

**Governing Iowa's public
universities and special schools**

University of Iowa
Iowa State University
University of Northern Iowa
Iowa School for the Deaf
Iowa Educational Services for the Blind and
Visually Impaired
Lakeside Laboratory Regents Resource Center
Western Iowa Regents Resource Center



Michael J. Richards, MD, President, *West Des Moines*
David R. Barker, PhD, *Iowa City*
Sherry Bates, *Scranton*
Nancy Boettger, *Harlan*
Abigail Crow, *Tiffin*
Milt Dakovich, *Waterloo*
Nancy Dunkel, *Dyersville*
Jim Lindenmayer, PhD, *Ottumwa*
Greta A. Rouse, *Emmetsburg*

Mark J. Braun, EdD, Executive Director

January 5, 2022

Mr. Charlie Smithson
Secretary of the Senate
State Capitol Building
Des Moines IA 50319

Ms. Meghan Nelson
Chief Clerk of the House
State Capitol Building
Des Moines IA 50319

Tim McDermott, Interim Director
Legislative Services Agency
State Capitol Building
Des Moines IA 50319

Re: Economic Development and Technology Transfer Report

Dear Members of the Iowa General Assembly:

Pursuant to Iowa Code and Iowa Acts, the enclosed annual report includes information from the University of Iowa, Iowa State University, the University of Northern Iowa, and their respective research foundations as follows:

Iowa Code §262B.3(3)

Patents and Licenses for FY 2021

2013 Iowa Acts, Chapter 141.54 (HF 604)

Activities, Projects, and Programs Funded with
Board of Regents Innovation Fund Approp,
Technology Commercialization, Entrepreneurship,
Regional Development, and Market Research
Report

These reports were also presented to the Board of Regents during its November meeting.

If you have any questions or need more information, please don't hesitate to contact this office.

Sincerely,

Mark J. Braun

\\Box Sync\Board of Regents Shared\BF\Legislative\2022 session\Reports\

Attachments

cc: Brendan Beeter
Legislative Liaisons
Legislative Log

**BOARD OF REGENTS
STATE OF IOWA**

ANNUAL ECONOMIC DEVELOPMENT AND TECHNOLOGY TRANSFER REPORT

Action Requested: Receive the report.

Presentation to the Board: The Board will hear from business customers of Regent universities research and economic development services, giving the Board a first-hand perspective of what the Regent universities provide to business and industry across the state, as well as showcasing the research that is such a benefit to the state of Iowa. The three presenters are scheduled to be:

- Debi Durham, Director of the Iowa Economic Development Authority and Iowa Finance Authority
- Gage Kent, Chief Executive Officer of Kent Corporation, Chair of the Iowa Business Council's Business Education Alliance subgroup, and Chair of ISU's Ivy College of Business Advisory Council; Kent Corporation also has space at the ISU Research Park
- Joe Murphy, Executive Director of the Iowa Business Council.

Full Reports Available: The full fiscal year (FY) 2021 annual reports from the University of Iowa (UI), Iowa State University (ISU) and the University of Northern Iowa (UNI) are available on the Board of Regents website and will be provided to the General Assembly, Governor's Office, Legislative Services Agency and the Iowa Economic Development Authority as required by law.

Executive Summary: Iowa's three public universities collaborate with business and industry and with each other to foster success for all economic development and entrepreneurship efforts in Iowa. They significantly impact Iowa on a daily basis and demonstrate to the public the value of research through research-based expertise and business assistance directly to Iowa's people, industry and communities in all 99 counties. Conducting academic research also results in intellectual property discoveries and innovations available to business, industry and the marketplace; and it provides Iowa with an educated workforce. Research and scholarship from faculty and staff at the Regent universities often lead to the discovery of innovations that can improve the quality of life for people in the state, the nation, and worldwide.

The Regent universities research and economic activities outlined in their reports meet the Board of Regents Strategic Plan, Priority 2, Objective 2.3: The Regent Enterprise will build strategic collaborations among universities and with outside entities to foster opportunities for innovation and economic development. Each institution shall report annually on significant partnership and/or collaboration activities. This includes both quantitative and qualitative metrics that demonstrate the impact of these activities.

FY 2021 Highlights:

Both Iowa State University (ISU) and the University of Iowa (UI) set research funding records in FY 2021. The Regent universities faculty and researchers compete with other faculty and researchers from around the world to win this funding for their work. Students are the beneficiaries of this hard work as they get hands-on experience participating in this research.

The Regent universities work diligently to develop breakthroughs that help to improve Iowa's economy through economic development, technology transfer and commercialization of research. Collectively, the three universities provided \$1.45 billion dollars in total sponsored funding to the State of Iowa in FY 2021, an increase of \$242 million from last fiscal year. Over half of the total

(\$790.3 million) comes from competitive federal grants and awards. This sponsored funding includes federal Higher Education Emergency Relief Fund (COVID Relief) funding.

The Regent universities provide assistance to Iowa businesses and start-up companies across Iowa. The numbers fluctuate on an annual basis, but generally reflect an upward trend over several years. In FY 2021, there were nearly 4,500 employees in the 185 companies located in the university research parks and incubators, 96 license and option agreements on institutional intellectual property were executed and 158 patents were awarded. These numbers only tell part of the story. First, the value added by providing assistance to licensees and startup companies as they take these (usually) early stage research ideas and turn them into revenue is not reflected. In addition, information on revenue from licensed patents is only collected during the patent term, which results in an underreporting of revenue generated from products that contain university technology. Nonetheless, these statistics reflect excellent performance when compared to similar institutions and reflect the economic value the Iowa Regent universities provide to the State of Iowa.

The below charts show the combined statistics for the three universities over the past five fiscal years. See the chart at end of the docket item for the details from each university.

Licenses, Intellectual Property and Patents	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Patent applications filed	305	299	260	250	239
Patents awarded	59	117	88	176	158
Disclosures of intellectual property	234	299	259	237	256
Total license and option agreements executed on institutional intellectual property	145	104	96	85	96
License and option agreements executed on institutional intellectual property in Iowa	59	32	38	34	30
License and option agreements yielding income	330	322	292	260	217
Revenue to Iowa companies as a result of licensed technology	\$14.1 M	\$41.7 M	\$13 M	\$10.3 M	\$6.9 M
Royalties and license fee income	\$5 M	\$6.2 M	\$4.6 M	\$4.6 M	\$4.8 M

Companies	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Total startup companies formed through licensing activities	29	7	10	7	15
Startup companies formed in Iowa through licensing activities	21	5	9	5	12
Startup companies formed through UNI assistance	134	96	94	99	107
Companies in research parks and incubators	185	179	189	191	185
New companies in research parks and incubators	66	60	168	72	55
Employees in companies in research parks and incubators	3,493	3,673	4,766	4,596	4,460

Income and Funding	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Total sponsored funding	\$1,099.1 M	\$1,102.7 M	\$1,098.5 M	\$1,207.8 M	\$1,449.5 M*
Sponsored funding from federal grants	\$465.6 M	\$518.2 M	\$540.4 M	\$648.3 M	\$790.3 M*
Total Corporate-sponsored funding	\$145.7 M	\$143.7 M	\$135.3 M	\$143.3 M	\$159.8 M
Corporate-sponsored funding in Iowa	\$25.7 M	\$23.1 M	\$32.2 M	\$21.6 M	\$20.59 M

*FY 2021 sponsored funding includes federal Higher Education Emergency Relief Fund (COVID Relief) funding

Externally sponsored projects supplement the instruction, research, scholarship and public services provided by the Regent universities. These funds do not supplant general fund dollars. This is true for all external funding (federal or non-federal) because it is required by federal regulation that external funds shall supplement and not supplant state dollars.

State Appropriations. Stable and increasing state dollars allow for the Regent universities to expand and grow Iowa's economy by using federal dollars to pay for programs and research that the Regent universities could not otherwise implement. In many cases sponsored projects, including many federally sourced projects, require cost share (match) funds so that the sponsor and the university have a financial stake in the project. In order to provide cost share some state dollars are used and in doing so the Regent universities are able to make every state dollar have twice, and sometimes more, of an impact on the university's instruction, research and public service.

Additionally, federal agencies will only invest in institutions that are financially healthy, compliant with federal regulations that have cutting edge technology and instrumentation, robust public service portfolios, and that have top-tier scholars and researchers. State funding supplies these resources, allowing the Regent universities to attract federal and non-federal funds so that every state dollar invested in the Regent universities has double or more of an impact on Iowa's communities and economy.

