorship to AI-based startups** (or collaborate with existing ones) in coordination with the existing innovation and entrepreneurship hubs.

### Examples of Acceleration Programs

Launchpad Accelerator consists of regional accelerator programs that help startups build products with Google tools. The 3-month program includes mentorship and runs in over 40 countries around the world. Launchpad Accelerator Mexico, based in Mexico City, supports startups in Latin America focused on using AI/ML with a global mindset.<sup>167</sup>

The ODI startup incubator ran from 2012 to 2017 as a 9-12 months program supporting early stage startups that used open data as part of their business model. During the incubation phase, the startups received coaching from the ODI team, mentorship, and training from relevant experts, as well as office space and access to the ODI's network of industry partners and stakeholders from the data community.<sup>168</sup>

- **Develop or promote existing tools to diagnose technical maturity level for SMEs to understand their own level of maturity with regards to data digitization and analytics**, process optimization, cybersecurity, and technological adoption, among others. Create a consolidated network of service providers that can help address the digital transformation needs of SMEs depending on their maturity level.
- **Work with local chambers of commerce and industry chambers to generate educational tools around AI** and to make local and global resources more accessible to key industries. This can help accelerate the transition of manufacturing, retail, and logistics companies into more sophisticated ventures, among other benefits.



## Develop a strategy for the Future of Work

Organizations such as Workforce Solutions Borderplex and the Bridge of Southern New Mexico are focusing on developing comprehensive approaches to regional workforce talent development. These efforts contribute to understanding the challenges to developing a regional Future of Work strategy.

### Key recommendations:

- **Form a binational Future of Work commission** to discuss and anticipate the risks ahead, building on top of existing workforce development strategies and coordinating ongoing efforts from a regional perspective. The commission should include industry, academia, civil society, and local government representatives.
- **Evaluate workforce performance and identify skills lacking by relying on data analytics.** Continuous training, together with upskilling and reskilling programs are becoming increasingly important to guarantee in light of the increasing pace of automation.

## Upskilling by Walmart

Walmart is investing in workers through higher wages and training, in order to increase their loyalty, reduce turnover, and gain a competitive advantage in the market, benefits that will reach everyone, from the employees to the company and the customers as a whole.<sup>169</sup> Some actions that the company is performing to improve the skills of their workers are:

The program Pathways allows the company to deliver instructions to employees through short gamelike computer modules, meant to be catchy and fun. There are practical drills that new employees spend their first six months doing, watched over closely by managers before entering into action.

In addition, the company offers employees certification credentials that can be used to demonstrate their knowledge of transferable skills and present to other employers across different industries, including IT and healthcare.







### Become a champion of human rights and ethically-aligned AI movements

The AI revolution is leading to new paradigms and raising new questions with regards to algorithmic accountability, transparency, explicability, bias, and others, due to the concerns they present for human rights, privacy, and security. Implementing ethically-aligned AI by design and not by default, will help adopters follow best practices and mitigate risks.

#### Key recommendations:

- **Ensure that the development and adoption of AI follows international ethical principles** such as those developed by the OECD,<sup>170</sup> the Montreal Declaration,<sup>171</sup> and the Future of Life Institute,<sup>172</sup> among others.
- **Advance local debates on AI best practices, certifications, and regulatory matters** in topics around ethical concerns and human rights to promote their adoption.
- **Educate industry leaders, government officials, students and professors, and the public in general** about the ethical risks associated with AI and offer resources such as toolkits and frameworks to help mitigate them.

### AI Ethics Frameworks and Resources

MIT Media Lab's AI Ethics summer camp teaches children how AI works and focuses on ethical aspects.<sup>173</sup>

The Ethics & Algorithms Toolkit, a collaboration between Johns Hopkins University Center for Governance Excellence, the City and County of San Francisco, Harvard DataSmart, and Data Community DC, is a risk management framework for governments with the goal of eliciting conversation, encouraging risk evaluation, and catalyzing proactive mitigation strategy planning for algorithm use in the public sector.<sup>174</sup>

The Institute of Electrical and Electronics Engineers' (IEEE) Global Initiative on Ethics of Autonomous and Intelligent Systems has the mission "to ensure every stakeholder involved in the design and development of autonomous and intelligent systems is educated, trained, and empowered to prioritize ethical considerations so that these technologies are advanced for the benefit of humanity". They have published a series of ethical AI standards.<sup>175</sup>

### Combine or align international and regional efforts

Combining and aligning international and regional efforts will help amplify the visibility and global voice of the Borderplex and facilitate access to international resources, knowledge, and funding mechanisms for AI development.

#### Key recommendations:

- **Attend periodical conferences** such as the World Summit AI Americas, the United Nations AI for Good Global Summit, the AI Now Symposium, the AI Masters Conference, the AI for Good Summit, the AI & Big Data Expo, the Rise of AI Conference, CogX, the AI Innovation Summit or Future of AI, among others, together with sector-specific events and conferences to stay up to date on use cases, best practices, and trends.
- **Actively participate in the design of global AI standards** through the IEEE's channels.<sup>176</sup>
- **Connect with key initiatives** such as fAIR LAC<sup>177</sup> (led by the Inter-American Development Bank (IADB); Mexico's multi-sector AI Coalition IA2030Mx; IEEE's Latam Circle (chaired by C Minds) and U.S. Circle; the AI Circle for the North American network Laurentia; and organizations such as Latinxs in AI.

### IA2030Mx, Mexico's Multisector Coalition

IA2030Mx is a multisectoral coalition composed of professionals, academic institutions, companies, startups, public agencies, and other key actors of the digital and the AI ecosystems in Mexico. It is currently working on creating a National AI Agenda and on strengthening local ecosystems.<sup>178</sup>

Since 2018, coalition members have been working under a quadruple helix approach, seeking to ensure that Mexico does not fall behind in the 4th Industrial Revolution, strategically takes advantage of the benefits of AI, and mitigates the ethical and social risks.

The coalition has the following goals:

1. Strengthening coordination and synergies between sectors;
2. Promoting a deeper debate on current and future opportunities and challenges related to AI as well as translating this debate into actions;
3. Taking advantage of Mexico's trajectory, talent, energy, and potential to make it a more competitive with an increased quality of life;
4. Making AI-related knowledge accessible to all;
5. Advancing the use and application of AI for the benefit of Mexicans.



## Become a global AI-driven healthcare innovation powerhouse

The Life Sciences and Healthcare sector provides an ideal opportunity for regional collaboration, complementarity, and shared growth. The region has the intellectual capacity, workforce, infrastructure, and facilities to become a healthcare powerhouse, harnessing the use of AI for different applications (see Annex 7).

### Key recommendations:

- **Develop a binational Biotechnology & Healthcare Innovation taskforce** that includes representatives from the three cities and is responsible for identifying potential AI applications within the sector, as well as learning from global practices.
- **Prepare marketing material and train a set of healthcare professionals to promote the region's innovation capacities**, highlight its infrastructure and successful projects.

## Design and deploy a Borderplex AI Agenda for 2020-2030

A medium-term regional AI agenda that is aligned with state (New Mexico, Texas, and Chihuahua), local (Ciudad Juarez, El Paso, and Las Cruces) and regional development plans (such as the 2020 Borderplex Alliance Roadmap) could allow the Borderplex to keep up with and have a say in the global transformation powered by the AI revolution.

### Key recommendations:

- **Design a multi-sector and binational governance framework** for the design and implementation of a Borderplex AI agenda 2020-2030. Invite existing initiatives such as the Borderplex Alliance or the Borderplex IT Council to lead this effort, manage stakeholder buy-in, track milestones, and document lessons-learned.
- **Strengthen the blueprint presented in this white paper** with a broad and inclusive consultation process. Use the results to inform the design of the AI Borderplex Agenda 2020-2030.
- **Secure public and private resources** for the design, implementation, evaluation, and documentation of the Borderplex AI agenda 2020-2030.





## CONCLUSION

Throughout the report, numerous characteristics of the Borderplex region, its industry, and population have been highlighted as key assets that can be strengthened by increased collaboration, coordination, and a regional strategy.

AI presents itself as a pivotal tool for the region, poised to add unprecedented economic value to the Borderplex. Global trends and international AI use cases provide a glimpse into the potential applications and benefits that could be harnessed by the region and highlight the urgent need to develop regional awareness regarding AI and its applications, to provide resources for companies and entrepreneurs to adopt it, and to shine the light on local champions to lead the way into the AI Revolution.

Considering the significant challenges ahead related to the important impact of automation on the region's jobs in the short-term, a people-centered Future of Work strategy can help the Borderplex's workforce gradually transition to the new market. At an individual level, such a strategy would need to promote and provide opportunities for lifelong learning, upskilling and reskilling, considering the growing need to develop core skills for successful human-machine collaborations. At an industry level, it would need to promote entrepreneurship, support local startups, invest in talent to boost retention, among other first steps to driving shared prosperity in the age of AI.

The blueprint to a general AI strategy offers a series of actionable recommendations to the region and emphasizes the importance of defining and employing regional culture and identity to encourage more cross-border and multi-stakeholder communication, coordination, and collaboration. Experimenting, iterating, failing, adapting, scaling, and learning will be crucial to successfully navigating an era that combines unprecedented change with endless possibilities.

The Borderplex is already well positioned to take advantage of the Fourth Industrial Revolution. Betting on the strengths of Ciudad Juarez, El Paso and Las Cruces, increasing collaboration, and strengthening the preparation of its workforce and industry, all of which can be promoted via an AI agenda, will further deepen its ability not only to ride the wave of digital transformation, but also to make sure its opportunities are translated into concrete benefits for the population. What is more, the region has a unique and perfectly timed opportunity: to demonstrate to the rest of the world how one region can harness the digital age to overcome physical walls and become a success story with regards to binational collaboration and competitiveness.

## ANNEXES

### Annex 1- Potential Automation Impact on the Borderplex Region at the City level

#### Ciudad Juarez, Chihuahua

According to our estimates, the number of jobs prone to automation in Ciudad Juarez is over two thirds of the total number of jobs (66.72%). The occupations least impacted by automation are: workers in agricultural and livestock activities, operators of agricultural and forestry machinery, sales people in establishments and officials and high authorities of the public, private and social sectors (Table 2). The two occupations most impacted by automation are: operators of facilities and industrial machinery, and assemblers of tools, machinery, metal and electronic products (Table 2). These two job groups account for almost a quarter of total employment and 30% of the total employment at risk in Ciudad Juarez. It is relevant to note that these occupations are among the high-risk group of jobs with regards to automation (Figure 3).

**Table 2:** Potential Automation Impact on Ciudad Juarez employment

| Occupation main group   | SINCO Code | 2019 Jobs | Impacted Jobs |       |
|---|------------|-----------|---------------|-------|
|   |            |           | Absolute      | %     |
| Operators of facilities and industrial machinery  | 81         | 86,267    | 76,044        | 16.26 |
| Assemblers of tools, machinery, metal, and electronic products  | 82         | 83,698    | 64,889        | 13.87 |
| Sales employees in stores   | 42         | 48,325    | 36,219        | 7.74  |
| Secretaries, captors, cashiers and file and transport control workers   | 31         | 42,498    | 35,573        | 7.61  |
| Support workers in mining, construction, and industry   | 92         | 38,628    | 31,765        | 6.79  |
| Domestic, cleaning, ironers, and other cleaning workers   | 96         | 34,257    | 26,153        | 5.59  |
| Auxiliaries and technicians in exact sciences, biological, engineering, information technology and telecommunications | 26         | 47,845    | 25,989        | 5.56  |
| Transport and mobile machinery drivers  | 83         | 31,707    | 24,486        | 5.23  |
| Peddlers  | 95         | 24,737    | 22,689        | 4.85  |
| Workers in the preparation and service of food and beverages in establishments  | 51         | 26,931    | 21,529        | 4.60  |
| Workers in the extraction and construction of buildings   | 71         | 25,164    | 20,466        | 4.38  |
| Auxiliaries and technicians in economic-administrative sciences, social sciences, humanities and arts                 | 25         | 20,355    | 12,674        | 2.71  |
| Home and personal care workers  | 52         | 18,114    | 9,592         | 2.05  |
| Workers in protection and surveillance services   | 53         | 17,590    | 9,249         | 1.98  |

