

## The Heartland Robotics Cluster

### The Vision

**The vision of the Heartland Robotics Cluster Coalition is to make Nebraska a leader in robotic technologies and advanced manufacturing automation targeting the agriculture industry.** The Covid-19 pandemic has caused severe disruptions in the agriculture supply chains and a significant reduction in the rural labor force which was already under severe duress due to population out-migration. This transformational \$30 million investment from EDA will set Nebraska on a long-term path to continue as a leader in agriculture production with greater labor productivity and less labor inputs. This “technology based economic development” initiative will formally establish/develop coalition cluster partners by leveraging our inherent agricultural strengths to make the region a resilient economy in the long run.

### The Economic Opportunity: Robotics for the Agriculture Industry

Agriculture is the leading industry in Nebraska with 1 out of every 4 jobs related to the sector. Nebraska agriculture accounts for more than 25% of the state’s labor income, 40% of the state’s economic output, and \$23 billion in cash receipts (3<sup>rd</sup> largest agriculture state in the nation). But Nebraska’s economy is exhibiting strain in its labor markets with the lowest unemployment rate in the nation at 2.2% as of September 2021. As with other rural, agriculture dominant states in the Midwest, a stagnant labor force requires concentrated efforts to increase labor productivity to grow GDP. Yet the challenge for agriculture has never been more evident: a 2014 AgTech report released by the Ewing Marion Kauffman Foundation stated: “...we must produce more food in the next forty years than during the entire course of human history to date, and must do so on a planet showing signs of severe environmental stress.” In addition to labor supply issues, this reality was made worse due to the pandemic: supply chain disruptions in the animal protein value chain, 25% of workers not showing up for work at meat processing facilities, and a diminishing rural labor force reflected in the 2020 census that has continued over the past 50 years. Nebraska experienced an 11.5% decline in real GDP from 2019 to 2020 while the United States saw a 2.2 percent decline in real GDP for the same period.

Yet the state’s core human capital is thriving - The Milken Institute 2020 State Technology and Science Index - Nebraska ranked 12<sup>th</sup> in the nation for the Concentration of Computer & Information Science Experts per 100,000 Workforce; U.S. News and World Report 2020 – Nebraska ranked 12<sup>th</sup> in the nation for high school graduation rate; and the state ranks #4 nationally for the number of high school and middle school teams (per student population) participating in two national robotic competitions (CREATE and VEX) and one international competition (FIRST) according to the Nebraska Public Power District. In September 2021, Brookings Institution identified Lincoln as 1 of 13 “early adopter” metro areas (the only in the Midwest) that have shown above-average involvement in AI activities based on substantial university R&D and major commercial activity in close proximity. Finally, Nebraska is ideal for agtech robotic innovation because of its rich and vibrant agriculture history and an ag-related workforce that is transitioning from aging (average age of farmers in US is 58) to younger, tech-minded future generation of farmers.

Coalition Members

**Invest Nebraska Corporation (INC) will serve as Lead Organization for the Heartland Robotics Cluster;** (See Appendix A: Regional Assets). The INC CEO will also serve as Chair of the Heartland Robotics Steering Committee comprised of primary and secondary coalition members. Newly hired program managers (see Budget Narrative) with The Combine will staff this Committee.

The Heartland Robotics Cluster **primary coalition members** will administer proposed cluster projects and serve on the Robotics Cluster Steering Committee. Descriptions of each organization can be found in Appendix A: Regional Assets.

- The Combine – (operated by INC)
- Metropolitan Area Planning Agency
- The University of Nebraska College of Engineering
- Nebraska Manufacturing Extension Partnership
- Nebraska Innovation Studio
- Northeast Community College
- Metro Community College

The Heartland Robotics Cluster **secondary coalition members** will also serve on the Robotics Cluster Steering Committee. Descriptions of each organization can be found in Appendix A: Regional Assets. Individual Support Letters can be found in Secondary Coalition Members Support Letters Attachment.

- Daugherty Water for Food Global Institute
- Nebraska Farm Bureau
- Nebraska Department of Economic Development
- NUtech Ventures
- Nebraska Innovation Campus
- Praire STEM

Proposed Cluster Projects (approximate total cost of \$30M over five years – actual metric numbers will be finalized with the Phase 1 Award - Documentation that primary coalition members read the application and are committed to execute proposed cluster project can be found in Primary Coalition Members Support Letters Attachment.