For FY 2021, the Iowa General Assembly appropriated nearly \$10.2 million in total funding for economic development, technology transfer and commercialization of research to the three Regent universities, which is a slight decrease from FY 2020. The two state general fund appropriations for FY 2021, totaling nearly \$1.5 million, are divided as follows:

- Nearly \$1.1 million to ISU and UI for the biosciences innovation program; the Board had requested \$4.0 million. The funding is divided \$813,286 to ISU and \$271,095 to UI. The funding continues the four bioscience platforms identified in the TEconomy report where Iowa has the greatest likelihood of achieving a differentiated leadership position to grow and diversify the state's economy: biobased chemicals, precision and digital agriculture, vaccines and immunotherapeutics, and medical devices. The funding will facilitate technology transfer, incubate start-ups and accelerate technology transfer, attract external funding and provide innovation ecosystem services, and develop a skilled workforce.
- \$394,321 to UNI for the expansion of the Metal Casting Center's additive manufacturing capabilities related to investment castings technology and industry support. This was funded at \$400,000 in FY 2020.

The remaining \$8.7 million allocated to the Regent universities, from the Skilled Worker and Job Creation Fund (SWJCF), has not changed since creation of the fund in FY 2014:

- \$3 million to the Regents Innovation Fund, which is used in the areas related to technology commercialization, marketing, entrepreneurship, business growth, and infrastructure projects and programs needed to assist in implantation of activities under Iowa Code chapter 262B (Commercialization of Research). The Regent universities invest the funds received from the legislature in opportunities that yield successful startups, innovative business assistance, and critical research leading to commercialization. The universities are required to match the funding on a one-to-one basis from non-state resources. Research grants, private investors or companies interested in a project, and other university funds are often used as match dollars. The legislation divides the funding: 35% to UI, 35% to ISU, and 30% to UNI.
- \$2 million to UI for implementing the entrepreneurship and economic growth initiative. The appropriation is used to expand public/private partnerships and programing through the Pappajohn Entrepreneurial Center.
- \$209,000 to UI for the UI Research Park, Technology Innovation Center and UI Pharmaceuticals (formerly Advanced Drug Development program). UI must direct expenditures for research toward projects that will provide economic stimulus for Iowa and emphasize providing services to Iowa-based companies.
- \$2.4 million to ISU for small business development centers, the ISU Research Park and the Center for Industrial Research and Service. At least \$735,728 must be allocated for purposes of funding small business development centers. ISU is to direct expenditures for research toward projects that will provide economic stimulus for Iowa and emphasize providing services to Iowa-based companies. The industrial incentive program must focus on Iowa industrial sectors and seek contributions and in-kind donations from businesses, industrial foundations, and trade associations, and that moneys for the Center for Industrial Research and Service industrial incentive program can only be allocated for projects which are matched by private sector moneys for directed contract research or for nondirected research. The match required of small businesses for directed contract research or for nondirected research shall be \$1 for each \$3 of state funds. The match required for other businesses for directed contract research or for nondirected research shall be \$1 for each \$1 of state funds. The match required of industrial foundations or trade associations shall be \$1 for each \$1 of state funds.
- \$1.07 million to UNI for the Metal Casting Center, the MyEntreNet internet application, and the Institute for Decision Making. UNI must allocate at least \$617,638 for purposes of support of entrepreneurs through the university's Center for Business Growth and Innovation and Advance Iowa program. UNI must direct expenditures for research toward projects that will provide economic stimulus for Iowa and emphasize providing services to Iowa-based companies.

FY 2021 University Report's Highlights

University of Iowa: The UI annual economic development and technology transfer report provides a description and activities for their programs and centers in FY 2021. UI secured its highest-ever level of external funding for research, scholarship, and creative activities in FY 2021 – including research contributing to the development of effective COVID-19 vaccines and treatments. The increase includes some federal relief and stimulus funding, a portion of which supported COVID-19 research.

UI noted that the record funding is a testament to the commitment and innovation of the university's faculty and staff. The funding not only supports research directly but also expands

resources available to researchers and scholars and allows the university to leverage its expertise to help Iowa communities. Much of the COVID-19-related research that was funded early in the pandemic, including clinical trials in the UI Roy J. and Lucille A. Carver College of Medicine with Pfizer, Inc. and BioNTech SE to study the effectiveness of messenger ribonucleic acid (mRNA) vaccines, received additional support in FY2021 to continue that work. But additional projects targeting the deadly virus behind COVID-19 – along with research into a wide range of important areas across the disciplines—also were greenlighted last year.

The University of Iowa ranks as one of the top-200 overall universities in the world and remains ranked by Reuters as one of the top-100 most innovative universities in the world. These recognitions are indicative of the quantity and quality of the research and educational experiences supported daily at the University of Iowa. These activities subsequently translate into positive impact on the economy of Iowa. The university's existing strategic plan calls to "Support the translation of intellectual work into applications to enhance economic development." This strategy will be implemented through:

- Creating increased opportunities for entrepreneurial education, new venture creation, technology transfer, with a specific focus in medtech and edtech innovation, and
- Connecting faculty, staff, and students to organizations and subject matter experts to solve unmet needs in social, health, technical, and business problems

Their annual report provides accomplishments from the eight economic development initiatives:

1. Protostudios, a state-of-the-art, rapid-prototyping facility that works with UI researchers, researchers from other Iowa universities and healthcare institutions and community members to develop fully functional prototypes of product ideas, allowing innovators to test, redesign and determine manufacturing paths and demonstrate usability to investors. Protostudios primary focus is on biomedical and electronics prototyping with access to 3D printers (plastics, metals, ceramics) milling, laser/wet jet cutter, printed circuit board fabrication, and consulting from on-staff industrial designers and engineers. Anatomical modeling of human organs prior to complex surgeries is developing into a key value add of Protostudios.
2. UI Research Park leases building sites and space to growing technology companies that require sustained research relationships with the university. The park is home to a world-class business incubator program that has nurtured over 100 UI start-ups and other new ventures since its founding. Incubator tenant companies can draw on both the research and business resources of the university, including access to UI libraries, hazardous waste management services, support for SBIR/STTR grants (Small Business Innovation Research/Small Business Technology Transfer federal grants), educational seminars, networking opportunities, and shipping/package handling.
3. Translational Research Incubator serves as the wet-lab counterpart to Protostudio's dry-lab program. The TRI space, located in the Medical Laboratories building on the university's campus is a complement to the UI Research Park as it can house up to four early-stage research-based biomedical or life science companies focused on commercializing technology developed at the University of Iowa.
4. UI Research Foundation works in conjunction with faculty and staff researchers to transfer their research from the lab to the global marketplace. UIRF assists researchers in

securing intellectual property (IP) protection, marketing new technologies, and collaborating with and licensing to industry partners. UIRF also supports faculty start-ups, through streamlined agreements, connections to resources, patent prosecution management and strategy, and funding referrals.

5. UI Ventures assists university faculty and staff in creating new companies based upon their research. It facilitates connections between the faculty and outside mentors, services and investors and serves as a liaison between the company and university services. Working closely to support the UI Research Foundation, UI Ventures actively engages with outside investors and business experts to improve visibility of UI companies, and bring business expertise to campus. In addition, UI Ventures manages the TRI incubator and operates the MADE program to encourage faculty and staff innovation and entrepreneurship throughout campus.
6. MADE is a manufacturing and e-commerce initiative launched in FY 2018. Iowa MADE is a first of its kind program, in the nation, whose mission is to encourage and facilitate the UI community to bring innovative, need-based products to market with the goal of enhancing economic development at the university as an extension of research and scholarship.
7. John Pappajohn Entrepreneurial Center offers nationally recognized comprehensive entrepreneurial education programs to all Iowans. Iowa JPEC and its university partners play an important role in the development of Iowa-based technology and high-growth start-up companies. Whether providing one-on-one consulting services and group training, working with start-up companies on technology transition, directing UI students on advanced field study projects, or providing training and seminars to business executives, Iowa JPEC seeks to support the next generation of entrepreneurs and business leaders.
8. UI Center for Advancement. The mission of the center is to advance the UI through engagement and philanthropy, and its Corporate and Foundation Relations group promotes economic development through connecting corporate partners with the UI's strengths. In addition, the UICFA is a key player in tapping UI's extensive alumni base to support entrepreneurship and technology commercialization through monetary resources and, equally important, advice and expertise.