## Annex 1 continued - Potential Automation Impact on the Borderplex Region at the City Level

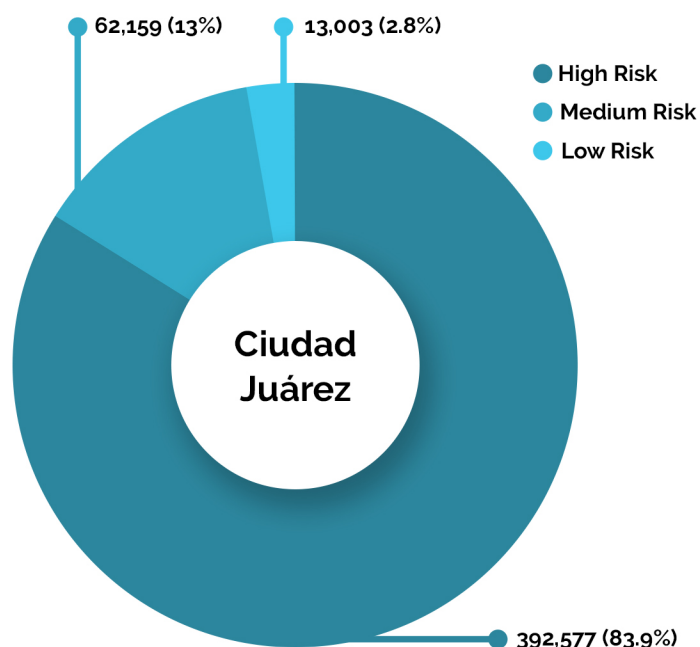
| Occupation main group   | SINCO Code | 2019 Jobs | Impacted Jobs |      |
|---|------------|-----------|---------------|------|
|   |            |           | Absolute      | %    |
| Workers in the processing of food, beverages and tobacco products   | 75         | 10,491    | 8,741         | 1.87 |
| Craftsmen and workers in the production of wood, paper, textile, and leather products                                 | 73         | 7,048     | 5,832         | 1.25 |
| Specialists in economic-administrative sciences, social sciences, humanities and arts                                 | 21         | 12,534    | 4,787         | 1.02 |
| Craftsmen and workers in the treatment and elaboration of metal products  | 72         | 6,378     | 4,604         | 0.98 |
| Workers who provide and manage information  | 32         | 4,571     | 3,981         | 0.85 |
| Food preparation aides  | 94         | 4,270     | 3,715         | 0.79 |
| Helpers of transport drivers, human, and animal traction transport drivers and chargers                               | 93         | 3,697     | 2,421         | 0.52 |
| Courier workers, show support, and merchandise delivery   | 97         | 2,883     | 2,396         | 0.51 |
| Coordinators and heads of area in financial, administrative and social services                                       | 15         | 6,975     | 1,822         | 0.39 |
| Nurses, medical technicians and health support workers  | 28         | 5,259     | 1,244         | 0.27 |
| Teachers and teaching specialists   | 23         | 13,029    | 1,189         | 0.25 |
| Craftsmen and workers in the production of ceramic, glass, tile, and similar products                                 | 76         | 1,387     | 1,186         | 0.25 |
| Coordinators and heads of sales area, restaurants, hotels and other establishments                                    | 17         | 2,478     | 991           | 0.21 |
| Craftsmen and workers in the production of rubber, plastics, and chemical products                                    | 74         | 1,049     | 904           | 0.19 |
| Directors and managers in financial, administrative and social services   | 12         | 4,166     | 864           | 0.18 |
| Researchers and specialists in exact sciences, biological, engineering, information technology and telecommunications | 22         | 12,100    | 836           | 0.18 |
| Directors and managers of sales, restaurants, hotels and other establishments   | 14         | 2,660     | 773           | 0.17 |
| Auxiliaries and education technicians, instructors and trainers   | 27         | 4,264     | 748           | 0.16 |
| Coordinators and heads of area in production and technology areas   | 16         | 13,504    | 615           | 0.13 |
| Directors and managers in production, technology and transportation   | 13         | 5,085     | 598           | 0.13 |
| Workers in rental services  | 43         | 587       | 572           | 0.12 |

### Annex 1 continued - Potential Automation Impact on the Borderplex Region at the City level

| Occupation main group  | SINCO Code | 2019 Jobs      | Impacted Jobs  |            |
|--|------------|----------------|----------------|------------|
|  |            |                | Absolute       | %          |
| Workers in fishing, forestry, hunting, and similar activities            | 62         | 706            | 484            | 0.10       |
| Doctors, nurses and other health specialists                             | 24         | 10,202         | 302            | 0.06       |
| Officials and high authorities of the public, private and social sectors | 11         | 1,897          | 235            | 0.05       |
| Merchants in establishments  | 41         | 17,268         | 233            | 0.05       |
| Operators of agricultural and forestry machinery                         | 63         | 210            | 180            | 0.04       |
| Workers in agricultural and livestock activities                         | 61         | 188            | 171            | 0.04       |
| <b>Total</b>   |            | <b>701,002</b> | <b>467,739</b> | <b>100</b> |

Source: Frey & Osborne (2017), INEGI (2019).

**Figure 3.** Ciudad Juárez: Potential Impact of Automation in Employment According to Risk Category

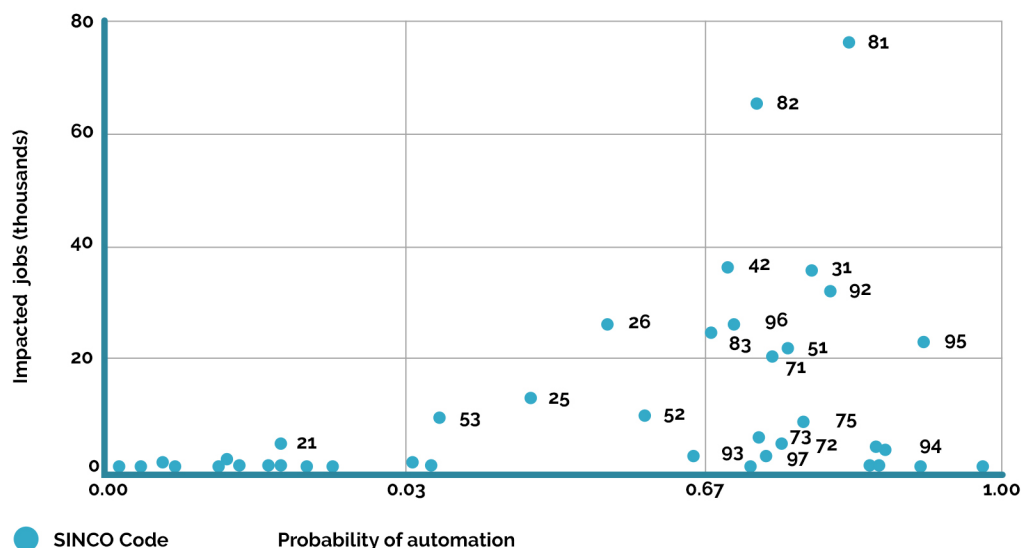


Source: Frey & Osborne (2017), INEGI (2019).

A large portion of jobs in Ciudad Juárez could be automated in the short-term, meaning more than 80% of jobs could be potentially impacted in the next five to ten years. After an important short-term impact on the most vulnerable occupations (operators of facilities and industrial machinery, and assemblers of tools, machinery, metal and electronic products), a sharp fall in the number of jobs impacted is expected during the medium-term (ten to 15 years), before stabilizing in the long-term (15 to 20 years) (Figure 4). Table 3 shows the occupations most and least likely to be affected by automation, as well as the estimated number of jobs that could be impacted in Ciudad Juárez.

### Annex 1 continued - Potential Automation Impact on the Borderplex Region at the City Level

**Figure 4.** Ciudad Juarez: Potential Impact of Automation on Employment



Source: Frey & Osborne (2017), INEGI (2019).

**Table 3.** Most and Least Prone Occupations to be Automated in Ciudad Juarez

|     | Most prone to automation (higher risk)  |               | Least prone to automation (lower risk)   |               |
|-----|---|---------------|--|---------------|
| Top | Occupations   | Jobs Impacted | Occupations  | Jobs Impacted |
| 1   | Customs Agents  | 1,940         | Specialist doctors   | 13            |
| 2   | Sellers by phone  | 437           | Coordinators and heads of area in social and economic development                | 1             |
| 3   | Workers in the rental of movable property (crockery, movies, video games, etc.) | 572           | Directors and managers in social and economic development                        | 3             |
| 4   | Machine operators for the production of paper and cardboard-based products      | 860           | Psychologists  | 5             |
| 5   | Telephone operators and telegraphists   | 1,008         | Coordinators and heads of area in education and training centers                 | 2             |
| 6   | Machine operators in the production of glass and glass products                 | 604           | Directors and managers in teaching and training centers                          | 3             |
| 7   | Support workers in various administrative activities                            | 10,280        | Priests, pastors and other theologians   | 4             |
| 8   | Workers who provide information by phone (call centers) and advertisers         | 355           | Secondary school teachers  | 11            |
| 9   | Machine operators for the development of pharmaceutical and cosmetic products   | 585           | Pedagogues, educational counselors and other specialists in educational sciences | 2             |
| 10  | Sales employees, dispatchers and sales clerks                                   | 22,948        | Supervisors in protection and surveillance services                              | 3             |

Source: Frey & Osborne (2017), INEGI (2019).



## Annex 1 continued - Potential Automation Impact on the Borderplex Region at the City Level

### El Paso, Texas

In El Paso, about 56% of total jobs present a certain degree of automation risk. According to the analysis of potential jobs impacted, the groups of occupations least affected by automation are: community and social services employees; farming, fishing, and forestry employees; and life, physical, and social science related occupations (Table 4). Occupations in office and administrative support, sales and related, and food preparation and serving, the most affected ones, represent almost half (46.6%) of total jobs potentially impacted (Table 4).

**Table 4:** Potential Automation Impact on El Paso employment

| Major Group of Occupations                                | 2010 SOC Code     | 2017 Jobs | Estimated jobs impacted |       |
|---|-------------------|-----------|-------------------------|-------|
|   |                   |           | Absolute                | %     |
| Office and administrative support occupations             | 43-0000           | 57,589    | 48,268                  | 24.27 |
| Sales and related occupations                             | 41-0000           | 39,601    | 25,650                  | 12.90 |
| Food preparation and serving related occupations          | 35-0000           | 23,926    | 18,752                  | 9.43  |
| Construction and extraction occupations                   | 47-0000           | 19,960    | 14,628                  | 7.36  |
| Transportation occupations                                | 53-1000 - 53-6000 | 21,293    | 13,652                  | 6.86  |
| Production occupations                                    | 51-0000           | 15,814    | 13,032                  | 6.55  |
| Building and grounds cleaning and maintenance occupations | 37-0000           | 14,416    | 11,190                  | 5.63  |
| Installation, maintenance, and repair occupations         | 49-0000           | 13,589    | 9,174                   | 4.61  |
| Personal care and service occupations                     | 39-0000           | 15,440    | 7,423                   | 3.73  |
| Business and financial operations occupations             | 13-0000           | 11,378    | 6,282                   | 3.16  |
| Education, training, and library occupations              | 25-0000           | 24,176    | 5,442                   | 2.74  |
| Management occupations                                    | 11-2000           | 29,993    | 4,740                   | 2.38  |
| Material moving occupations                               | 53-7000           | 5,885     | 4,490                   | 2.26  |
| Healthcare support occupations                            | 31-0000           | 7,897     | 3,958                   | 1.99  |
| Law enforcement workers including supervisors             | 33-3000           | 6,454     | 3,157                   | 1.59  |

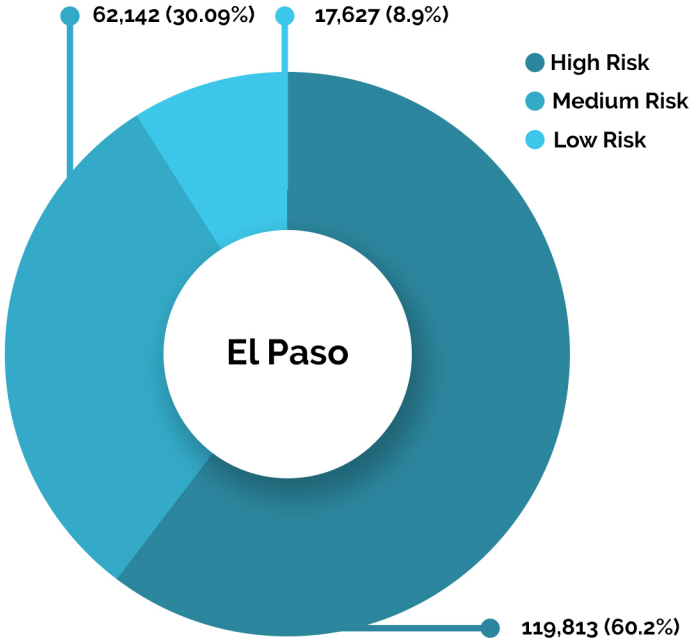
**Annex 1 continued - Potential Automation Impact on the Borderplex Region at the City level**

| Major Group of Occupations   | 2010 SOC Code | 2017 Jobs      | Estimated jobs impacted |            |
|--|---------------|----------------|-------------------------|------------|
|  |               |                | Absolute                | %          |
| Health technologists and technicians   | 29-2000       | 6,151          | 1,916                   | 0.96       |
| Arts, design, entertainment, sports, and media occupations                               | 27-0000       | 5,583          | 1,329                   | 0.67       |
| Legal occupations  | 23-0000       | 2,656          | 1,320                   | 0.66       |
| Computer and mathematical occupations  | 15-0000       | 5,154          | 1,139                   | 0.57       |
| Architecture and engineering occupations   | 17-0000       | 4,022          | 1,124                   | 0.57       |
| Fire fighting and prevention, and other protective service workers including supervisors | 33-1000       | 6,011          | 732                     | 0.37       |
| Health diagnosing and treating practitioners and other technical occupations             | 29-1000       | 12,970         | 573                     | 0.29       |
| Life, physical, and social science occupations   | 19-0000       | 1,650          | 412                     | 0.21       |
| Farming, fishing, and forestry occupations   | 45-0000       | 352            | 279                     | 0.14       |
| Community and social services occupations  | 21-0000       | 5,090          | 220                     | 0.11       |
| <b>Total</b>   |               | <b>357,050</b> | <b>198,882</b>          | <b>100</b> |

Source: Frey & Osborne (2017), U.S. Census Bureau (2019).