**1. Innovation/Technology & Workforce - Robotic R&D: College of Engineering, University of Nebraska** – (1) Conduct generalized research in the field of robotics and expand the knowledge and expertise in the specific robotic areas of: AI and machine learning, visualization, hardware design, and locomotion. (2) Develop a teaching lab for undergraduate students in robotics. (3) Formalize undergraduate and graduate degree programs in robotics. ~ \$6,000,000

Preliminary Proposed Specific Metrics for Proposed Cluster Project	
# of undergraduates receiving degrees	# of graduates receiving degrees
Additional R&D robotic funding received	# of graduate/undergraduate robotic startups
# of graduates placed with robotic companies	
# of women/underserved populations receiving graduate/undergraduate degrees	

**2. Innovation/Technology - Lab Space & Technical Assistance for All Robotics: Nebraska Innovation Studio** – (1) Create a specific robotic makerspace within Nebraska Innovation Studio (“the iHub”) where entrepreneurs and innovators can build a proof-of-concept robotic solution,

utilize various electronic components and equipment, conduct preliminary certification testing, and demonstrate their hardware to potential investors/customers. (2) Develop and administer a Robotic Technical Assistance Program for entrepreneurs and early-stage companies focused solely on hardware development including proof-of-concept, prototype development, and testing/certification. ~ \$6,000,000

Preliminary Proposed Specific Metrics for Proposed Cluster Project	
# of companies receiving TA (Technical Assistance)	# of companies receiving SBIR/STTR awards
# of companies receiving state BIA grants	# of users of iHub (Robotic Makerspace)
# of women and underserved populations receiving TA	

**3. Innovation/Technology - Entrepreneurship TA for AgTech Robotics and Irrigation Automation: The Combine** – (1) Hire an Agriculture Robotics Program Manager and Irrigation Automation Program Manager to: (a) staff regular meetings of the Robotics Cluster Steering Committee, (b) identify labor supply issues in agriculture, (c) manage The Combine 8-Module Program specifically for agriculture robotic startups, (d) collaborate with industry partners identified in Appendix B: Industry Leadership of this application, and (e) expand the existing Combine Insights Network of agriculture producers/farmers that will test new robotic technologies. ~ \$3,000,000

Preliminary Proposed Specific Metrics for Proposed Cluster Project	
# of companies participating in incubator	# of entrepreneurship ecosystem events
# of companies completing module program	# of industry partners serving as beta users
# and amount of companies receiving outside capital & follow-on capital	
# of women/underserved population founders participating in The Combine	

**4. Supply Chain - Advanced Manufacturing Automation: Nebraska Manufacturing Extension Partnership** – (1) Identify rural/urban manufacturers that may assist various stages in the supply chain for new, robotic startups. (2) Assist rural/urban manufacturers to integrate robotic automation into their production systems. (3) Develop long-term strategic plan related to supply chain resiliency through expansion and co-locating downstream suppliers for robotic manufacturers. (4) Create a Manufacturing Automation Demonstration Area and Program on Nebraska Innovation Campus for existing Nebraska manufacturers. ~ \$4,000,000

Preliminary Proposed Specific Metrics for Proposed Cluster Project
# of manufacturers participating in robotics supply chain
# of manufacturers integrating automation into production lines
# of new manufacturing companies started
# of women/underserved manufacturers served by Manufacturing Automation Program

**5. Workforce - Urban Workforce Development and Equity/Inclusion: Metro Community College (Metro Omaha)** – (1) Create workforce training curriculum in coordination with Northeast Community College, needed to train students in robotics/software development and share with other four public community colleges located in Nebraska. (2) Expand existing Prototype Design Lab to include new live freight farm labs and expand the Highlander Accelerator Greenhouse and

Education Center as innovation labs for robotic automation and sustainable urban agriculture (*spoke of the iHub*) for the underserved North and South Omaha communities. (3) Coordinate metro community partners to conduct educational and workforce outreach (use of mobile robotics lab) to underserved minorities and women including opportunities in sustainable vertical robotic farming, and robotics and AI/Machine. (4) Establish robotic learning competitions in underserved area middle and high schools. ~ \$7,000,000

Preliminary Proposed Specific Metrics for Proposed Cluster Project	
# of students receiving 2-year degrees	# of participants in the Robotics Lab MakerSpace
# of K-12 students participating in robotic competitions and educational outreach	
# of women/underserved populations participating in educational outreach	
# of women/underserved populations receiving 2-year degrees in robotics	

**6. Workforce - Rural Workforce Development & Makers Space: Northeast Community College (Rural Nebraska)** – (1) Create workforce training curriculum in coordination with Metro Community College, needed to train students in robotics/software development and share with the other four public community colleges located in Nebraska. (2) Engage with community partners to conduct educational and workforce outreach (use of mobile robotics lab) and expand the Robotics Cluster benefits equitably to underserved racial minorities and women in the rural region. (3) Develop and staff new Robotics Lab Maker Space which will serve as a spoke for Nebraska Innovation Studio’s *iHub*. ~ \$4,000,000