Iowa State University: The ISU annual economic development and technology transfer report provides a description and activities for their programs and centers in FY 2021. ISU broke its record by securing \$559.1 million in external funding, including federal COVID aid, breaking the previous record of \$509.2 million set in fiscal year 2018. This is the third time in the past five fiscal years that Iowa State's external funding total has passed \$500 million. Fiscal year 2020's total of \$494.7 million nearly crossed that threshold.

Even through the challenges of a pandemic, ISU researchers stayed committed to relevance and purpose, whether it's unearthing answers to larger questions through fundamental research, or applied research that translates to new innovations that can be commercialized to grow the economy and benefit society. In addition to grants supporting research teams across campus, external funding also provides academic support, scholarships and more. The funding can include contracts, gifts and cooperative agreements from federal, state and local governments, as well as from corporations, nonprofits and other universities.

ISU promotes economic growth in Iowa by providing business and technical assistance to existing companies, supporting the creation of new companies, helping attract new companies and entrepreneurs to Iowa, creating intellectual property and moving research ideas to the market, and contributing to workforce and entrepreneurial development.

As the land-grant institution in the very first state to adopt the Morrill Act, Iowa State University wholeheartedly supports the land-grant ideals of putting science, technology and human creativity to work. Economic development is a top priority for ISU, and the university is very proud of the impact it has on both the lives of its students and the state economy. Iowa State's economic development programs, services and initiatives contribute to the overall positive net impact the university creates on Iowa's business community and return on investment it generates for students, taxpayers and society. Through President Wendy Wintersteen's Innovation and Entrepreneurship Initiative, ISU is embedding innovation and entrepreneurship more deeply into their culture and curriculum. By doing so, ISU is cultivating the next generation of innovators and entrepreneurs while responding to the needs of communities and the state.

ISU pioneered the first statewide extension service in 1906. The extension experiment – universities actively transferring their research and expertise to every corner of every state – was immensely successful across America and remains so today. Each year, more than a million Iowans directly benefit from ISU Extension and Outreach programs. ISU Extension and Outreach, in collaboration with ISU colleges, impacts economic development in the state through all of its programs – Community and Economic Development, as well as Agriculture and Natural Resources, Human Sciences, and 4-H Youth Development.

The Office of Economic Development and Industry Relations (EDIR) serves as the gateway to the university's expertise, capabilities, resources and facilities that support and enhance economic development throughout the state. EDIR works very closely with other university units that contribute to the university's economic development efforts and impact, including the Office of the Vice President for Extension and Outreach, the Office of the Vice President for Research and the academic colleges.

Their annual report provides accomplishments from EDIR, which consists of the following key economic development units that provide integrated and comprehensive business, technical, entrepreneurial support and educational services to ISU's clients and partners:

1. The Center for Industrial Research and Service (CIRAS) works with business and industry across all 99 counties to enhance their performance through service offerings in five general areas: technology, growth, productivity, leadership, and workforce. CIRAS leads three federal business outreach programs and two state-based programs, with staff and partners located across campus and across the state.
2. The Small Business Development Center (SBDC), administered by ISU, consists of 15 regional centers serving all 99 counties in Iowa. SBDC assists individuals interested in starting new companies and provides business services and counsel to existing small companies across Iowa to solve management problems, to improve operations, to seek financing, and to pursue new opportunities. ISU also operates two of the regional centers.
3. Pappajohn Center for Entrepreneurship serves entrepreneurs on campus and in the community, provides entrepreneurial opportunities for students including a student accelerator, hosts statewide and local business plan and pitch competitions and participates in university-wide academic programs in entrepreneurship ranging from a cross-campus minor to a PhD program.

4. ISU Research Foundation and Office of Intellectual Property and Technology Transfer protect, manage, market and license the intellectual property of ISU researchers. The licensed intellectual property rights, in ISU developed innovative technologies, provide rights which may improve the business's manufacturing costs, become a new product line, increase revenue streams or advance product market share. In addition, the ISU Research Foundation supports intellectual property work for the University of Northern Iowa. OIPTT negotiates and implements nondisclosure agreements, material transfer agreement and the industry and commodity agreements related to ISU's research collaborations with industry.
5. ISU Research Park provides a resource-rich environment where innovators flourish. It includes close proximity and easy access to ISU for tenant partners, which include start-ups and established companies that range from growing entrepreneurial ventures to global corporations. The Research Park offers high quality labs and office space, as well as numerous community events, services and amenities that support the efforts of science- and technology-based organizations.

University of Northern Iowa: The UNI annual economic development and technology transfer report provides a description and activities for programs and centers in FY 2021.

UNI's economic development outreach programs are housed in the Business and Community Services (BCS) division and works toward supporting the UNI strategic goal of contributing to the economic vitality of the state. Since 2000, BCS has engaged the entire university community in its outreach efforts, including faculty, staff, students and alumni – all of whom play a critical role in enhancing economic development across Iowa.

In FY 2021, UNI provided economic development assistance throughout all of Iowa's 99 counties, for the 21st consecutive year. Every dollar received from the state to UNI's BCS leverages five dollars in private grants, fees or federal funding. Client interaction made a solid rebound from FY 2020 and the pandemic challenges with a nearly 10 percent increase in unique clients served.

Specific areas of service offered by BCS include: entrepreneurship, community and economic development, market research, environmental research, sustainability, advanced manufacturing, metal casting and additive manufacturing. Their annual report provides accomplishments from the 12 programs located within BCS:

1. Advance Iowa
2. Center for Business Growth & Innovation
3. Center for Energy and Environmental Education
4. Geoinformatics Training, Research, Education and Extension Center (GeoTREE)
5. Institute for Decision Making
6. Iowa Waste Reduction Center
7. John Pappajohn Entrepreneurial Center
8. Metal Castings Center and Center for Additive Manufacturing
9. Recycling and Reuse Technology Transfer Center
10. Small Business Development Center
11. Strategic Marketing Services
12. Tallgrass Prairie Center

Together, these programs:

- Provided service in all 99 counties to 3,505 unique business, community, and governmental entities and served an additional 73,538 unique visitors to MyEntre.Net/IASourceLink
- Reached more than 302,000 Iowans
- Engaged 124 faculty members and 240 students in the direct delivery of BCS client services, and another 2,525 students were reached by BCS programs