The analysis indicates that a significant portion of employment (60%) in El Paso could be affected by automation in the short-term, and that nearly 120,000 jobs are at high risk of being affected by automation in the next five to ten years (Figure 5, Figure 6). The magnitude of impact decreases over time, as the long and medium-term approach. Table 5 shows the main sub-categories of occupations most and least prone to be affected by automation, as well as the estimated number of jobs impacted in El Paso.

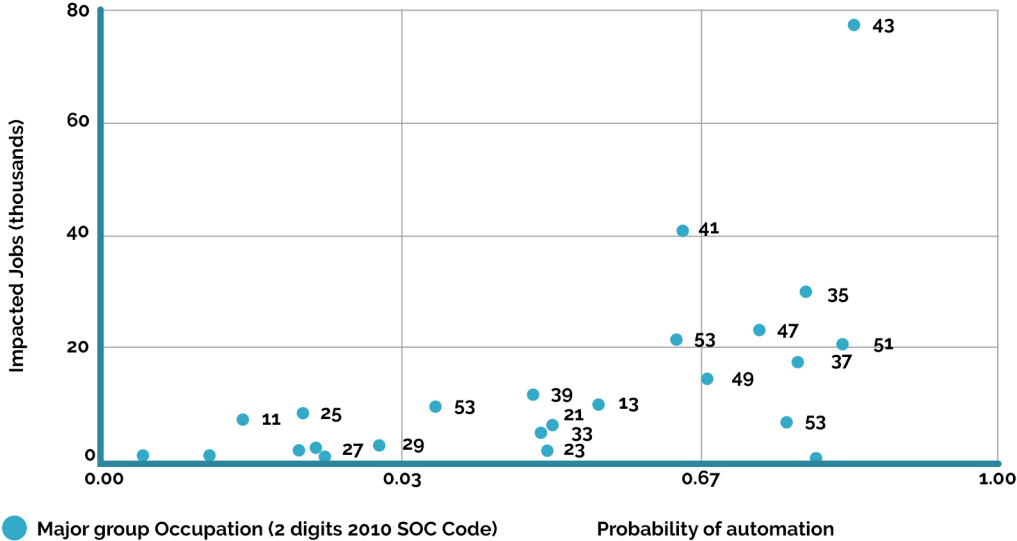
**Figure 5.** El Paso: Potential Impact of Automation in Employment According to Risk Category



Source: Frey & Osborne (2017), U.S. Census Bureau (2019).

**Annex 1 continued - Potential Automation Impact on the Borderplex Region at the City Level**

**Figure 4.** Ciudad Juarez: Potential Impact of Automation on Employment



Source: Frey & Osborne (2017), U.S. Census Bureau (2019)

**Table 5.** Most and Least Prone Occupations to be Automated in El Paso

|     | Most prone to automation (higher risk)        |               | Least prone to automation (lower risk)   |               |
|-----|---|---------------|--|---------------|
| Top | Occupations                                   | Jobs Impacted | Occupations  | Jobs Impacted |
| 1   | Office and administrative support             | 48,268        | Community and social services occupations  | 220           |
| 2   | Production                                    | 13,032        | Health diagnosing and treating practitioners and other technical occupations             | 573           |
| 3   | Farming, fishing, and forestry                | 279           | Fire fighting and prevention, and other protective service workers including supervisors | 732           |
| 4   | Food preparation and serving related          | 18,752        | Management occupations   | 4,740         |
| 5   | Building and grounds cleaning and maintenance | 11,190        | Computer and mathematical occupations  | 1,139         |
| 6   | Material moving                               | 4,490         | Education, training, and library occupations   | 5,442         |
| 7   | Construction and extraction                   | 14,628        | Arts, design, entertainment, sports, and media occupations                               | 1,329         |
| 8   | Installation, maintenance, and repair         | 9,174         | Life, physical, and social science occupations   | 412           |
| 9   | Sales and related                             | 25,650        | Architecture and engineering occupations   | 1,124         |
| 10  | Transportation occupations                    | 13,652        | Health technologists and technicians   | 1,916         |

Source: Frey & Osborne (2017), U.S. Census Bureau (2019).

## Annex 1 continued - Potential Automation Impact on the Borderplex Region at the City Level

### Las Cruces, New Mexico

According to the authors' estimates, 50% of the jobs in Las Cruces present a certain degree of automation risk. As shown in Table 6, community and social services occupations are the least likely to be affected by automation, followed by health diagnosing and treating practitioners and other technical occupations as well as life, physical, and social science occupations, accounting together for a minimum share of employment at risk (less than 1%). Office and administrative support occupations, food preparation, and service-related occupations, and sales and related occupations are the categories that represent almost half of the employment at potential risk (46.39%).

**Table 6:** Potential Automation Impact on Las Cruces Employment

| Major Group of Occupations                                 | 2010 SOC Code*    | 2017 Jobs | Estimated jobs impacted |       |
|--|-------------------|-----------|-------------------------|-------|
|  |                   |           | Absolute                | %     |
| Office and administrative support occupations              | 43-0000           | 10,880    | 9,119                   | 20.38 |
| Food preparation and serving related occupations           | 35-0000           | 7,971     | 6,247                   | 13.96 |
| Sales and related occupations                              | 41-0000           | 8,319     | 5,388                   | 12.04 |
| Building and grounds cleaning and maintenance occupations  | 37-0000           | 3,587     | 2,784                   | 6.22  |
| Personal care and service occupations                      | 39-0000           | 5,645     | 2,714                   | 6.07  |
| Construction and extraction occupations                    | 47-0000           | 3,565     | 2,613                   | 5.84  |
| Production occupations                                     | 51-0000           | 2,325     | 1,916                   | 4.28  |
| Installation, maintenance, and repair occupations          | 49-0000           | 2,708     | 1,828                   | 4.09  |
| Material moving occupations                                | 53-7000           | 2,085     | 1,591                   | 3.56  |
| Education, training, and library occupations               | 25-0000           | 6,607     | 1,487                   | 3.32  |
| Business and financial operations occupations              | 13-0000           | 2,338     | 1,291                   | 2.89  |
| Transportation occupations                                 | 53-1000 - 53-6000 | 1,745     | 1,119                   | 2.50  |
| Law enforcement workers including supervisors              | 33-3000           | 2,176     | 1,064                   | 2.38  |
| Management occupations                                     | 11-2000           | 6,112     | 966                     | 2.16  |
| Arts, design, entertainment, sports, and media occupations | 27-0000           | 3,312     | 788                     | 1.76  |

**Annex 1 continued - Potential Automation Impact on the Borderplex Region at the City level**

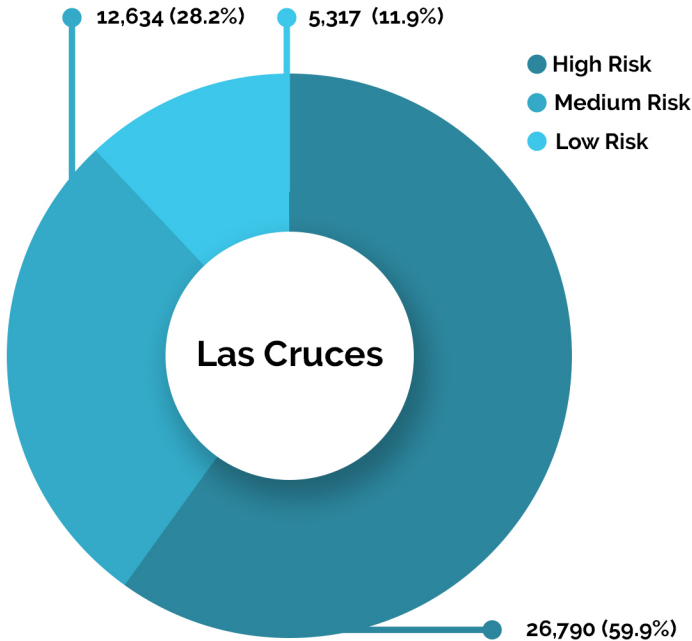
| Major Group of Occupations   | 2010 SOC Code* | 2017 Jobs     | Estimated jobs impacted |            |
|--|----------------|---------------|-------------------------|------------|
|  |                |               | Absolute                | %          |
| Healthcare support occupations   | 31-0000        | 1,549         | 776                     | 1.73       |
| Farming, fishing, and forestry occupations   | 45-0000        | 872           | 692                     | 1.55       |
| Health technologists and technicians   | 29-2000        | 2,023         | 630                     | 1.41       |
| Computer and mathematical occupations  | 15-0000        | 2,537         | 561                     | 1.25       |
| Legal occupations  | 23-0000        | 568           | 282                     | 0.63       |
| Architecture and engineering occupations   | 17-0000        | 913           | 255                     | 0.57       |
| Fire fighting and prevention, and other protective service workers including supervisors | 33-1000        | 1,972         | 240                     | 0.54       |
| Life, physical, and social science occupations   | 19-0000        | 924           | 231                     | 0.52       |
| Health diagnosing and treating practitioners and other technical occupations             | 29-1000        | 2,391         | 106                     | 0.24       |
| Community and social services occupations  | 21-0000        | 1,232         | 53                      | 0.12       |
| <b>Total</b>   |                | <b>84,356</b> | <b>44,742</b>           | <b>100</b> |

Source: Frey & Osborne (2017), U.S. Census Bureau (2019). \*Refers to a code assigned by the Standard Occupational Classification

As in the previous automation risk analyses, jobs were divided into three risk categories: low, medium or high risk of automation (Figure 7). In Las Cruces, almost 60% of the jobs are at high risk of automation. The pace at which automation might take place is dependent on the importance of intrinsic human characteristics (such as awareness, creative intelligence and social intelligence) to the job. Jobs with more tasks that require such skills will take longer to automate than those that do not.<sup>179</sup>

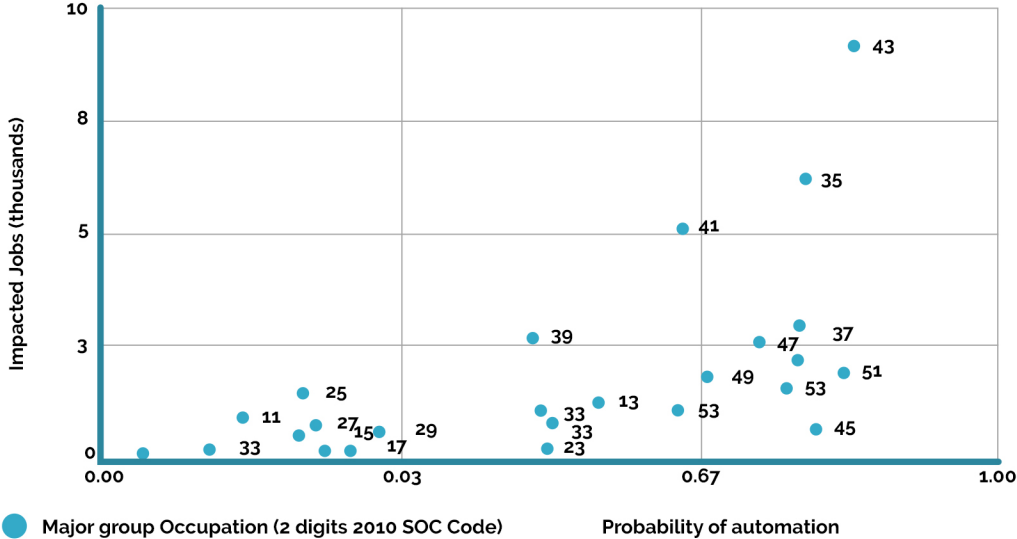
**Figure 7.** Las Cruces: Potential Impact of Automation in Employment according to Risk Category

Source: Frey & Osborne (2017), U.S. Census Bureau (2019).



**Annex 1 continued - Potential Automation Impact on the Borderplex Region at the City Level**

**Figure 8.** Las Cruces: Potential Impact of Automation on Employment



Source: Frey & Osborne (2017), U.S. Census Bureau (2019).