Preliminary Proposed Specific Metrics for Proposed Cluster Project	
# of students receiving 2-year degrees	# of participants in the Robotics Lab MakerSpace
# of community members starting agriculture companies	
# of women/underserved populations participating in educational outreach	
# of women/underserved populations receiving 2-year degrees in robotics	

Accessibility of Matching Funds for Phase 2

Invest Nebraska discussed the Phase 2 funding with each of the primary coalition members leading a proposed cluster project and preliminarily identified the following match fund sources:

Cluster Project	Responsible Coalition Partner	Sources of Matching Funds Identified from Existing Foundation Relationships and Existing Revenue Sources
1. Robotic R&D	University of Nebraska College of Engineering	Existing/New State Appropriation, University of Nebraska Foundation, Private Foundations in Nebraska
2. Lab Space & Technical Assistance for Robotic Hardware	Nebraska Innovation Studio	University of Nebraska Foundation, New State Appropriation, Private Foundation Support (Kiewit Foundation)
3. Entrepreneurship Technical Assistance for AgTech Robotics	The Combine - Powered by Invest Nebraska	New operational funding from Invest Nebraska's existing returned capital investments, Daugherty Foundation
4. Advanced Manufacturing Automation	Nebraska Manufacturing Extension Partnership	NIST Funding, In-kind Support and Funding from Nebraska Manufacturing Advisory Council
5. Urban Workforce Development and Equity/Inclusion	Metro Community College	Private Foundation Support, Community College Taxing Authority, Metro Community College Foundation
6. Rural Workforce Development and Robotics Maker Space	Northeast Community College	Private Foundation Support, Community College Taxing Authority, Northeast Community College Foundation

## Barriers to Implementation and Mitigation Strategies

(1) *A reduction of state general fund appropriation to the Nebraska Business Innovation Act (BIA) Programs for entrepreneurs and startups if the pandemic continues and budget shortfalls ensue.* This is mitigated due to the strong legislative and industry support for the BIA Programs. In 2021, the Nebraska Legislature increased annual funding for the BIA from \$6M/year to \$14M/year.

(2) *Difficulty identifying the 20 percent match for each proposed cluster project.* To mitigate that risk, Invest Nebraska is willing to commit matching funds from its returned capital to ensure the interconnected cluster projects move forward.

(3) *Lack of entrepreneurial talent to drive robotic startups.* It will be necessary for the coalition cluster partners to continuously build relationships with industry and conduct outreach to entrepreneurs identifying robotic opportunities in agriculture and other industries. The Combine Module Program will also mitigate this barrier through entrepreneurial TA.

(4) *Conducting a successful metric-driven equity robotic program for underserved populations and women.* This proposal funds significant projects related to building makers spaces and robotic programming. However, project #5 (Urban Workforce Development and Equity/Inclusion) requires significant partnerships, collaborations, and outreach. Metro Community College is in the best position to coordinate this project due to its ongoing commitment to the Omaha metro area and its successful impacts in the core urban areas of North and South Omaha. Developing a coalition of area partners will allow this project to impact a significant number of K-12 students from underserved populations through robotic learning and robotic competitions. As these students grow and learn through the education system, the opportunity exists to capture their imagination around robotics and recruit the high-school graduates to the community college or College of Engineering.

## Timeline for Implementation of the Heartland Robotics Cluster

Cluster Project	Responsible Coalition Primary Member	Project Start Date	Project End Date	Construction Projects	
				Started	Completed
1. Robotic R&D	University of Nebraska College of Engineering	7/1/2023*	9/30/2027	-	-
2. Lab Space & TA for Robotic Hardware	Nebraska Innovation Studio	10/1/2022	9/30/2027	1/1/2023	12/31/2023
3. Entrepreneurship TA for AgTech Robotics	The Combine - Powered by Invest Nebraska	10/1/2022	9/30/2027	-	-
4. Automation and Advanced Manufacturing	Nebraska Manufacturing Extension Partnership	11/1/2022	9/30/2027	1/1/2023	12/31/2023
5. Urban Workforce Development and Equity/Inclusion	Metro Community College	10/1/2022	9/30/2027	11/1/2022	4/1/2023
6. Rural Workforce Development and Robotics Maker Space	Northeast Community College	10/1/2022	9/30/2027	1/1/2023	12/31/2023

\*University of Nebraska fiscal year begins 7/1/2023