**BOARD OF REGENTS
STATE OF IOWA**

**AGENDA ITEM 9
PAGE 10**

Indicators	FY 2017				FY 2018				FY 2019				FY 2020				FY 2021			
	ISU	SUI	UNI	Regents Total	ISU	SUI	UNI	Regents Total	ISU	SUI	UNI	Regents Total	ISU	SUI	UNI	Regents Total	ISU	SUI	UNI	Regents Total
Number of disclosures of intellectual property	130	93	11	234	145	143	11	299	165	83	11	259	132	95	10	237	144	101	11	256
Number of patent applications filed	152	148	5	305	143	153	3	299	98	160	2	260	102	146	2	250	114	123	2	239
Number of patents awarded	15	42	2	59	42	74	1	117	32	54	2	88	56 -US only; 98 -Total	76	2	176	50 US only; 71 Total	86	1	158
Number of license and option agreements executed on institutional intellectual property in total	85	58	2	145	51	51	2	104	46	48	2	96	46	37	2	85	47	47	2	96
Number of license and option agreements executed on institutional intellectual property in Iowa	39	18	2	59	21	9	2	32	25	12	1	38	22	10	2	34	22	7	1	30
Number of license and option agreements yielding income	199	122	9	330	185	127	10	322	155	127	10	292	154	95	11	260	118	87	12	217
Revenue to Iowa companies as a result of licensed technology	\$9.9 million	\$0.5 million	\$3.7 million	\$14.1 million	\$36.9 million	\$1.24 million	\$3.6 million	\$41.74 million	\$8.3 million	\$1.2 million	\$3.5 million	\$13 million	\$5.4 million	\$1.1 million	\$3.8 million	\$10.3 million	\$1.7 million	\$1.1 million	\$4.1 million	\$6.9 million
Number of startup companies formed, in total (through licensing activities)	9	20	--	29	2	4	1	7	4	5	1	10	4	2	1	7	8	6	1	15
Number of startup companies formed, in Iowa (through licensing activities)	8	13	--	21	2	2	1	5	4	4	1	9	4	0	1	5	8	3	1	12
Number of startup companies formed through UNI assistance	--	--	134	134	--	--	96	96	--	--	94	94	--	--	99	99	--	--	107	107
Number of companies in research parks and incubators	115	46	24	185	118	41	20	179	130	38	21	189	135	34	22	191	134	32	19	185
Number of new companies in research parks and incubators	43	7	16	66	40	6	14	60	151	1	16	168	53	5	14	72	35	5	15	55
Number of employees in companies in research parks and incubators	1,702	1,704	87	3,493	2,178	1,429	66	3,673	2,253	2,459	54	4,766	2,041	2,500	55	4,596	1,913	2,500	47	4,460
Royalties and license fee income	\$3.3 million	\$1.67 million	\$35,050	\$5.0 million	\$4.3 million	\$1.72 million	\$21,500	\$6.24 million	\$2.8 million	\$1.77 million	\$29,050	\$4.6 million	\$3.0 million	\$1.57 million	\$45,100	\$4.62 million	\$2.9 million	\$1.81 million	\$63,400	\$4.8 million
Total sponsored funding	\$503.6 million	\$557.7 million	\$37.8 million	\$1,099.1 billion	\$509.2 million	\$554.0 million	\$39.5 million	\$1,102.7 billion	\$469.0 million	\$588.7 million	\$40.8 million	\$1,098.5 billion	\$494.7 million	\$666.2 million	\$46.9 million	\$1,207.8 billion	\$559.1 million*	\$818.04 million*	\$72.4 million*	\$1,449.5 million*
Sponsored funding from federal grants	\$219 million	\$224.4 million	\$22.2 million	\$465.6 million	\$235.6 million	\$260.5 million	\$22.1 million	\$518.2 million	\$237.1 million	\$281.5 million	\$23.2 million	\$541.8 million	\$253.0 million	\$346.7 million	29.1 million	\$628.8 million	\$303.5 million*	\$431.3 million*	\$55.5 million*	\$790.3 million*
Corporate-sponsored funding in total	\$45.3 million	\$99.5 million	\$875,000	\$145.7 million	\$51.3 million	\$91.6 million	\$803,000	\$143.7 million	\$57.2 million	\$77.1 million	\$1.0 million	\$135.3 million	\$51.2 million	\$91.1 million	\$1.0 million	\$143.3 million	\$51.5 million	\$107.1 million	\$1.2 million	\$159.8 million
Corporate-sponsored funding in Iowa	\$14.3 million	\$10.5 million	\$875,000	\$25.7 million	\$7.8 million	\$14.9 million	\$400,000	\$23.1 million	\$20.7 million	\$10.9 million	\$560,000	\$32.2 million	\$11.8 million	\$8.8 million	\$1.0 million	\$21.6 million	\$12.2 million	\$7.49 million	\$900,000	\$20.59 million

* FY 2021 sponsored funding includes federal Higher Education Emergency Relief Fund (COVID Relief) funding

IOWA STATE UNIVERSITY

OF SCIENCE AND TECHNOLOGY

FY21 ANNUAL ECONOMIC DEVELOPMENT AND TECHNOLOGY TRANSFER REPORT TO BOARD OF REGENTS, STATE OF IOWA

PRESENTED BY:

David Spalding
Raisbeck Endowed Dean, Debbie and Jerry Ivy College of Business
Interim Vice President, Office of Economic Development and Industry Relations

November 4, 2021

Iowa State University Annual Economic Development and Technology Transfer Report – FY2021

As the land-grant institution in the very first state to adopt the Morrill Act, Iowa State University wholeheartedly supports the land-grant ideals of putting science, technology and human creativity to work. Economic development is a top priority for Iowa State, and the university is very proud of the impact it has on both the lives of its students and the state economy. Iowa State's **economic development programs, services and initiatives** contribute to the overall positive net impact the university creates on Iowa's business community and return on investment it generates for students, taxpayers, and society. Through President Wendy Wintersteen's **Innovation and Entrepreneurship Initiative**, we are embedding innovation and entrepreneurship more deeply into our culture and curriculum. By doing so, we are cultivating the next generation of innovators and entrepreneurs while responding to the needs of our communities and state.

Iowans can count on Iowa State to serve as a trusted resource, using our core strengths—innovation, science-based extension and outreach, and education. In response to the ongoing COVID-19 crisis, units within the **Office of Economic Development and Industry Relations (EDIR)** have adapted their normal business operations to better meet Iowans' needs. The units continue to remain very engaged across the entire state, providing outreach and assistance in support of Iowa businesses.

EDIR consists of the following key university economic development units that provide integrated and comprehensive business, technical, entrepreneurial support, and educational services to Iowa State's clients and partners:



- The **Center for Industrial Research and Service (CIRAS)** works with business and industry across all 99 counties to enhance their performance through service offerings in five general areas: technology, growth, productivity, leadership, and workforce. CIRAS leads three federal business outreach programs and three state-based programs, with staff and partners located across campus and across the state.



- The **Small Business Development Center (SBDC)**, administered by Iowa State, consists of 15 regional centers serving all 99 counties in Iowa. SBDC assists individuals interested in starting new companies and provides business services and counsel to existing small companies across Iowa to solve management problems, to improve operations, to seek financing, and to pursue new opportunities. Iowa State also operates two of the regional centers.

IOWA STATE UNIVERSITY

Pappajohn Center for Entrepreneurship

- The **Pappajohn Center for Entrepreneurship** serves entrepreneurs on campus and in our community, provides entrepreneurial opportunities for students including a student accelerator, hosts statewide and local business plan and pitch competitions, and participates in university-wide academic programs in entrepreneurship ranging from a cross-campus minor to a PhD program. The Pappajohn Center for Entrepreneurship has a presence in the Research Park CORE Facility, and new this year, on campus in the Student Innovation Center. Flagship programs include ISU Startup Factory, CYstarters, and CyBIZ Lab.

IOWA STATE UNIVERSITY

Research Foundation, Inc.

IOWA STATE UNIVERSITY

Office of Intellectual Property and Technology Transfer

- **The Office of Innovation Commercialization, which encompasses the ISU Research Foundation (ISURF) and Office of Intellectual Property and Technology Transfer (OIPTT)**, protects, manages, markets, and licenses intellectual property resulting from the research enterprise at Iowa State University. Both established and startup companies license intellectual property rights from ISURF in order to introduce new products, decrease their manufacturing costs, improve revenue streams, and increase their market share. OIPTT negotiates and executes nondisclosure agreements, material transfer agreements, and research agreements between ISU and industry partners and commodity groups.



- **ISU Research Park (ISURP)** provides a resource-rich environment *WHERE INNOVATORS FLOURISH*. It includes close proximity and easy access to Iowa State University for our tenant partners, which include start-ups and established companies that range from growing entrepreneurial ventures to global corporations. The Research Park offers high quality labs and office space, as well as numerous community events, services and amenities that support the efforts of science- and technology-based organizations.

Highlights of FY2021

EDIR

- Named winner of the Innovation Award given by the Innovation of Economic Prosperity Universities program of the Association of Public & Land Grant Universities

CIRAS

- Worked with a Mason City company to help them pivot to making face shields when the pandemic hurt their operations. Ultimately the company produced over 2 million face shields with the majority going to organizations in Iowa.
- **Achieved a milestone by reporting \$3B in impact** and over 31,000 jobs created or retained from companies over the past five years as a result of CIRAS and partner assistance.
- **Launched a new partnership with the Iowa Department of Transportation (DOT)** to help economically and socially disadvantaged businesses develop so they are better able to compete for highway construction projects and other DOT-funded projects. CIRAS will provide one-on-one assistance to companies who qualify as Disadvantaged Business Enterprises (DBE) about the best ways to position themselves for bidding opportunities.

America's SBDC Iowa

- Due to the assistance of the SBDC during the reporting period, the following statewide economic impact was attributed by clients served in all 99 counties:
 - 207 new businesses started – 17 new business/month
 - 2,245 job created – 187 jobs/month
 - \$182 million in capital infusion into businesses served
 - Sales increased by \$415 million - \$34 million in sales increases/month
- Launched the Rural Business Innovators program with 8 companies in the first cohort.
- #IASBDCMobile initiative began in the fall of 2020, with dedicated team members going to more than 20 communities across the state to bring needed assistance and resources in the areas of accounting, operations digital marketing and e-commerce.