The authors' estimates indicate that 60% of the potential impact of automation on Las Cruces jobs will occur in the short-term (five to ten years), impacting about 27,000 jobs. Automation's impact on employment is expected to peak during the short and medium-term, gradually decreasing in the long-term. Table 7 shows the main subcategories of occupations most and least prone to be affected by automation, as well as the estimated number of jobs impacted in Las Cruces

**Table 7.** Most and Least Prone Occupations to be Automated in El Paso

|     | Most prone to automation (higher risk)        |               | Least prone to automation (lower risk)   |               |
|-----|---|---------------|--|---------------|
| Top | Occupations                                   | Jobs Impacted | Occupations  | Jobs Impacted |
| 1   | Office and administrative support             | 9,119         | Community and social services occupations  | 53            |
| 2   | Production                                    | 1,916         | Health diagnosing and treating practitioners and other technical occupations             | 106           |
| 3   | Farming, fishing, and forestry                | 692           | Fire fighting and prevention, and other protective service workers including supervisors | 240           |
| 4   | Food preparation and serving related          | 6,247         | Management occupations   | 966           |
| 5   | Building and grounds cleaning and maintenance | 2,784         | Computer and mathematical occupations  | 561           |
| 6   | Material moving                               | 1,591         | Education, training, and library occupations   | 1,487         |
| 7   | Construction and extraction                   | 2,613         | Arts, design, entertainment, sports, and media occupations                               | 788           |
| 8   | Installation, maintenance, and repair         | 1,828         | Life, physical, and social science occupations   | 231           |
| 9   | Sales and related                             | 5,388         | Architecture and engineering occupations   | 255           |
| 10  | Transportation occupations                    | 1,119         | Health technologists and technicians   | 630           |

Source: Frey & Osborne (2017), U.S. Census Bureau (2019).

## METHODOLOGY



### *Risk of Automation Analysis*

The probabilities estimated by Frey And Osborne were used to assess the impact of the 4th Industrial Revolution on occupations in the Borderplex region. To estimate jobs at risk, the number of employees in each occupation category was multiplied by their probability of automation.

The 2017 employment and occupations data came from the U.S. Census Bureau<sup>180</sup> for the metropolitan areas of El Paso, TX and Las Cruces, NM. For the metropolitan municipality of Juarez, Chihuahua, 2019 figures were obtained from the *Instituto Nacional de Estadística, Geografía e Informática (INEGI)*<sup>181 182</sup>

While the occupational classification system used by Frey and Osborne and the U.S. Census Bureau was the 2010 Standard Occupational Classification (2010, SOC), the system used for Mexico was the Sistema Nacional de Clasificación de Ocupaciones (SINCO). Equivalence tables were used between systems to classify Mexican occupations according to 2010 SOC.<sup>183</sup> The probabilities (simple average) were grouped at the 5-digit classification level (broad group) under 2010 SOC when there were more than one detailed occupation. Only when no correspondence was found between SINCO and SOC at the 5-digit level (some miscellaneous occupations, for instance), was the minor group average (4 digits) used.<sup>184</sup> For occupations without equivalence between both systems, the average probability of the subgroup of Mexican occupations (at SINCO's 3 digits level) was assigned.

Other approaches have focused on disaggregating occupations into activities. For example, McKinsey Global Institute disaggregated occupations into 2,000 activities and rated each of them against human performance in 18 capabilities.<sup>185</sup> Being aware of the limitations of different methodologies, the authors of this report chose to use Frey and Osborne's probabilities as they are consistent with the occupation classification system used in U.S. employment data, as well as the data sources available in Mexico.<sup>186</sup>

## Annex 2- List of Interviewees

We thank the interviewees for their valuable time, insights, and contributions to the development of this report.

| Ciudad Juarez         |  |
|-----------------------|--|
| Alejandra Meza        | Bixelium   |
| Cecilia Valera        | Bio El Paso- Juarez  |
| Hector Gutierrez      | Former Delphi  |
| Hector Nuñez          | Botcake  |
| Hector Palacios       | Medicar Health Inc   |
| Javier Acosta         | Mechatronics   |
| Jorge Topete          | Mexicana de Telecomunicaciones                               |
| Juan Carlos Dominguez | Atmosfera Producciones                                       |
| Juan Padilla          | Former LEAR  |
| Lisbeily Dominguez    | Secretaria de Innovación y Desarrollo Económico de Chihuahua |
| Mariana Laguera       | Bixelium   |
| Mario Macario Ruiz    | Instituto Tecnológico de Ciudad                              |
| Roberto Carlos        | Mech Robotix   |
| Rodolfo Vázquez       | Technology Hub   |
| Sergio Velasco        | Instituto Promotor de Educación (IPE)                        |
| Tania Olivier         | IT Lab   |







Annex 2 continued - List of Interviewees

| Las Cruces         |                                    |
|--------------------|------------------------------------|
| Carlos Murguia     | Arrowhead Research Center, NMSU    |
| Debbie More        | Las Cruces Chamber of Commerce     |
| Enrico Pontelli    | New Mexico State University (NMSU) |
| Francisco Pallares | City of Las Cruces                 |
| Jake Redfearn      | NNN Sales                          |
| Joe Bullington     | Jacobs Technology                  |
| Mandy Guss         | City of Las Cruces                 |
| Tracey Bryan       | The Bridge of Southern New Mexico  |
| Wayne Savage       | Arrowhead Innovation Fund, NMSU    |

| El Paso            |                             |
|--------------------|-----------------------------|
| Ann Gates          | UTEP, CS Department         |
| Carlos Martinez    | The Hub of Human Innovation |
| Cathy Chen         | FabLab El Paso              |
| Ebetuel Pallares   | Cowork Oasis                |
| Gina Galey         | UTEP, Business College      |
| Jackie Butler      | Bio El Paso- Juarez         |
| Jonathan Childress | Microsoft Techspark         |
| Meghan Curry       | Insights El Paso            |
| Scott Patton       | Minerva, IT                 |
| Tony Ramirez       | The Borderplex Alliance     |
| Vanessa Leon       | UTEP, Business College      |

## Annex 3- Borderplex Region Top Exports by State

At a state level, Chihuahua's exports represent 13.41% of Mexico's total exports for 2018.<sup>187</sup> Below, Table 8 summarizes the main sub-sectors of economic activity and their value.

**Table 8.** Chihuahua: Top 5 exports 2018

| Concept by sub sector of North American Industrial Classification System (SCIAN)                                 | Value<br>(thousands of dollars) |
|--|---------------------------------|
| Manufacture of computer eqpt., communication, measurement and other electronic eqpt., components and accessories | 24,450,845                      |
| Transportation equipment manufacturing   | 13,062,378                      |
| Other manufacturing industries   | 4,000,012                       |
| Manufacture of accessories, electrical appliances and electrical power generation equipment                      | 3,627,126                       |
| Machinery and equipment manufacturing  | 2,566,571                       |
| Other Exports  | 4,237,116                       |
| Total exports  | 51,944,047                      |

**Source:** Own elaboration with data from INEGI (2019) Exportaciones anuales de mercancías por subsector de actividad SCIAN de Chihuahua

At a state level, Texas' exports represent 18.96% of the U.S.' 2018 total exports. Below, Table 9 summarizes the main sub-sectors of economic activity and their value.

**Table 9.** Texas: Top 5 exports 2018

| Concept 6 Digit Harmonized Commodity Description and Coding Systems (HS) | Value<br>(thousands of dollars) |
|--|---------------------------------|
| Crude oil from petroleum and bituminous minerals                         | \$38,567                        |
| Petrol oil bitum minera  | \$28,394                        |
| Lt oils, preps gt=70% petro  | \$24,964                        |
| Propane, liquefied   | \$12,923                        |
| Parts & accessories for adp m  | \$10,784                        |
| Other Exports  | \$200,306                       |
| Total exports  | \$315,939                       |

**Source:** U.S. Census Bureau.

At a state level, New Mexico's exports represent 0.22% of the U.S.'s 2018 total exports. Below, Table 10 summarizes the main sub-sectors of economic activity and their value.

**Table 10.** New Mexico: Top 5 exports 2018

| 6 Digit Harmonized Commodity Description and Coding Systems (HS) | Value<br>(thousands of dollars) |
|--|---------------------------------|
| Processors and controllers, electronic integ cirt                | \$800.43                        |
| Parts & accessories for adp m                                    | \$522.44                        |
| Instr & appl f medical surgical dental vet, nesoi                | \$196.49                        |
| Radar apparatus  | \$178.82                        |
| Civilian aircraft, engines, and parts                            | \$103.03                        |
| Other exports  | \$1,855.62                      |
| Total exports  | \$3,656.83                      |

**Source:** U.S. Census Bureau.

## Annex 4- Top Borderplex Industry Employers

With regional business incentives such as the Industrial Revenue Bonds (IRBs) in Las Cruces, El Paso's Tax Abatement Policy and its designation of Housing and Urban Development Empowerment Zones, and the Mexican government's Maquiladora Program,<sup>188</sup> the Borderplex region is home to over 70 Fortune 500 companies, supported by each city's top universities. This combination has created the right environment for industry giants to settle and generate the region's jobs.

| Company                         | Based in                | Approx. Number of Employees |
|---------------------------------|-------------------------|-----------------------------|
| 1. Electrolux                   | Juarez                  | 5,000 <sup>189</sup>        |
| 2. Bosch                        | Juarez                  | 4,500 <sup>190</sup>        |
| 3. Foxconn                      | Juarez and surroundings | 22,000 <sup>191</sup>       |
| 4. Flextronics                  | Juarez                  | 3,000 <sup>192</sup>        |
| 5. Lexmark                      | Juarez                  | Information not available   |
| 6. Delphi                       | Juarez                  | 13,000 <sup>193</sup>       |
| 7. Visteon                      | Juarez                  | 4,500 <sup>194</sup>        |
| 8. Virgin Galactic              | Las Cruces              | 43 <sup>195</sup>           |
| 9. Jacobs                       | Las Cruces              | Information not available   |
| 10. Johnson Controls            | El Paso                 | Information not available   |
| 11. Lear                        | Juarez                  | Information not available   |
| 12. Cardinal Health             | El Paso                 | Information not available   |
| 14. Yazaki                      | Juarez                  | Information not available   |
| 15. Siemens                     | Juarez                  | Information not available   |
| 16. White Sands Missile Range   | Las Cruces              | 3000 <sup>+196</sup>        |
| 17. Walmart                     | Las Cruces              | 3000 <sup>+197</sup>        |
| 18. New Mexico State University | Las Cruces              | 2986 <sup>198</sup>         |

## Annex 5- Workforce Participation at a Regional Level

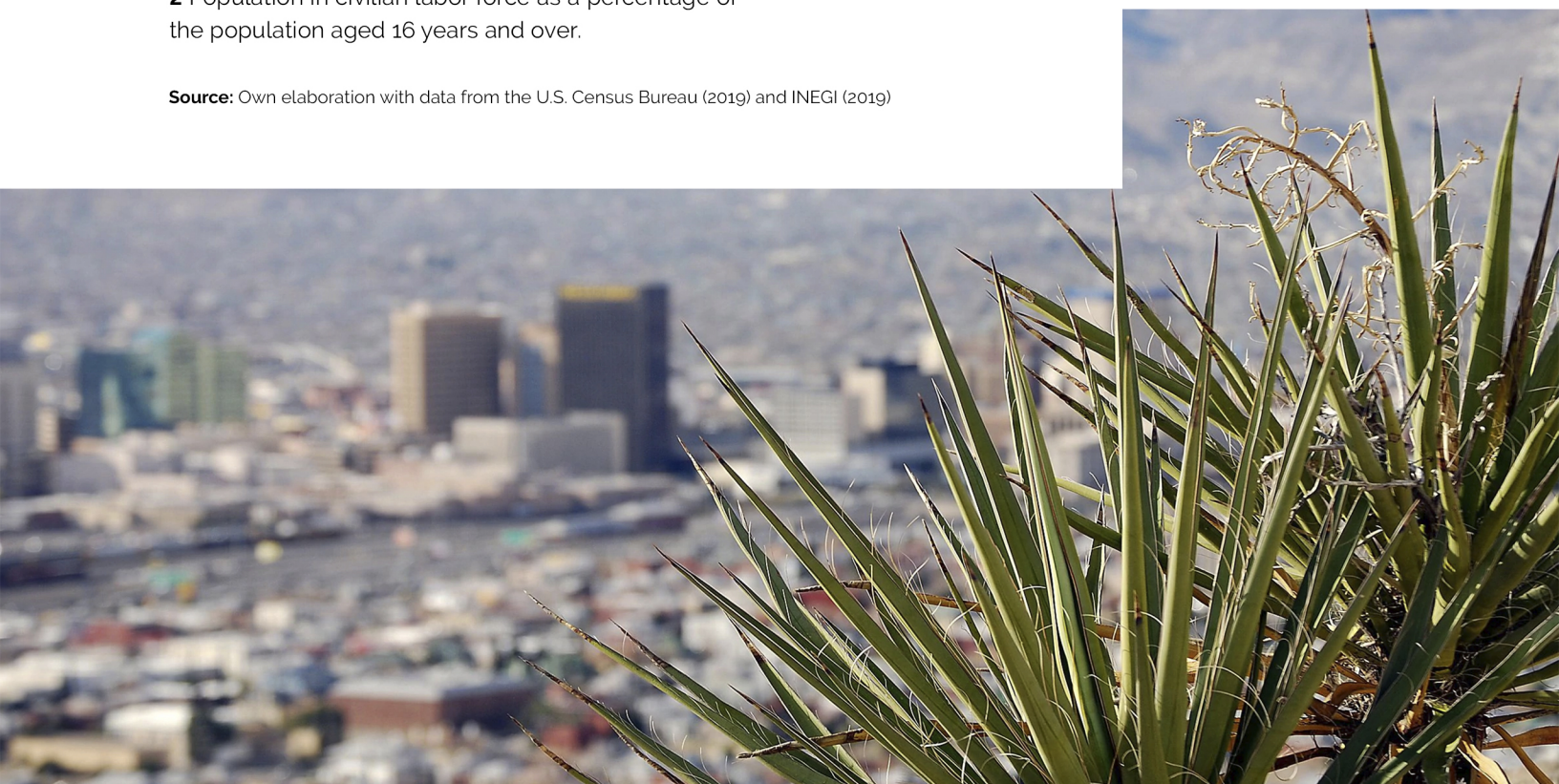
**Table 11.** Workforce Participation

| Metropolitan area     | Period    | Labor force participation (%) |
|-----------------------|-----------|-------------------------------|
| Juárez <sup>1</sup>   | 2019      | 66.02                         |
| El Paso <sup>2</sup>  | 2013-2017 | 58.50                         |
| Doña Ana <sup>2</sup> |           | 59.00                         |

**1** Participation Rate. Economically active population as a percentage of the population aged 15 years and over. Data for the second quarter of 2019.

**2** Population in civilian labor force as a percentage of the population aged 16 years and over.

**Source:** Own elaboration with data from the U.S. Census Bureau (2019) and INEGI (2019)



## Annex 6- Life Sciences and Healthcare in the Borderplex

The Life Sciences and Healthcare sectors have grown steadily and parallelly in Ciudad Juarez, El Paso, and Las Cruces, requiring increased workforce specialization and state-of-the-art facilities.

As shown below, there is a great opportunity for the region to focus regional technology efforts on the expansion of the medical device industry, invest in bio-science and innovation, and explore healthcare service provision.

Some of the current assets in the region include:

### Medical Device Industry

- **Overview:** over 30 factories employing more than 40,000 workers and producing Class I, II and III medical devices. The region logistics industry provides ease of access to the North American Market.
- **Companies in the Industry:** international corporate manufacturers, contract manufacturers, and drug-device combination manufacturers.
- **Devices Manufactured in the Region:** catheter-based devices, orthopedic supports, minimally invasive surgical equipment, aortic and thoracic stents, diagnostic imaging equipment, surgery kits, electronic PCBA for medical devices, pressure belts, respiratory devices, ophthalmic devices, electronic and mechanical infusion pumps.
- **Product Development Capabilities:** contract manufacturers and standalone firms: prototyping, new product introduction, testing service, product design.



- **Manufacturing Capabilities:** precision injection molding, laser welding, wet process (anodize, passivate), extrusion, press brake, hard tool and soft tool punch presses, medical metal machining, validation, kitting/custom pack, failure analysis, highly automated production lines.
- **Biomedical Device Manufacturing Suppliers:** sterilization services, laboratory testing, laminated vinyl, different types of bounding, advance sewing, thermoform, bag and packaging, blow molding, foam, thermoset, metal stamping, fabrication, casting and molding.

### Bio-Science and Innovation

- **Medical Center of the Americas (MCA) in El Paso, major activity hub:**
  - 440-acre MCA campus anchored by the Cardwell Collaborative biotech incubator (headquarters for BIO El Paso – Juárez and the MCA Foundation), Texas Tech University Health Sciences Center El Paso, University Medical Center of El Paso, and El Paso Children's Hospital.
  - The MCA Innovation Center in the Cardwell Collaborative hosts a group of bioscience and biomedical startups and offers access to world-class laboratory facilities, entrepreneurship training, and mentoring

## Annex 6 continued - Life Sciences and Healthcare in the Borderplex



### ● Arrowhead Center at New Mexico State University in Las Cruces:

- Research and innovation hub dedicated to commercializing high-tech innovations and launching and developing new businesses.
- Major hub of activity at Arrowhead Park (200-acre community for science, technology and business with over 25 active business tenants and dozens of startups).

### ● Regional Universities and Colleges:

- Texas Tech University Health Sciences Center El Paso: Home to the Paul L. Foster School of Medicine, Gayle Greve Hunt School of Nursing and Graduate School of Biomedical Sciences, research centers focusing on cancer, diabetes and metabolism, infectious disease, and neuroscience.
- The University of Texas at El Paso: long history of science and engineering excellence; major investments in research infrastructure to pursue status as national research university; bioscience and technology-related research centers include W.M. Keck Center for 3D Innovation (advanced manufacturing technologies for biomedical devices); Border Biomedical Research Center; Center for Space Exploration and Technology; and the Research Institute for Manufacturing and Engineering Systems.
- New Mexico State University, Las Cruces: Nationally recognized research institution; bioscience and technology research areas include biochemistry, molecular biology and genetics; energy and biofuels; and space science and aerospace

- Doña Ana Community College: Public community college with several campuses, branch of New Mexico State University. With more than 14 thousand students for 2016-17, it provides associates degrees and technical/vocational training, including specialized accreditations, to the Las Cruces and neighboring communities.

- El Paso Community College: Ranked No. 1 nationally for awarding associate degrees to Hispanic students, offers associate degrees and certificates for a broad range of health sciences and science, technology, engineering and mathematics programs.

- Universidad Autónoma de Ciudad Juárez: Operates a medical school under the Institute of Biomedical Sciences, producing surgeons, specialist physicians, nurses and other health care professionals; Also offers degrees in physics, mathematics, civil and environmental engineering, electrical and computer engineering, manufacturing and industrial engineering.

- Instituto Tecnológico de Ciudad Juárez: Array of engineering degrees; campus research facilities include laboratories for automated manufacturing, robotics, metallurgy, and electrical and computational systems.

- Tec de Monterrey Juarez Campus: Wide range of academic programs, including advanced degrees in medicine, biotechnology, nanotechnology, engineering and computer science.

- Universidad Tecnológica de Ciudad Juárez: Academic programs include renewable energy, international logistics, industrial maintenance, mechatronics, nanotechnology, business innovation, industrial operations, and information technology.

## Annex 6 continued - Life Sciences and Healthcare in the Borderplex

### Healthcare

- Healthcare is a major employer in El Paso's private and public sectors. Education and Health Services are the third source of employment in order of number of people employed.
- In the Las Cruces area, Education and Health Services is the second source of employment in importance.
- In Ciudad Juarez, doctors, nurses and other specialists, as well as medical technicians and health support workers account for just over 2% of the jobs.
- Access to quality healthcare for Borderplex residents is expanding dramatically thanks to a construction boom and the expansion of hospitals, clinics, and other facilities. Notable highlights:
  - University Medical Center of El Paso: Nonprofit, community-owned Medical Center; Regional powerhouse; Teaching and research hospital; Level 1 Trauma Center and Comprehensive Stroke Center.
  - El Paso Children's Hospital: Largest pediatric medical facility in West Texas.
  - THOP Transmountain Campus: 106-bed teaching hospital.
  - Replacement of the William Beaumont Army Medical Center: \$1 billion U.S. dollars, state-of-the-art medical campus under construction at Fort Bliss to care for soldiers and veterans; 272-acre campus, scheduled for completion in 2019.
  - Memorial Medical Center, Las Cruces: Serves over 300,000 residents. Recently completed a \$3.2 million U.S. dollars Post-Anesthesia Care Unit/Recovery area. Invested \$2.8 million U.S. dollars in upgraded surgical equipment, including the first 3D laparoscopic surgical equipment in the region.
  - MountainView Regional Medical Center, Las Cruces: 168-bed facility, that's accredited by The Joint Commission, employs around 625 healthcare professionals representing over 35 medical specialties.
- Health Care Higher Education in the El Paso Region:
  - The El Paso community made a commitment at the end of the millennium to improving access to healthcare for its residents by supporting efforts to improve healthcare education in El Paso, leading to the creation of Texas Tech University Health Sciences Center of El Paso.
  - The University of Texas invested \$60 million in the state-of-the-art Health Sciences and Nursing building that opened in 2011, accommodating 3,000 students.
  - Burrell College of Osteopathic Medicine, Las Cruces: The region's newest medical school began educating physicians in 2016. Dedicated to improving regional health through osteopathic medical education, research and its support of clinical service to the community. Research areas include biomedical science, clinical science, medical education, and population health.
- El Paso's Major Healthcare Employers:
  - Private Sector: Tenet Healthcare's system of hospitals and sites (5,100 employees); HCA Healthcare's system of hospitals and sites (2,300 employees).
  - Public Sector: University Medical Center of El Paso (2,800 employees); Texas Tech University Health Sciences Center El Paso (1,500 employees).



## Annex 7 - Microsoft: A Spark to the Borderplex Region

Microsoft has launched several AI initiatives to modernize business and catalyze innovation globally. For instance, Microsoft's AI Business School is educating industry leaders and providing them with tools to enhance their business models. As part of its "Future Computed" series, the multinational has also carried out an in-depth look at how AI is transforming the manufacturing sector by optimizing digital operations and driving efficiencies, enabling new products and services and allowing for safer work environments.

Beyond promoting private industry developments, Microsoft has also launched an AI for Good Initiative, seeking to understand AI as a tool for change and to address global issues such as climate change, agricultural resilience, biodiversity conservation, water protection, as well as exploring the use of AI for improved accessibility, for human rights monitoring and compliance, and for cultural, language, and heritage preservation. Microsoft's AI principles include:

- **Fairness:** AI systems should treat all people fairly
- **Inclusiveness:** AI systems should empower everyone and engage people
- **Reliability & Safety:** AI systems should perform reliably and safely
- **Transparency:** AI systems should be understandable
- **Privacy & Security:** AI systems should be secure and respect privacy
- **Accountability:** AI systems should have algorithmic accountability



## Annex 7 continued - Microsoft: A Spark to the Borderplex Region

Moreover, the company has engaged in a series of projects in the Borderplex's priority sectors. The learnings it obtains from these projects will be relevant and applicable to the entire region.



### Medical Research

Cochrane is a non-profit organization that publishes systematic reviews of healthcare interventions, with more than 37,000 contributors working in 130 countries. They aim to analyze the latest medical research to find the best treatments and interventions for patients and citizens. Their rigorous and robust studies offer world class advice. The challenge is that these can take up to 1-2 years to complete and policymakers often need information in a shorter time frame.<sup>199</sup>

- The organization is now applying AI and Machine Learning to analyze thousands of reports to automatically select important ones to include in systematic reviews.
- With Microsoft's cloud-based Cortana Intelligence solutions, Cochrane successfully freed up weeks of monotonous work, freeing up experts healthcare reviewers free to spend time on higher-level analysis.
- Continuously improving the performance of the Machine Learning system, the team is engaging with more than 5,000 scientists in 117 countries through the Cochrane Crowd platform. Using cloud API services, clinical assessment groups benefit from looking at the latest medical research in different specialties.
- The system is now being used by the National Institute for Health and Care Excellence in the United Kingdom, which provides healthcare delivery guidance across the National Health Service (NHS) for over 65 million people.

### Predictive Forecasting

For Arçelik A.Ş., a global appliance maker, having the right spare parts available anytime and anywhere they're needed is essential to serving its customers quickly and effectively. However, their outdated forecasting system wasn't able to meet that need.<sup>200</sup>

- With the help of BilgeAdam, a solution for demand forecasting based on Microsoft's Cortana Intelligence Suite was developed, which offers a fully managed big data and advanced analytics suite in Microsoft Azure that transforms data into insights for action.
- Inventory turnover is expected to climb by 10%, service calls are made faster and more cost-effectively. Overall, customers reported increased satisfaction.
- After six months in production, the spare parts forecasting solution achieved 80% accuracy. It now produces forecasts for all 350,000 spare parts stock-keeping units (SKUs).