Pappajohn Center for Entrepreneurship

- ISU Startup Factory, in partnership with BioConnect Iowa and Venture Net Iowa, was awarded a \$525,472 EDA grant to launch Iowa's first Go-To-Market Accelerator program. The program launched in February 2021 with five companies representing education technology, animal health, biotechnology, advanced manufacturing and medical technology.
- Iowa State University was awarded the U.S. Association for Small Business and Entrepreneurship (USASBE) National Model Program award for its robust entrepreneurship programs that span from the classroom to startups.
- The Princeton Review ranked Iowa State #11 in the country for its undergraduate entrepreneurship programs.
- Dr. Shan Jiang, Materials Science professor and member of Cohort X of ISU Startup Factory, was awarded a 2021 Regents Innovation Fund grant for his self-stratifying amphiphilic Janus particles, which has the potential through his startup company to significantly change the coatings industry. Dr. Jian and his team were selected to attend the National I-Corps program in early 2021.

Office of Innovation Commercialization

- Renewable Waxes. Iowa State University researchers discovered a method to make a new wax from soybean oil that appears to meet the temperature and performance requirements of manufacturers from various industries. ISURF has entered into an option

agreement with a Fortune 100 company to evaluate the patented formulations and methods for commercialization.

ISU Extension and Outreach

- Outreach Agriculture and Natural Resources programs made more than 98,200 contacts with farmers and agribusinesses, providing research-based information to help Iowans grow the economic base of Iowa agriculture.
- Human Sciences Extension online educational offerings are now widely available to support recruitment and retention of the child care workforce and to improve quality of care. During FY 2021, a total of 22,344 early care and education professionals participated in 90,285 hours of online education.
- 4-H Youth Development programs reached more than 100,000 Iowa youth in 2019-2020, preparing these young people to actively pursue careers and education beyond high school and build skills. Annually about 91 percent of 4-H seniors report they intend to pursue trades or post-secondary education within 12 months of graduation.

ISU Research Park

- At the beginning of the pandemic (March 2020), ISURP had 140,000 square feet of vacant space in our multi tenant buildings. We currently (Nov 2021) have less than 4,000 rentable square feet available.
- Last year, ISURP intentionally switched our engagement model to be more collaborative with campus partners. This has netted increased spend on research and revenue generating projects across the institution and underscored our value proposition with key tenant partners.
- ISURP is in partnership with Iowa State University, the athletic department, the BioCentury Research Farm, and multiple university groups on building out multiple private partnership deals that will likely impact our tenant roster and current geographic model moving forward.

Vice President for Research

- In June, Iowa State University became home to a new NSF-funded initiative focused on enhancing rural broadband connectivity and bridging the divide between urban and rural areas both in the state, and the nation as a whole. [ARA Wireless Living Lab for Smart and Connected Rural Communities](#) is led by Iowa State Electrical and Computer Engineering professor, Hongwei Zhang. ARA is receiving **\$8 million in federal funding** from the [Platforms for Advanced Wireless Research](#) (PAWR) **as well as a matching investment** in cash and in-kind contributions from PAWR industry consortium partners. ARA's ultimate goal of enhancing rural broadband connectivity can have a profoundly positive impact on improving the economic sustainability of rural communities by:
 - Supporting the state's growth in the Biosciences, in digital and precision agriculture, in particular;
 - Making industry and manufacturing in rural areas more vital and competitive; and
 - Fueling greater innovation and entrepreneurship across the rural landscape.
- Iowa State University and U.S. Department of Energy (DOE) National Laboratory, Ames Laboratory, have become a national research epicenter for the rapidly emerging field of plastics upcycling. An award of **\$2.7 million** from the Defense Advanced Research Projects Agency (DARPA) is just one multiple grants received by researchers Aaron

Sadow, Chemistry professor, Erich Cochran, Chemical and Biological Engineering professor, and Robert Brown, director of the Bioeconomy Institute. This innovative work in plastics upcycling opens economic opportunities but also offers creative solutions for resolving the world's mounting issues with waste and is an important step toward a more sustainable future.

- Soumik Sarkar, associate professor of Mechanical Engineering and a Walter W. Wilson Fellow in Engineering, received an initial FY21 award of \$1.9 million from NSF and USDA-NIFA on a **five-year \$7 million** Cyber-Physical Systems (CPS) Frontier grant. Sarkar is leading a multi-institution, interdisciplinary research initiative that could bring unprecedented levels of efficiency and sustainability to production agriculture. The team is focused on transforming current cyber-physical systems and capabilities in agriculture by developing a novel, context-aware cyber-agricultural system that encompasses sensing, modeling, and actuation activities to enable farmers to respond to crop stressors more cost-effectively, with greater agility and with less impact on the environment than current practices.

In June 2016, EDIR moved into the new **Economic Development Core Facility**, which houses these units under one roof. EDIR serves as the gateway to the university's expertise, capabilities, resources, and facilities that support and enhance economic development throughout the state. EDIR works very closely with other university units that contribute to the university's economic development efforts and impact, including the Office of the Vice President for Extension and Outreach, the Office of the Vice President for Research, and the academic colleges.

Iowa State **pioneered the first statewide Extension Service** in 1906. The extension experiment—universities actively transferring their research and expertise to every corner of every state—was immensely successful across America and remains so today. **Iowa State University Extension and Outreach**, in collaboration with ISU colleges, impacts economic development in the state through all of its programs—Community and Economic Development (CED), as well as Agriculture and Natural Resources, Human Sciences, and 4-H Youth Development.

ISU promotes economic growth in Iowa in a number of ways. We provide business and technical assistance to existing companies, we support the creation of new companies, we help attract new companies and entrepreneurs to Iowa, we create intellectual property and help move research ideas to the market, and we contribute to workforce and entrepreneurial development.

Business and Technical Assistance

SBDC - The SBDC, through its Lead Center based at Iowa State University, and its 15 regional centers, continues to work tirelessly to assist small businesses in every corner of the state with pandemic recovery. In a typical year, the SBDC assists approximately 4,000 clients. Throughout the pandemic, SBDC has assisted more than 70,000 businesses. Business Counselors provided direct client counseling on small business relief programs and advice on how to pivot their businesses to keep the doors open and the lights on. The SBDC also engaged in several additional initiatives that directly impacted Iowa's businesses, including significant rural outreach:

- #Back2Biz – Be Smart with the Restart campaign – developed resources including a recovery guidebook, customizable and printable posters for workplace safety, as well as operations and employee well-being tips. <http://iowasbdc.org/back2biz/>
- Business Recovery Kits – delivered 300 kits to 25 communities across the state. The focus of the kits is a Small Business Recovery Guide which has e-commerce, digital marketing, restaurant guidance, and other resources. The kits also contained a cybersecurity guide, resource magnet with contact information, and masks required window clings. The kits were developed in both English and Spanish. <https://iowasbdc.org/wp-content/uploads/2021/02/Small-Business-Recovery-Guide.pdf>
- #IASBDCMobile initiative began in the fall of 2020, with dedicated team members going to more than 20 communities across the state to bring needed assistance and resources in the areas of accounting, operations digital marketing and e-commerce. Through this initiative, the e-commerce platform, Shop Iowa (www.shopiowa.com) was heavily promoted. Funded in part by IEDA, the platform is available for no-cost for small businesses. The pandemic brought forth the need for businesses to get online to make sales, and the platform was a no-risk opportunity to engage in e-commerce. During the tour, the SBDC team had a lighted portable photo studio they demonstrated and let businesses use during their visits. They were very popular and SBDC used funds to purchase a portable photo studio for all 942 communities in Iowa. Throughout the spring of 2021, SBDC staff, state advisory board members, Main Street Iowa staff, ISU Extension and Outreach – FFED staff, and others delivered the photo studios. <https://iowasbdc.org/photo-box/>
- The pandemic also showed the need to increase outreach to minority-owned businesses and entrepreneurs, as they have been among the hardest hit. SBDC has launched the Inclusivity Challenge. The purpose is to hold conversations all across the state and work with our partners to discuss how we can work together to support minority entrepreneurs. A kick-off event was held in July, and many conversations are starting with action plans to show results of the efforts. <https://iowasbdc.org/wp-content/uploads/2021/07/inclusivity.pdf>

The efforts by the entire SBDC staff have produced significant results, especially for the rural areas of the state:

RURAL MILESTONES



CAPITAL INFUSION

SFY20 **\$43,938,098** → SFY21 **\$126,247,149** **+187%**
INCREASE

SFY 20 - 21  CLIENTS COUNSELED → **8,709**



SALES INCREASE

SFY20 **\$159,912,951** → SFY21 **\$199,994,227** **+25%**
INCREASE



In response to the tremendous need for services in our rural areas, the SBDC responded with additional counselors and starting the Rural Business Innovators (RBI) program. There are a lot of strong business ideas in our rural areas that needed additional support to take their business product or idea to the next level toward commercialization. RBI is an entrepreneurial training program that focuses on finding commercialization opportunities in Iowa's rural areas in an effort to increase wealth and create jobs in rural Iowa. The first cohort of eight tech companies have been meeting and developing their business models.

<https://sites.google.com/iastate.edu/ruralbusinessinnovators/home>

STATEWIDE MILESTONES



CAPITAL INFUSION

SFY20 **\$75,907,697** → SFY21 **\$212,305,314 +179%**
INCREASE

SFY 21  CLIENTS COUNSELED → **7,332**



SALES INCREASE

SFY20 **\$182,549,994** → SFY21 **\$422,691,097 +131%**
INCREASE



During the most recent State Fiscal year of July 1, 2020 through June 30th, 2021, **America's SBDC Iowa** provided business assistance to individuals and companies in **all 99 counties totaling 7,332 clients and 14,493 counseling hours**. Of the over 70,000 small businesses that were touched by the SBDC, 7332 were registered in our system for continued follow up. As a result of this counseling, 207 new businesses were started and 2,245 jobs were created. Additionally, SBDC assistance was **credited by clients with increasing their capital infusion by more than \$182 million and increasing their sales by more than \$415 million**. This translates into 187 new jobs every month, 17 new business every month and sales increases of \$34.0 million every month.

The **ISU SBDC regional center and the Mid Iowa SBDC regional center**, hosted by Iowa State University provided 2,497 hours of counseling assistance to startup and existing companies; served 842 clients with one-on-one counseling; provided advice to several hundred clients via telephone and e-mail; and advised a number of technology companies in the areas of licensing, equity-based financing, market entry, and numerous operational areas. The centers documented **45 new business starts with 203 new jobs created that have generated \$41.27 million in capital infusion and \$39.76 million in sales increases**.

CIRAS - CIRAS was created in 1963 to improve the quality of life in Iowa by helping businesses and their communities prosper and grow. **CIRAS' individually tailored strategy, Engage. Educate. Embed. means we work with companies to fashion solutions specific to their individual needs**. CIRAS offers services in five main areas: growth, productivity, technology, leadership, and workforce.

A vast network of university and industry experts brings years of professional experience to CIRAS, making us a leading integrator of solutions in Iowa. **Over the past five years, CIRAS and its partners have reported impact from companies totaling more than \$3 billion (sales gained or retained \$2.5 billion, new investments \$0.3 billion, costs saved or avoided \$0.2 billion) and over 31,000 jobs created or retained** as a result of the assistance they received.

In 2020 alone, **1631 businesses from 93 counties in the state received assistance on projects or attended educational workshops from CIRAS staff or partners.** Companies responding to surveys reported \$614 million in total economic impact (\$560 million in sales gained or retained, \$29 million of new investment, and \$25 million in costs saved or avoided) and over 7,400 jobs created or retained as a result of the assistance they received from CIRAS and its partners.

- The **CIRAS Manufacturing Extension Partnership (MEP)** program helps small to mid-sized manufacturers grow by implementing new technical and management practices.
- The **CIRAS Procurement Technical Assistance Center (PTAC)** assists companies from all industries and skill levels in navigating the contracting processes for federal, state, and local governments.
- The **CIRAS Economic Development Administration University Center Program (EDAUCP)** develops workforce management plans for rural communities clustered near metropolitan areas.
- The **CIRAS Technology Assistance Program (TAP)** provides expertise to Iowa businesses to reduce their risk of deploying technologies.
- The **Iowa Lean Consortium (ILC)** is a member-driven program dedicated to advancing Lean in all sectors of the economy.
- The **Disadvantaged Business Enterprise (DBE)** Program helps economically and socially disadvantaged businesses better compete for Iowa DOT-funded projects.

Appendix 1 provides some illustrative examples of CIRAS, SBDC, and ISURF projects with Iowa companies and entrepreneurs during the past year.

IOWA STATE UNIVERSITY

Extension and Outreach

Community and Economic Development

ISU Extension and Outreach - The Community and Economic Development program within ISU Extension and Outreach has multiple community development specialists in place with expertise and/or experience working with minority-owned businesses and community business leaders. Through a partnership with SBDC, CED specialists reached 54 business owners in under-represented markets, equating close to 250 hours of one-on-one business counseling in addition to invaluable time spent in advocacy to these markets. The Financial Empowerment Center is working closely with SBDC and CED to provide financial literacy training for minority business owners, to prepare them to acquire capital to start or grow their business. Through the training in the past two years, 76 entrepreneurs were trained, resulting in 50 minority-owned businesses starting or improved.

This past year the **Agriculture and Natural Resources (ANR) program made more than 98,200 contacts with farmers and agribusinesses through 1,836 meetings, 3,943 face-to-face consultations, and 33,777 phone and email discussions.** Specialists made 959 digital presentations and online courses, reaching more than 126,000 participants in real-time and an additional 70,581 in on-demand viewing of virtual program archives. ANR specialists present research-based information and answer technical questions to help lowans **grow the economic base of Iowa agriculture.** ANR provides farmers, policy makers, regulators, and agribusiness professionals the opportunity to learn from research-based education to inform their decisions, which leads to sustainable environments, profitable farms, thriving communities, and a more secure food system.

Appendix 2 provides some illustrative examples of this work.

ISU Research Park - ISURP, WHERE INNOVATORS FLOURISH, is a growing technology community and incubator for innovators at new and expanding businesses, providing access to the vast array of resources available at Iowa State University. ISURP has a history of success because companies find value in a close physical presence and connection to the university as it facilitates working with faculty and graduate students on research, tapping into and recruiting the graduate and undergraduate student talent pool, and accessing university facilities. ISURP tenants include companies of all sizes and industry focus, though engineering and technology, and bioscience/ag tech comprise the largest proportion, reflecting Iowa State's strength in STEM. Tenants include companies incubated at ISURP as well as established global brands. **Five Iowa companies that had an IPO started at ISURP; today two remain at ISURP and one additional is located elsewhere in Ames.** In addition, multiple ISURP companies have enjoyed significant liquidity events, with multiple startups acquired by global brands.

Today, ISURP is a 400-acre development just south of campus with approximately 800,000 square feet of building space. **Fifteen new companies and affiliates, and 26 pre-incubator cohorts joined ISURP in FY21,** bringing the **cumulative total to 508 companies and research centers and 8,066 employees for current and former tenants that are still in existence world-wide.** Currently, there are **101 companies and research centers and 18 affiliates and coworking members located at ISURP, employing 1,913 and 520 people, respectively.**

In choosing to locate at ISURP, businesses are doing more than simply occupying a building. They are joining a thriving community focused on driving innovation, researching and developing solutions to complex challenges, creating a pipeline that offers easy access to world class talent, and supercharging the state economy.

- In the past seven years, **ISURP has increased its tenant base by more than 100%, has increased square footage by 75% and significantly increased the number of employees.** In addition, commercial amenity and infrastructure projects have brought ISURP an additional 38 build ready acres for portfolio company growth so we are well positioned for the next generation of workforce solutions.
- ISURP contributes more to local property taxes than any other entity in Story County (\$1.5 million annually).
- In 2019 ISURP opened a standalone sprayer technology facility for John Deere, in addition to already housing one of its Global Technology and Innovation Centers.

- Added Silicon Valley startup PivotBio, and locally grown startup Summit Capture Solutions to the tenant mix, both precision/sustainable agriculture companies with multiple relationships in place with other ISURP tenants.
- Headquarters for the AgStartup Engine, a private systematic program to fund AgTech entrepreneurs and help them towards success through mentorship and financial support.
- 200+ student interns work at ISURP at any given time
- 53 corporate locations throughout the state, in addition to ISURP presence
- \$68,000 average salary for ISURP company employees
- An additional 2,500+ are employed throughout Iowa from ISURP graduate companies

COVID-19 brought our tenant base and programs unprecedented change and challenge, but it also represents an opportunity for thoughtful growth. While ISURP never missed a day of in person business operations, nearly all of our tenants have been forced into remote working situations, and many of those tenants, in particular the larger, international companies have not yet returned. The absence of workforce created strain on ISURP based amenities as childcare censuses shift for our child care provider, our restaurant provider could no longer provide catering services for events, and our gym has many members that are unable to utilize its services. Our events, community-based programming and the ISU Startup Factory and I-Corps programs all shifted to an online environment. **Tenant acquisition slowed but activity remained high and on the contrary, tenant retention has remained steady and vacancy rates are within traditional industry averages pre-COVID.** Despite the broad challenges we emerged from the first year of the COVID-19 pandemic with a level of activity that filled our multi-tenant buildings, created many internal construction projects to accommodate changing work environments, added new tenants and left us with a vacancy rate so low we are considering multiple new construction projects headed into 2022.