## Annex 7 continued - Microsoft: A Spark to the Borderplex Region

### Helping to Monitor Human Rights Violations

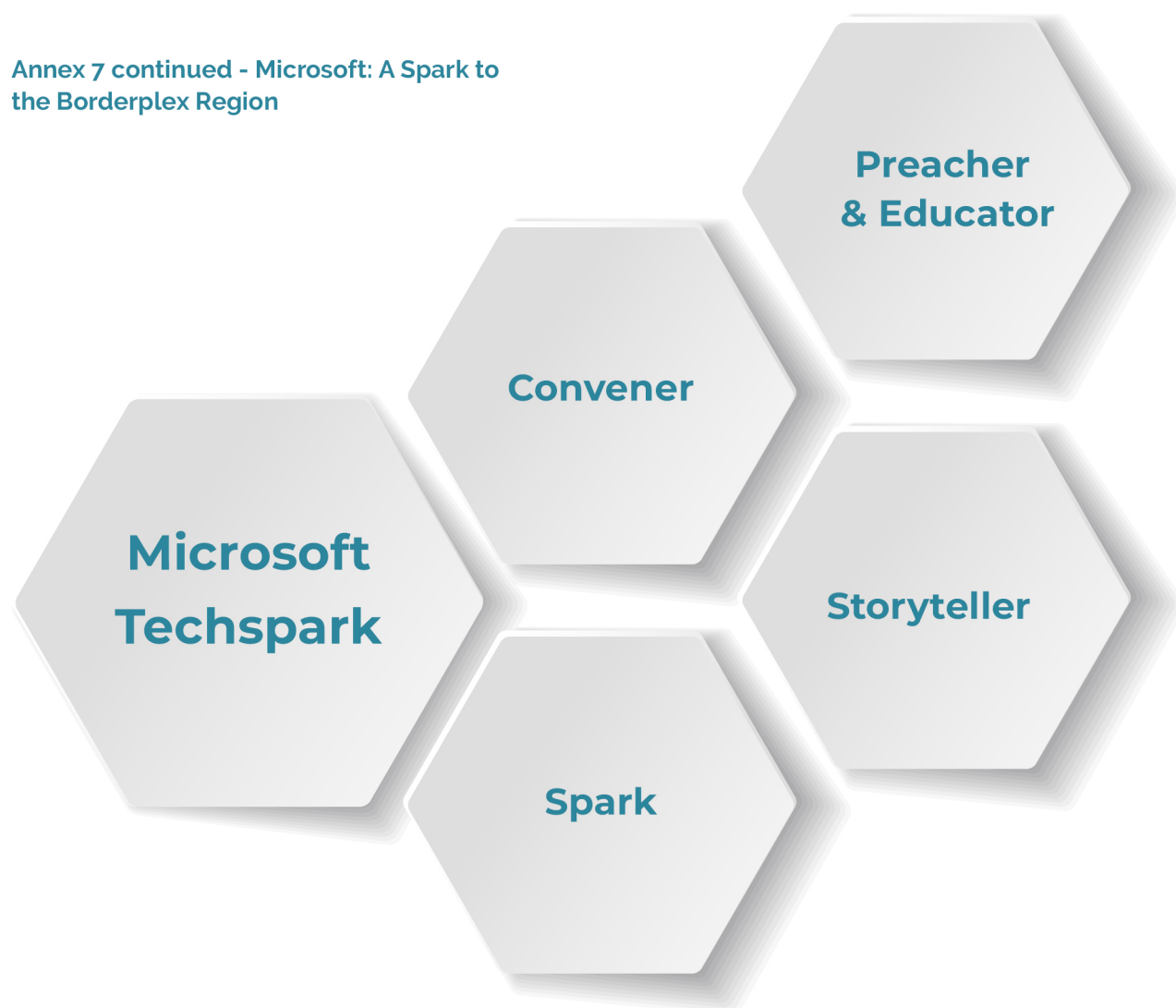
The Clooney Foundation for Justice has developed an initiative focused on monitoring trials around the world that pose a high threat to human rights. They monitor trials in which the law may be used to target a minority or silence a government critic, meaning that there is a likelihood of an unfair trial.<sup>201 202</sup>

- To achieve their objectives, they partnered with the Office of the United Nations' High Commissioner for Human Rights, the American Bar Association, Columbia Law School, and Microsoft.
- Through the program, a small group of lawyers and activists are trained to report on legal proceedings, boiling a trial down to a series of facts that can be easily recorded and ultimately compared.
- With a platform to record audio and take pictures of people and documents that are then uploaded as backup to the cloud, Microsoft's AI can carry out speech-to-text translation so that experts around the globe can analyze it, regardless of language.
- The app also aims to create a data set that has never existed before, which allows AI to identify trends, analyzing trials from around the globe to determine best practices, highlight unsung heroes, and expose corruption.

The Microsoft TechSpark team based in El Paso and Ciudad Juarez has the institutional legitimacy to convene actors, catalyze collaborations, educate key players, tell success stories, support binational projects, and lead by example to harness the use of AI and new technologies across the region. Through its "Tech Intensity" philosophy, it can empower local actors to build new capabilities and innovate, collaborate, and unlock and infuse the power of technology across everything they do.



## Annex 7 continued - Microsoft: A Spark to the Borderplex Region



**Convener.** As a global organization with a history of growth and success, Microsoft has the power to convene key actors across sectors to begin conversations and knowledge exchange around AI development and adoption, covering existing and potential use cases.

**Spark.** Microsoft can ignite curiosity through events targeted at different audiences (students, industry decision makers, government officials), and by providing seed funding to support binational pilot projects that foster cross-city collaboration along the Borderplex region's priority sectors.

**Preacher & Educator.** The company has numerous examples to speak about AI as a tool for business growth and social impact, which can serve as a basis for educating different audiences about the risks and opportunities presented throughout this report.

**Storyteller.** The different experiences and use cases from the Microsoft portfolio showcase the importance of technology as a tool for empowerment, innovation, and to drive business and societal transformation. The Borderplex region needs champions that can put the spotlight on a diverse set of entrepreneurs (including women and minorities) and tell their success stories.



## Sources

1. A full list of interviewees is provided in Annex 2.
2. World Economic Forum (2018). The Future of Jobs Report. Available at: [http://www3.weforum.org/docs/WEF\\_Future\\_of\\_Jobs\\_2018.pdf](http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf)
3. Lynch, S. (2017) Why AI is the new electricity. Stanford Business Insights. Available at: <https://www.gsb.stanford.edu/insights/andrew-ng-why-ai-new-electricity>
4. PWC (2017). Sizing the prize What's the real value of AI for your business and how can you capitalise?. Available at: <https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf>
5. By Future of Work we refer to how new technologies like Artificial Intelligence are shaping and transforming our understanding of work.
6. Future of Life (2019). National and International AI Strategies. Available at: <https://futureoflife.org/national-international-ai-strategies/>
7. The Borderplex Alliance (2019). Business Climate in the North American Borderplex. Available at: <https://borderplexalliance.org/-business-resources/business-climate>
8. According to the U.S. Census Bureau and the Consejo Nacional de Población (Mexico) estimates for 2018. The metropolitan statistical areas (MSA) of El Paso, Texas and Las Cruces, New Mexico, as well as the metropolitan municipality of Juarez, Chihuahua are contemplated.
9. The Borderplex Alliance (2019). Key Industries in the North American Borderplex. Available at: <https://borderplexalliance.org/-borderplex/key-industries-in-the-north-american-borderplex>
10. A list of top Borderplex industry employers is provided in Annex 4
11. WorldCity, Inc. (2019). U.S. Trade Numbers. El Paso Border Crossing, Texas. Available at: <https://www.ustradenumbers.com/port/el-paso-border-crossing-texas/>  
Karklis, L
12. et al. (2018). U.S.-Mexico border: An interactive look at the barriers that divide these two countries. The Washington Post. Available at: <https://www.washingtonpost.com/graphics/2018/national/us-mexico-border-flyover/>
13. U.S. Bureau of Transportation Statistics (2019). Border Crossing Entry Data. Figures for June 2019. Available at: <https://data.transportation.gov>
14. Amaral, M. L. G. (2007). Ciudades fronterizas del Norte de México/- Border cities of the North of Mexico. In *Anales de Geografía de la Universidad Complutense* (Vol. 27, No. 2, p. 41). Universidad Complutense de Madrid.

## Sources

15. Ibid.
16. Ibid.
17. Historic trade route between Mexico City and San Juan Pueblo, New Mexico.
18. Barragán, E. H. T., & Díaz-Bautista, A. (2009). Desarrollo e integración del norte de México y el sur de los EUA a partir del análisis de la evolución de las ciudades fronterizas. *Análisis Económico*, 24(57), 141-168
19. Ibid.
20. Latin American Herald Tribune (2010). Prohibition turned Ciudad Juarez into Sin City for Texans. Available at: <http://www.laht.com/article.asp?ArticleId=353286&CategoryId=14091>
21. Ibid.
22. Las Cruces Convention & Visitors Bureau (2019). History - Visit Las Cruces New Mexico. Available at: <https://www.lascrucescvb.org/history/>
23. Ibid.
24. Amaral, M. L. G. (2007). Op. cit.
25. Maquila Industry refers to the assembly industry where materials processed in Mexico are imported without paying tariffs in the process. It began in the mid 60s based on the Programa Industrial Fronterizo implemented by the federal government.
26. Ibid.
27. The Borderplex Alliance (2019). Key Industries in the North American Borderplex. Available at <https://borderplexalliance.org/borderplex/key-industries-in-the-north-american-borderplex>
28. Paso del Norte Watershed Council (2019).
29. Texas State Historical Association (2019). Rio Grande. Available at: <https://tshaonline.org/handbook/online/articles/rmr05>
30. Ibid.
31. Ibid.
32. Throughout this report, we use the word "maquila" to represent foreign-owned manufacturing operation in Mexico.
33. The Borderplex Alliance (2019). Key Industries in the North American Borderplex. Available at <https://borderplexalliance.org/borderplex/key-industries-in-the-north-american-borderplex>
34. SIDE's program for 4.0 industry promotion. Available at: <https://www.youtube.com/watch?v=zPdkuqDfo7A>

**Table 1**

- 1 CONAPO (2013). Proyecciones de la población de los municipios que componen las zonas metropolitanas, 2010-2030. Figures for 2018.
- 2 INEGI (2019). Encuesta Nacional de Ocupación y Empleo. Indicadores estratégicos. Figures for the second quarter of 2019.
- 3 Proposed classification of Galindo-Rueda, F. and F. Verger (2016) OECD Taxonomy of Economic Activities Based on R&D Intensity, OECD Science, Technology and Industry Working Papers, 2016/04, OECD Publishing, Paris. Data from INEGI (2019) Exportaciones trimestrales de mercancías por subsector de actividad SCIAN de Chihuahua.
- 4 INEGI (2019). Censos Económicos 2009. Industrias manufactureras. Características económicas.

- 3 Proposed classification of Galindo-Rueda, F. and F. Verger (2016) OECD Taxonomy of Economic Activities Based on R&D Intensity, OECD Science, Technology and Industry Working Papers, 2016/04, OECD Publishing, Paris. Data from INEGI (2019) Exportaciones trimestrales de mercancías por subsector de actividad SCIAN de Chihuahua.
- 4 INEGI (2019). Censos Económicos 2009. Industrias manufactureras. Características económicas.
35. Borderplex Alliance (2019). Available at: <https://borderplexalliance.org/borderplex/our-region/el-paso>
36. ITAEE 3rd Trimester of 2019.
37. El Paso Foreign Trade Zone (2019). Available at: <http://ftz.elpaso-texas.gov/>
38. WorldCity, Inc. (2019, September 11). U.S. Trade Numbers. Available at: <https://www.ustradenumbers.com/country/mexico/>
39. El Paso Foreign Trade Zone (2019). Available at: <http://ftz.elpaso-texas.gov/about-ftz/logistics-warehouses>
40. Borderplex Alliance (2019). Available at: <https://borderplexalliance.org/borderplex/our-region/el-paso>
41. Ibid.

**Table 2**

- 1 U.S. Census Bureau (2019). Estimates for 2018.
- 2 U.S. Bureau of Labor Statistics (2019). Civilian labor force, June 2019.
- 3 U.S. Bureau of Labor Statistics (2019). Preliminary, June 2019.
- 4 U.S. Bureau of Labor Statistics (2019). June 2019.
- 5 U.S. Bureau of Economic Analysis. 2017 GDP in current U.S. dollars

42. The Borderplex Alliance (2019). Available at: <https://borderplexalliance.org/borderplex/our-region/southern-new-mexico>
43. In 2019, Rich Global Hemp corporation opened offices and production facilities in Las Cruces with plans to produce industrial hemp plants and seeds. The investment includes research in partnership with the New Mexico Department of Agriculture and the New Mexico State University. The company promises to employ up to 180 people and to inject \$136 million U.S. dollars in direct spending over ten years, with an economic impact of approximately \$247 million U.S. dollars. See more at: <https://www.lcsun-news.com/story/money/business/2019/05/20/rich-global-hemp-begins-production-south-las-cruces/3746288002/>

## Sources

44. U.S. Bureau of Economic Analysis (2019). Gross domestic product (GDP) by metropolitan area. GDP in current dollars of 2017.
45. Huntsman, Billy (2018). NMSU receives major grant for NSF Scholarships in STEM program. NMSU. Available at: <https://newscenter.nmsu.edu/Articles/view/13286/nmsu-receives-major-grant-for-nsf-scholarships-in-stem-program>
46. AgriTech is the use of technology in agriculture, horticulture, and aquaculture with the aim of improving yield, efficiency, and profitability.
47. Borderplex Alliance (2019). Our region. Available at: <https://borderplexalliance.org/borderplex/our-region/southern-new-mexico>

**Table 3**

- 1 NMSU. About us. Available at: <https://nmsu.edu/about.html>
- 2 U.S. Census Bureau (2019). Estimates for 2018.
- 3 U.S. Bureau of Labor Statistics (2019). Civilian labor force, June 2019.
- 4 U.S. Bureau of Labor Statistics (2019). Preliminary, June 2019.
- 5 Ibid
- 6 Town Square Publications (2019). Las Cruces NM | Agriculture. Available at: <https://local.townsquarepublications.com/newmexico/lascruces/17/topic.html>
- 7 2017 GDP in current U.S. dollars. U.S. Bureau of Economic Analysis.