The physical absence of our tenant base throughout much of 2020 and the first part of 2021 also allowed ISURP to upgrade and enhance shared spaces in several of our multi-tenant buildings to bring them to a higher standard. We enhanced exterior spaces and have held outdoor events. We launched a new co-working and affiliate program to address the needs of those workers that are still remote, but that might need temporary or drop in space outside of their homes. We also have engaged multiple companies with opportunities across colleges at Iowa State University utilizing Zoom and online services that have positively scaled the decision-making processes and are realizing collaboration and research agreements at a faster velocity than ever before. We also developed a much closer relationship with the BioCentury Research Farm, have streamlined project management and corporate facing functions, have partnered with the Iowa State Foundation and the Iowa State Vice President of Research offices under the leadership of Iowa State Economic Development and Industry Relations to create a team based approach to corporate partners.

Looking forward, we believe ISURP will continue to represent a world class location for companies and corporations as they look to re-think their strategy around workforce. We hope to target our services to our traditional markets, but also to cultivate relationships with a new cross section of companies looking to train large groups of employees, such that they could either stay at ISURP, or work in remote environments indefinitely. Our experience in the creation of beachhead offices for our large, Iowa based manufacturing companies will uniquely position us to help these companies rethink their workforce strategy. Our proximity to Iowa State and a

ready-made talent base of graduating students will allow us to offer them a talented, ready-made workforce.

Workforce Development

A key component of the university's value proposition related to economic development, and its primary mission, is **providing a world class education that provides students with the technical, analytical, problem-solving, communications, and social responsibility skills required in today's workplace**. Iowa State is the largest university in Iowa with 30,708 students, and despite our Midwest location, our student body is quite diverse. Even in the pandemic year of 2019-2020, our graduates were in high demand, and we had a **campus-wide placement rate of 91%** (i.e., 91% of undergraduate students are employed in their field or are pursuing graduate education within six months of finishing their undergraduate studies).

Iowa State is well known for providing students with professional development activities on campus that give great opportunities for companies to utilize our students' talents. Iowa State's 2020 Association of Public & Land-Grant Universities (APLU)'s Innovation and Economic Prosperity Innovation award recognized the opportunities for innovation and collaboration through the new Student Innovation Center and the Pappajohn Center for Entrepreneurship, as well as support for startups from the Office of Economic Development and Industry Relations (EDIR). ISU has placed cultivating entrepreneurship and innovation at the heart of its economic engagement and development efforts. ISU has a host of programs centered on entrepreneurship, including an undergraduate major and minor, graduate certificate and Ph.D. program in the discipline, as well as experiential learning opportunities outside of the classroom and venture creation and small business support.

We have excellent entrepreneurship programs in every college as well as "experiential learning" centers that provide opportunities for cross functional teams of students to work on business projects. **Each year more than 500 Iowa State students intern at ISU Research Park companies (200+ in the Park at any given time) and at university centers.** Additionally, engineering students complete a senior capstone project, and several faculty across campus integrate company projects into their courses.

We are very proud that Iowa State's undergraduate Entrepreneurship programs **ranked #11 in the 2020-21 Princeton Review ranking of over 300 undergraduate Entrepreneurship programs**. Additionally, the U.S. Association for Small Business and Entrepreneurship named Iowa State University as a "Model Program", the association's highest honor. President Wintersteen's leadership in entrepreneurship and innovation has raised awareness and support for entrepreneurial students, faculty, alumni and the community. In only its fourth year, the Ivy College of Business undergraduate major in Entrepreneurship ranked #32 in the US News & World Report rankings.

During the summer of 2021, the Pappajohn Center for Entrepreneurship sponsored its sixth cohort of **CYstarters**, an 11-week summer accelerator program for students and recent graduates from across campus. Eighteen students on 14 business teams were selected to spend the summer in a hands-on mentoring environment to launch and grow their companies. The program took place at the CORE Facility of the Research Park, offering students space to work, funding, educational sessions, and mentoring from close to 60 professionals, entrepreneurs and

educators. The young entrepreneurs worked with Pappajohn Center staff on a daily basis in accountability sessions over the course of the summer. **All 14 teams successfully launched their business or are continuing to make progress. Fifty-two of the 78 total businesses over the past six years are still active and have gone on to be successful in state and national competitions.** Three CYstarters companies placed in national virtual competitions in 2020.

Over 270 students competed in the Pappajohn Center's campus-wide pitch and business plan competitions. Top performers in those events received financial support totaling more than \$80,000 for their fledgling concepts.

The Pappajohn Center partnered with the Ivy MBA Program to host the Ivy Mind to Market Technology Entrepreneurship MBA case competition, featuring an ISU startup as the live case. Six universities competed virtually in the 2021 Mind to Market case competition. The schools represented include the University of Illinois at Urbana-Champaign, Texas Christian University, the University of Kansas, Purdue University, University of Warwick, and Iowa State University. The MBA students enjoyed meeting the company founders, learning about the company's technology, and then competing to provide the best market strategies for the company.

The Iowa State Pappajohn Center works collaboratively with the other four JPEC programs to host a statewide student competition, a statewide Iowa entrepreneur competition, a weeklong entrepreneur summer boot camp in Okoboji at the Lakeside Lab, and a fellowship with Entrepreneurs Organization Iowa. **Through these programs and continued matching support from IEDA, the JPECs awarded \$120,000 in incentives for entrepreneurial ventures.** The 2021 finalists presented to a panel of judges at the CORE Facility in August; the winners will be announced at the 25th anniversary celebration of the five John Pappajohn Entrepreneurial Centers in September.

The Pappajohn Center for Entrepreneurship **placed 42 student interns in startup companies located at the ISU Research Park, provided more than \$64,000 in match funding to startups, and reported over 16,600 students taking at least one course with an entrepreneurship component at the university.** Over 18,000 individuals participated in programs and classes focused on entrepreneurship, startups and small business.

The COVID pandemic forced the cancellation of programs including the Women Who Create Conference and SheTalks events, as well as the Reiman Entrepreneur Speaker Series. However, the Pappajohn Center launched a series of "Side Hustle" virtual trainings that drew over 400 people. Many people were spinning off small home-based businesses during the pandemic, so the workshops were popular.

The **CyBIZ Lab** interdisciplinary student consulting program offers business solutions to companies of all sizes as well as supports faculty commercialization efforts through the Regents Innovation Fund (RIF) program. The improved performance resulting from these interactions allow businesses to retain and often expand their workforce. **Forty-five CyBIZ Lab students working part-time completed 20 consulting projects that gave students the opportunity to**

work with actual businesses to solve business problems. Not surprisingly, a number of the projects focused on the COVID impact to companies and organizations.

CyBIZ Lab works with clients that include startups, non-profit organizations, government agencies, communities (partnership with ISU Extension), college administrators, national professional organizations, small and medium sized businesses, and large global companies. CyBIZ Lab is unique in that teams are interdisciplinary and include both undergraduate and graduate students working together; projects also have a flexible timeline outside the classroom schedule, which allows teams to be highly responsive to company needs.

CIRAS helps connect students to real-life experiences that provide benefits to businesses across Iowa through the engineering capstone program. **Last year, engineering students worked on 111 projects, 96 of them with Iowa companies. This included 77 different Iowa companies across 32 Iowa counties.** Companies responding to surveys reported **impacts of over \$18 million** for these projects.

CIRAS partnered with public and private leadership in Delaware County to pilot the Iowa Workforce Innovation Network (iWIN). This approach uses data to build workforce strategies for individuals that are not employed or under-employed, retention of current employees, increased productivity of your workforce, increased output through automated systems, and the future workforce. In 2021, CIRAS is expanding this program to several communities and businesses throughout Iowa.