48. Annex 7 provides an in-depth look at the Life Sciences and Health industry.
49. Fablabs (2019). Available at: <https://www.fablabs.io/labs/fablabjuarez>
50. The Hub of Human Innovation (2019). About us. Available at: <http://hubep.org/about-us/>
51. FabLab El Paso (2019). Mission. Available at: <https://fablabelpaso.org/mission-statement/>
52. Insights El Paso (2019). About us. Available at: <http://www.insight-selpaso.org/about/>
53. Arrowhead Center (2019). About us. Available at: <https://arrowheadcenter.nmsu.edu/about/>
54. Arrowhead Innovation Fund (2019). Available at: <http://www.arrowheadinnovationfund.com>
55. The Bridge of Southern New Mexico (2019). What we do. Available at: <http://thebridgeofsnm.org/what-we-do/>
56. Smith, B (2019). Microsoft TechSpark: A New Civic Program to foster economic opportunity to all Americans. Available at: <https://www.linkedin.com/pulse/microsoft-techspark-new-civic-program-foster-economic-brad-smith/>

57. Garcias, L (2019). The Bridge Accelerator: Programa Binacional de Aceleración a la Medida. Available at: <https://t-hub.mx/blog/80/the-bridge-accelerator-programa-binacional-de-aceleracion-a-la-medida>
58. RESET (2018). Available at: <https://www.reset.ws/index-es.html>
59. Border Tech (2019). About. Available at: <http://www.bordermarket-tech.com/ES/>
60. El Paso Pitch (2019). Available at: <https://elpasopitch.com>
61. Borderplex Alliance (2019). Borderplex 2020: Unifying the region. Available at: <https://borderplexalliance.org/about-us/program-areas-and-incentives/borderplex-2020>
62. Electronic Caregiver (2019). About. Available at: <https://electronic-caregiver.com/about-electronic-caregiver/>
63. AI Now (2018). Algorithmic Accountability Toolkit, p. 2. Available at: <https://ainowinstitute.org/aap-toolkit.pdf>
64. Harvard Business Review Press (2019). On AI, Analytics and the New Machine Age. pp.2-8
65. The Borderplex Alliance (2019). Key Industries in the North American Borderplex. Available at <https://borderplexalliance.org/-borderplex/key-industries-in-the-north-american-borderplex>
66. Including the number of jobs they provide.
67. The figures cited are not forecasts for a particular period in time. They are indicative of the considerable potential for the global economy that advanced analytics represents in each sector described.
68. The Borderplex Alliance (2019). Key Industries in the North American Borderplex. Available at <https://borderplexalliance.org/-borderplex/key-industries-in-the-north-american-borderplex>
69. The Borderplex Alliance (2019). Advanced Logistics. Available at: <https://borderplexalliance.org/borderplex/key-industries-in-the-north-american-borderplex/advanced-logistics>
70. SSI Schäfer IT Solutions GmbH. (2018). Artificial Intelligence in Logistics: Terms, applications and perspectives. Available at: [www.ssi-schaefer.com/resource/blob/504606/06d87a3eff1abfb-dd7af3875404b724a/white-paper-artificial-intelligence-in-logistics--dam-download-en-16558--data.pdf](http://www.ssi-schaefer.com/resource/blob/504606/06d87a3eff1abfb-dd7af3875404b724a/white-paper-artificial-intelligence-in-logistics--dam-download-en-16558--data.pdf)
71. Chui, M., et al (2018). Notes from the AI frontier: Insights from hundreds of use cases. McKinsey Global Institute.

## Sources

72. DHL Customer Solutions & Innovation (2018). Artificial Intelligence in Logistics. Available at: <https://www.logistics.dhl/content/dam/dhl/global/core/documents/pdf/glo-core-trend-report-artificial-intelligence.pdf>
73. The Gartner Hype Cycle provides a graphic representation of the maturity and adoption of technologies and applications, and how they are potentially relevant to solving real business problems and exploiting new opportunities. Each hype cycle drills down into the five key phases of a technology's life cycle. More information in: <https://www.gartner.com/en/research/methodologies/gartner-hype-cycle>
74. Gartner (2019). Top Trends on the Gartner Hype Cycle for Artificial Intelligence, 2019. Available at: <https://www.gartner.com/smarterwithgartner/top-trends-on-the-gartner-hype-cycle-for-artificial-intelligence-2019/>
75. SSI Schäfer IT Solutions GmbH. (2018). Artificial Intelligence in Logistics: Terms, applications and perspectives. Available at: [www.ssi-schaefer.com/resource/blob/504606/06d87a3eff1abfbd7af3875404b724a/white-paper-artificial-intelligence-in-logistics--dam-download-en-16558--data.pdf](http://www.ssi-schaefer.com/resource/blob/504606/06d87a3eff1abfbd7af3875404b724a/white-paper-artificial-intelligence-in-logistics--dam-download-en-16558--data.pdf)
76. Gartner (2019). Top Trends on the Gartner Hype Cycle for Artificial Intelligence, 2019. Available at: <https://www.gartner.com/smarterwithgartner/top-trends-on-the-gartner-hype-cycle-for-artificial-intelligence-2019>
77. INEGI (2019). Encuesta Nacional de Ocupación y Empleo. Indicadores estratégicos. Figures for the second quarter of 2019.
78. Chui, M., et al (2018). Notes from the AI frontier: Insights from hundreds of use cases. McKinsey Global Institute.
79. Future Today Institute (2019). Tech Trends Report 2019. Pag. 165. Available at: <https://futuretodayinstitute.com/2019-tech-trends/>
80. Gartner (2019). Top Trends on the Gartner Hype Cycle for Artificial Intelligence, 2019. Available at: <https://www.gartner.com/smarterwithgartner/top-trends-on-the-gartner-hype-cycle-for-artificial-intelligence-2019/>
81. Future Today Institute (2019). Tech Trends Report 2019. Pag. 177. Available at: <https://futuretodayinstitute.com/2019-tech-trends/>
82. Future Today Institute (2019). Tech Trends Report 2019. Pag. 179. Available at: <https://futuretodayinstitute.com/2019-tech-trends/>
83. DHL Customer Solutions & Innovation (2018). Artificial Intelligence in Logistics. Available at: <https://www.logistics.dhl/content/dam/dhl/global/core/documents/pdf/glo-core-trend-report-artificial-intelligence.pdf>
84. Microsoft (2017). Microsoft Customer Story - Oil and gas experts use machine learning to deploy predictive analytics at the edge. Available at: <https://customers.microsoft.com/en-us/story/schneider-electric-process-mfg-resources-azure-machine-learning>
85. Microsoft. How Schneider Electric's AI Evolution Is Powering the Future. The Future Computed. Available at: <https://thefuturecomputed.com/schneiderelectric/>
86. Gartner (2019). Top Trends on the Gartner Hype Cycle for Artificial Intelligence, 2019. Available at: <https://www.gartner.com/smarterwithgartner/top-trends-on-the-gartner-hype-cycle-for-artificial-intelligence-2019/>
87. The Borderplex Alliance (2019). Available at: [borderplexalliance.org/borderplex/key-industries-in-the-north-american-borderplex/business-services](http://borderplexalliance.org/borderplex/key-industries-in-the-north-american-borderplex/business-services)
88. Hess, R. (2017). Artificial Intelligence Starting to Impact Back Office Operations. Available at: <http://www.ngkfgcs.com/Blog/October-2017/Artificial-Intelligence-starting-to-impact-back-of>
89. Chui, M., et al (2018). Notes from the AI frontier: Insights from hundreds of use cases. McKinsey Global Institute.
90. Future Today Institute (2019). Tech Trends Report 2019 (p.298) Available at: <https://futuretodayinstitute.com/2019-tech-trends/>
91. Future Today Institute (2019). Tech Trends Report 2019 (p.299) Available at: <https://futuretodayinstitute.com/2019-tech-trends/>
92. Future Today Institute (2019). Tech Trends Report 2019 (p.230) Available at: <https://futuretodayinstitute.com/2019-tech-trends/>
93. Digital Genius (2019). Retrieved from <https://www.digitalgenius.com/>
94. Magoosh (2019). Magoosh Uses DigitalGenius to Reduce Customer Support Queue by 50%. Available at: <https://www.digitalgenius.com/wp-content/uploads/2018/08/DigitalGenius-Customer-Story-Magoosh.pdf>
95. Digital Genius (2019). KLM Royal Dutch Airlines Transforms Social Customer Service with DigitalGenius AI. Available at: <https://www.digitalgenius.com/casestudy/klm-royal-dutch-airlines-news/>
96. DHL Customer Solutions & Innovation (2018). Artificial Intelligence in Logistics (p.30). Available at: <https://www.logistics.dhl/content/dam/dhl/global/core/documents/pdf/glo-core-trend-report-artificial-intelligence.pdf>
97. Gartner (2019). Top Trends on the Gartner Hype Cycle for Artificial Intelligence, 2019. Available at: <https://www.gartner.com/smarterwithgartner/top-trends-on-the-gartner-hype-cycle-for-artificial-intelligence-2019/>
98. DHL Customer Solutions & Innovation. (2018). Artificial Intelligence in Logistics (p.22). Available at: <https://www.logistics.dhl/content/dam/dhl/global/core/documents/pdf/glo-core-trend-report-artificial-intelligence.pdf>
99. Ramaswamy, S. (2017). How Companies Are Already Using AI. Available at: <https://hbr.org/2017/04/how-companies-are-already-using-ai>
100. Davis, C. (2019). 5 ways leading CIOs are deploying AI in 2019. Available at: <https://www.cio.com/article/3337500/5-ways-leading-cios-are-deploying-ai-in-2019.html>

## Sources

101. Eide, N. (2018). Walmart weaves AI into the back office. Available at: <https://www.ciodive.com/news/walmart-weaves-ai-in-to-the-back-office/540404/>
102. Schmerlzer, R. (2019). Artificial Intelligence Is Making Increasing Headway In The Enterprise Back Office. Available at: [www.forbes.com/sites/cognitiveworld/2019/07/10/artificial-intelligence-is-making-increasing-headway-in-the-enterprise-back-office/#47cf212731ad](http://www.forbes.com/sites/cognitiveworld/2019/07/10/artificial-intelligence-is-making-increasing-headway-in-the-enterprise-back-office/#47cf212731ad)
103. Gartner (2019). Top Trends on the Gartner Hype Cycle for Artificial Intelligence, 2019. Available at: <https://www.gartner.com/smarterwithgartner/top-trends-on-the-gartner-hype-cycle-for-artificial-intelligence-2019/>
104. The Borderplex Alliance (2019). Available at: [borderplexalliance.org/borderplex/key-industries-in-the-north-american-borderplex/defense-and-aerospace](http://borderplexalliance.org/borderplex/key-industries-in-the-north-american-borderplex/defense-and-aerospace)
105. Chui, M., et al (2018). Notes from the AI frontier: Insights from hundreds of use cases. McKinsey Global Institute.
106. Future Today Institute (2019). Tech Trends Report 2019 (p.353) Available at: <https://futuretodayinstitute.com/2019-tech-trends/>
107. Future Today Institute (2019). Tech Trends Report 2019 (p.356) Available at: <https://futuretodayinstitute.com/2019-tech-trends/>
108. Future Today Institute (2019). Tech Trends Report 2019 (p.355) Available at: <https://futuretodayinstitute.com/2019-tech-trends/>
109. Miller, S. (2018). Army looks to improve training simulations with intelligent automation. Available at: <https://defensesystems.com/articles/2018/12/19/army-automation-tools-ste.aspx>
110. Scipio (2018). Machine Learning to Revolutionize Military Training. Available at: <http://digital.hbs.edu/platform-rctom/submission/machine-learning-to-revolutionize-military-training/>
111. Reilly, M.B. (2016). Beyond video games: New Artificial Intelligence beats tactical experts in combat simulation. Available at: [https://magazine.uc.edu/editors\\_picks/recent\\_features/alpha.html](https://magazine.uc.edu/editors_picks/recent_features/alpha.html)
112. Gartner (2019). Top Trends on the Gartner Hype Cycle for Artificial Intelligence, 2019. Available at: <https://www.gartner.com/smarterwithgartner/top-trends-on-the-gartner-hype-cycle-for-artificial-intelligence-2019/>
113. Newsroom (2018). U.S. Army to use Uptake's Artificial Intelligence Software to Increase Bradley Fighting Vehicle Readiness. Available at: <https://www.uptake.com/newsroom/u-s-army-to-use-uptakes-artificial-intelligence-software-to-increase-bradley-fighting-vehicle-readiness>
114. Holt, K. (2018, June 26). U.S. Army tests AI that predicts vehicle repairs. Available at: <https://www.engadget.com/2018/06/26/us-army-ai-vehicle-repairs-bradley/>
115. Gartner (2019). Top Trends on the Gartner Hype Cycle for Artificial Intelligence, 2019. Available at: <https://www.gartner.com/smarterwithgartner/top-trends-on-the-gartner-hype-cycle-for-artificial-intelligence-2019/>
116. Bio El Paso Juarez (2019). Medical Device Industry. Available at: <https://bioelpasojuarez.org/our-region/medical-device-industry>
117. Chui, M., et al (2018). Notes from the AI frontier: Insights from hundreds of use cases. McKinsey Global Institute.
118. Lucas, G. M., et al (2017). Reporting Mental Health Symptoms: Breaking Down Barriers to Care with Virtual Human Interviewers. Frontiers in Robotics and AI. Available at: <https://doi.org/10.3389/frobt.2017.00051>
119. Gaskell, A. (2017). Can a Virtual Therapist Help With PTSD? Available at: <https://dzone.com/articles/can-a-virtual-therapist-help-with-ptsd>
120. Ibid.
121. NYU Langone Health (2019). Artificial intelligence can diagnose PTSD by analyzing voices: Study tests potential telemedicine approach. ScienceDaily. Available at: [www.sciencedaily.com/releases/2019/04/190422082232.htm](http://www.sciencedaily.com/releases/2019/04/190422082232.htm)
122. Hope, D. (2019). Technology News: Artificial Intelligence Can Now Identify PTSD. Available at: <https://www.smartdatacollective.com/technology-news-artificial-intelligence-can-now-identify-ptsd/>
123. Ibid.
124. Ibid.
125. Ibid.
126. Gartner (2019). Top Trends on the Gartner Hype Cycle for Artificial Intelligence, 2019. Available at: <https://www.gartner.com/smarterwithgartner/top-trends-on-the-gartner-hype-cycle-for-artificial-intelligence-2019/>
127. Microsoft (2019). Microsoft Healthcare Bot. Available at: <https://www.microsoft.com/en-us/research/project/health-bot/>
128. Ho, Vanessa (2018). Skip the hold music and meet Premera Scout, a chatbot that helps you with health care. Available at: <https://news.microsoft.com/transform/premera-scout-chatbot-helps-with-health-care/>
129. Gartner (2019). Top Trends on the Gartner Hype Cycle for Artificial Intelligence, 2019. Available at: <https://www.gartner.com/smarterwithgartner/top-trends-on-the-gartner-hype-cycle-for-artificial-intelligence-2019/>



## Sources

130. Taking into account jobs in leisure and hospitality industries for both U.S. cities (June 2019 data from the U.S. Bureau of Labor Statistics) and employment in restaurants and accommodation services for Ciudad Juarez (2nd quarter 2019 data from INEGI).
131. Juarez a Diario (2019). Plataforma "Visit the Borderplex" atraerá turismo a la región binacional. Available at: <https://www.juarezadiario.com/tecnologia/plataforma-visit-the-borderplex-atraera-turismo-a-la-region-binacional/>
132. Chui, M. et al (2018). Notes from the AI frontier: Insights from hundreds of use cases. McKinsey Global Institute.
133. M&IT (2019). AI and robots among WorldHotels' predicted travel trends 2019. Available at: <https://mitmagazine.co.uk/features/worldhotels-release-predicted-travel-trends-2019-focussing-on-ai-and-robots/>
134. Hackernoon (2019). 7 Successful Applications of AI & Machine Learning in the Travel Industry. Available at: <https://hackernoon.com/successful-implications-of-ai-machine-learning-in-travel-industry-3040f3e1d48c>
135. Citibeats (2019). Available at: <https://citibeats.net/>
136. Case Study: Tourism in Cork, Ireland. Jan 2018. Available at: [https://citibeats.net/wp-content/uploads/2018/03/Tourism\\_Feedback\\_Citibeats\\_CaseStudy\\_EN.pdf](https://citibeats.net/wp-content/uploads/2018/03/Tourism_Feedback_Citibeats_CaseStudy_EN.pdf)
137. Gartner (2019). Top Trends on the Gartner Hype Cycle for Artificial Intelligence, 2019. Available at: <https://www.gartner.com/smarterwithgartner/top-trends-on-the-gartner-hype-cycle-for-artificial-intelligence-2019/>
138. SmartEcoMap. Smart Tourism Solutions. Available at: <https://smartecomap.com/en/features/>
139. Gartner (2019). Top Trends on the Gartner Hype Cycle for Artificial Intelligence, 2019. Available at: <https://www.gartner.com/smarterwithgartner/top-trends-on-the-gartner-hype-cycle-for-artificial-intelligence-2019/>
140. World Economic Forum (2018). The Future of Jobs Report. Available at: [http://www.weforum.org/docs/WEF\\_Future\\_of\\_Jobs\\_2018.pdf](http://www.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf)
141. Lee, K. (2018). AI Super Powers: China, Silicon Valley and the New World Order. p210.
142. Smith, B & Browne, C (2019). Tools and Weapons: The Promise and the Perils of a Digital Age.
143. Annex 1 provides an overview of the methodology for estimating automation impact on jobs, as well as employment data sources and data limitations.
144. Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation? Technological forecasting and social change, pp. 114, 254-280.
145. British Embassy, C Minds, Oxford Insights (2018) Towards an AI Strategy in Mexico: Harnessing the AI Revolution. Available at: <https://www.cminds.co/reports>
146. Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation? Technological forecasting and social change, pp. 114, 254-280.
147. Accenture (2017). Shaping the New Digital Border Agency. Available at: <https://www.accenture.com/gb-en/insight-new-digital-border-agency>
148. More information available at: <https://www.microsoft.com/en-us/ai/ai-business-school>
149. More information available at <https://es.coursera.org/learn/ai-for-everyone>
150. More information available at: <https://ai-academy.com/>
151. More information available at: <https://www.cminds.co/afr>
152. Microsoft (2019). TEALS Program. Available at: <https://www.microsoft.com/en-us/teals>
153. Microsoft News Center (2018). Partnership with Microsoft will bring computer science to four El Paso schools. Microsoft Stories Available at: <https://news.microsoft.com/2018/04/30/partnership-with-microsoft-will-bring-computer-science-to-four-el-paso-schools/>
154. Allowing to stack online courses and skills in a formal education program as credits towards earning a degree.
155. More information available at: <https://www.stem.org.uk/stem-ambassadors>
156. For instance, the 2019 Future Workforce Report, commissioned by Upwork, surveyed more than 1,000 U.S. hiring managers to show how Millennials and Gen Z are redefining the Future of Work. More information available at: <https://www.upwork.com/i/future-workforce-fw/2019/>
157. W3C (2017) Data on the Best Web Practices. Available at: <https://www.w3.org/TR/dwbp/>
158. More information available at: <https://datastandards.directory>
159. More information on the U.S. Government Open Data Site: <https://www.data.gov>
160. Datos Abiertos (Open Data). Available at: <https://datos.gob.mx>
161. Mörter, E (2018). What is a data trust? The ODI Blog. Available at: <https://theodi.org/article/what-is-a-data-trust/>
162. From: Wikipedia contributors (2019). Living lab. Available at: [https://en.wikipedia.org/wiki/Living\\_lab](https://en.wikipedia.org/wiki/Living_lab)
163. More at <https://growthlist.co/blog/ai-vc>
164. More information available at: <https://mountainnazca.com>
165. More information available at: <https://altaventures.com>

## Sources

166. More information available at: <http://livcapital.mx>
167. More information available at: <https://developers.google.com/community/launchpad/accelerators>
168. More information available at: <https://theodi.org/service/startups-fostering-innovation/opportunities-for-startups/startup-accelerator/>
169. Tamar Jacoby (2015). Wal-Mart Tests 'Upskilling'. The Wall Street Journal. <https://www.wsj.com/articles/wal-mart-tests-upskilling-1441393973>
170. OECD Principles on Artificial Intelligence (2019). Available at: <https://www.oecd.org/going-digital/ai/principles/>
171. Montreal Declaration for Responsible Development of Artificial Intelligence (2018). Available at: <https://www.montrealdeclaration-responsibleai.com>
172. Principles of AI coming from the 2017 Asilomar conference, organized by the Future of Life Institute. Available at: <https://futureoflife.org/ai-principles/>
173. Quinns, C (2019). Teaching Kids The Ethics Of Artificial Intelligence. WGBH News. Available at: <https://www.wgbh.org/news/science-and-technology/2019/07/31/teaching-kids-the-ethics-of-artificial-intelligence>
174. More information available at: <https://ethicstoolkit.ai>
175. The IEEE is the world's largest technical professional organization with the mission of fostering technological innovation and excellence for the benefit of humanity. More information available at: <https://standards.ieee.org/industry-connections/ec/autonomous-systems.html>
176. The IEEE is the world's largest technical professional organization with the mission of fostering technological innovation and excellence for the benefit of humanity. More information available at: <https://www.ieee.org>
177. A regional platform to promote the development and widespread adoption of responsible AI in Latin America.
178. Visit the IA2030Mx website at: <https://www.ia2030.mx>
179. Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation? Technological forecasting and social change, 114, 254-280.
180. U.S. Census Bureau (2019). 2017 American Community Survey 1-Year Estimates.
181. INEGI (2019). Encuesta Nacional de Ocupación y Empleo. Indicadores estratégicos. Figures for the second quarter of 2019.
182. Data for the metropolitan municipality of Juarez began to be collected as of 2019. For data for U.S. metropolitan areas, 2017 estimations are the latest available.
183. SINCO's comparative tables and technical documents: <https://www.inegi.org.mx/data/clasificaciones.html>
184. More information about 2010 SOC and its structure: <https://www.bls.gov/soc/2010/>
185. Manyika, J. et al (2017). A Future that Works: Automation, Employment, and Productivity, McKinsey Global Institute, San Francisco
186. Despite the coincidences between the results due to the application of both methodologies for countries such as the United States, Sweden and the Czech Republic, the estimated impacts with the Frey and Osborne methodology are greater for most countries, including a wide gap for developing economies. From: Minian, Isaac, & Martínez Monroy, Ángel. (2018). El impacto de las nuevas tecnologías en el empleo en México. Problemas del desarrollo. 49(195). 27-53. <https://dx.doi.org/10.22201/iiiec.20078951e.2018.195.64001>
187. INEGI (2019). Exportaciones por entidad federativa. <https://inegi.org.mx/temas/exportacionesef/>
188. City Data (2019). El Paso Economy. Available at: <http://www.city-data.com/us-cities/The-South/El-Paso-Economy.html>
189. Coronado, M (2017). Electrolux aumenta producción. El Diario. Available at: [http://diario.mx/Economia/2017-09-07\\_ea67d3f7/electrolux-aumenta-produccion/](http://diario.mx/Economia/2017-09-07_ea67d3f7/electrolux-aumenta-produccion/)
190. Gaytán, B (2019). Conduce Bosch Juárez los autos autónomos. El Diario. Available at: <https://diario.mx/economia/conduce-bosch-juarez-los-autos-autonomos-20190528-1521034/>
191. Solinet (2015). Foxconn en México: precariedad en la frontera.
192. Coronado, M. (2015) Cuadruplica Flex personal. El Diario. Available at: [https://diario.mx/Economia/2015-11-04\\_03477a9e/cuadruplica-flex-personal/](https://diario.mx/Economia/2015-11-04_03477a9e/cuadruplica-flex-personal/)
193. Coronado, M (2017). A partir de hoy, Delphi se divide en dos empresas. El Diario. Available at: [http://diario.mx/Economia/2017-12-04\\_e7f43a6-c/a-partir-de-hoy-delphi-se-divide-en-dos-empresas/](http://diario.mx/Economia/2017-12-04_e7f43a6-c/a-partir-de-hoy-delphi-se-divide-en-dos-empresas/)
194. Cordoba, C (2015). Proveedora de autopartes invierte 85 mdd para planta en Chihuahua. El Financiero. Available at: [www.elfinanciero.com.mx/empresas/proveedora-de-autopartes-invierte-85-mdd-para-planta-en-chihuahua](http://www.elfinanciero.com.mx/empresas/proveedora-de-autopartes-invierte-85-mdd-para-planta-en-chihuahua)
195. Haussamen, H (2019). Virgin Galactic lays off dozens of employees as it prepares for commercial flights. Las Cruces Sun News. Available at: <https://www.lcsun-news.com/story/news/local/spaceport/2019/01/25/virgin-galactic-lays-off-dozens-employees-prepares-commercial-flights/2677785002/>
196. MVEDA (2019). Major Employers. Available at: <https://www.mveda.com/-docs/Major-Employers.pdf>
197. MVEDA (2019). Major Employers. Available at: <https://www.mveda.com/-docs/Major-Employers.pdf>

## Sources

198. NMSU (2018). Quick Facts. Available at: [https://oia.nmsu.edu/files/2017/11/23069\\_QuickFactsBrochure\\_8.pdf](https://oia.nmsu.edu/files/2017/11/23069_QuickFactsBrochure_8.pdf)
199. Kenji, T (2017). Democratizing AI to improve citizen health. Microsoft Research Blog. Available at: <https://www.microsoft.com/en-us/research/blog/democratizing-ai-improve-citizen-health/>
200. Microsoft (2017). Microsoft Customer Stories: Arçelik A.Ş. Retrieved from: <https://customers.microsoft.com/en-US/story/this-global-appliance-maker-needed-a-crystal-ball-to-anticipate-business-needs>
201. Clooney Foundation for Justice (2019). TrialWatch. Retrieved from: <https://cfj.org/project/trialwatch/>
202. Digital Trends (2019). Amal and George Clooney want to change the world. Can Microsoft help? Retrieved from: <https://www.digitaltrends.com/computing/clooney-foundation-trialwatch-ai-microsoft/>
203. Smith, B & Browne, C (2019). Tools and Weapons: The Promise and the Peril of the Digital Age