Iowa State University Engineering Community Outreach works to create a future talented workforce to positively impact economic development in Iowa and the nation through ongoing innovation of STEM programming to K-12 youth, educators and the public since its inception in 2002. Trainings, events and awareness initiatives impact communities and industry talent expansion through partnerships and engagement to increase the diversity of STEM students and their exposure to career pathways. **Programs directed include FIRST® LEGO® League and FIRST® LEGO® League Jr. where over 700 teams across the state participated in 60 events throughout the academic year supported by over 1,000 volunteers.** Virtual summer kids camp activities and family-centric STEM programming were delivered throughout the spring and summer in order to provide innovative approaches to outreach to Iowa families during the pandemic. Leadership of Manufacturing Day resulted in over 100 events with communications out to over 5,000 education and industry stakeholders to promote Iowa manufacturing and the many state organizations working in partnership to share best practice. Programming continues to expand to meet the needs of educating and inspiring Iowans into high-skill, high-demand STEM careers.

In addition to professional development opportunities on campus, **ISU's career services offices work closely with companies to assist them in establishing internships for our students.** Internships provide students the opportunity to apply what they are learning on campus as well as the opportunity to experience firsthand the type of work environment they will be entering after completing their studies. Companies and other organizations benefit from the interns' work output (many companies calculate a return on investment for their internship programs, and the returns are impressive), and they use the internship as a testing ground for prospective new employees.

In the most recent year for which we have data, our career services offices were able to document **nearly 2,500 ISU interns who were employed by more than 960 different Iowa employers located in 260 communities in 91 counties.** These numbers do not include students who did not register their internship nor do they include students who had non-internship jobs related to their field of study.

The **Rising Star Internship Program** gives Iowa State students a unique, multi-disciplinary opportunity to learn while living and working in rural Iowa communities. **The experiential work opportunities aim to increase students' potential for employability and promote awareness of ISU Extension and Outreach.** It is a cooperative effort between Iowa State University academic units and ISU Extension and Outreach at both the campus and county levels. Students apply their academic knowledge in work settings, examine their personal career interests, assess their professional attributes, and gain knowledge of extension career opportunities. Requirements for the program include status as an undergraduate student at or above the sophomore level, with a minimum grade point average of 2.5. The summer 2021 program resumed on a limited basis, with 8 students in 16 counties, following a 2020 lapse in response to the COVID-19 pandemic. ISU Extension and Outreach is committed to fully resuming the Rising Star program to provide this opportunity, and the rich interdisciplinary collaboration it brings, to ISU students in 2022 and beyond.

- This program is not a conventional internship. The Colleges of Design, Human Sciences, and Agriculture and Life Sciences have helped recruit their students to live and work in interdisciplinary teams of two or three. Students are placed in rural Iowa communities. Since the program's inception, interns have been placed to work in 24 Iowa counties.
- The Rising Star Internship Program gives Iowa State students a greater understanding of the land-grant mission through extension and outreach work and provides a quality experience that improves their career opportunities upon graduation. Some interns use the Rising Star Internship to complete a requirement for their field of study. Interns also are gaining an understanding of rural Iowa's strengths and challenges.
- **Since 2014, when the program was developed, 66 students have completed the internship.** The work of the students in each region will always be focused on a locally identified need with supervision from the regional director and supported by extension professionals and other identified community members. Interns have raised the awareness of local foods and healthy living as they have assisted communities, schools, underserved audiences, producers, farmers markets, and community and economic development entities. Students tailor projects using knowledge gained in the classroom with real world work experiences that match their skills and interests.
- Following the conclusion of the experience, interns are invited to become members of the Rising Star Galaxy Club, which helps them stay connected to ISU Extension and Outreach and provides links to job opportunities. Past interns often volunteer to assist with recruitment and orientation of new applicants.

Iowa State also supports students' learning and skill development in the STEM fields even before they get to the university. Through the STEM Scale-Up Program the North Central STEM Hub provided STEM programs and resources to more than 287 educators, impacting over 9,700 PK-12 students and 80% of the region's community school districts. These programs range from building robots and coding programs to conducting agricultural field experiences and

learning about STEM careers. The Hub also provided free, hands-on education experiences for PK-12 youth and families during the pandemic in the form of STEM kits and virtual experiences to over 1,500 PK-12 students. ISU Extension and Outreach professionals also played a significant role in each region through representation on each of the six Regional Advisory Boards.

4-H Youth Development prepares Iowa's young people for careers. By participating in 4-H educational experiences, youth develop STEM, communication, leadership, civic engagement, healthy living, and general life skills. Youth are challenged to actively pursue careers and education beyond high school and build skills. In fact, annually about 91 percent of 4-H seniors report they intend to pursue trades or post-secondary education within 12 months of graduation. **4-H programs reached more than 100,000 Iowa youth in 2019-2020.**

- Over the past four years, 4-H has added **FLEx2Go** (part of the Forward Learning Experience) field-based kits containing Oculus Rift Virtual Reality sets, a 3-D printer, and a 360-degree camera. The camera captures video in 360 degrees, which when combined with Virtual Reality, allows the viewer to be right in the environment. The first 4-H 360 videos immersed youth in agriculture production experiences to better understand practices in modern agriculture.
- **4-H and FLEx won a grant through the Iowa Space Grant Consortium** for a new FLEx program. It is called FLEx Space Artemis to introduce and expand youth knowledge of core space concepts and celebrate the NASA ARTEMIS program and upcoming plans for the Moon, Mars, and even Earth. Activities include Seeing and Making with the FLEx2GO Space Artemis (FSA) Mobile KIT and new flight/design VR motion-base simulator.
- **FLEx** continues to partner with the Iowa State University Women in Science and Engineering (WiSE) Program to expand the reach of FLEx programming to youth across Iowa. WiSE recruits, trains, and deploys collegiate student role models majoring in STEM fields to lead experiential STEM programming in K-8 classrooms and educational events, including delivering FLEx across Iowa.
- **STEAM'n through the Seasons** is a curriculum designed to teach K-3 children fundamental STEM and art concepts through integrated STEAM-literacy activities that focus on a seasonal topic. Each lesson includes high quality children's books and opportunities for hands-on STEM play. STEM play is needed to help young children become strong STEM thinkers by allowing children to pursue questions, investigate ideas, and begin to form and test theories about the world around them.
- **AgOvation** is a newer and expanding program at Iowa 4-H that helps youth develop 21st century skills through a year-long competition. In 2021, teams across Iowa completed experiential learning projects in the summer with finals at the Iowa State Fair. Currently teams from Sac, Cherokee, Hamilton, Story, and Linn counties are participating. Each team identifies a problem in modern agriculture, researches it, develops a solution, tests their solution, and presents their work in a "Shark Tank" type experience to industry professionals. Each team has a mentor and industry advisers to help them as they prepare for the final competition.
- **Iowa 4-H and NASA Iowa Space Grant Consortium** collaborated to implement Astro Camps in Iowa. Sixty kits were sent to counties across the state. Other

partners included the Science Center of Iowa, Putnam Museum, University of Northern Iowa STEM, and the Governor's STEM Council. Goals of the program include strengthening the nation's STEM future workforce, attracting and retaining youth in STEM, and engaging youth in NASA's mission.

- **Animal U** is a new online youth curriculum in animal science developed by Iowa State University Extension and Outreach. Currently, Animal U has over 200 modules for beef, swine, and careers with plans to expand to sheep, goats, dairy, poultry, and rabbits. Each specie has three levels: beginner, intermediate, and advanced. Each specie module covers twelve different topic areas including animal husbandry, advocacy, welfare, and more. The career module takes the learner through a variety of animal related careers from conception of the animal to consumption of the product. Users can create an avatar based on their interests and will investigate careers and learn life skills necessary to prepare them for a career. Modules are interactive and include an assessment. The curriculum is designed for 4th-12th grade audiences and can be self-directed, but also has a facilitator's guide and can be used in a classroom setting. The outcomes of Animal U are to use a livestock project to demonstrate stronger STEM proficiency; create an understanding of the science involved in producing an abundant and safe food supply; create advocates and future scientists for the livestock industry; and introduce youth to the commercial livestock industry and the abundance of careers associated with food animal production. Since launching in April 2020, we have had over 14,000 users from 49 states and 10 countries.

Finally, several ISU units provide training and related educational activities to a wide variety of individuals, occupations, and industries across the state. **Appendix 2** provides several such examples.

Technology Transfer

In FY21 ISU researchers submitted 144 intellectual property disclosures (not including datasets) and ISURF filed 114 patent applications. In calendar year 2020, ISU was recognized for having 44 U.S. utility patents issued, tied for 65th on the list of the top 100 institutions for issued U.S. patents. In FY21, ISU had 50 U.S. patents issued and a total of 71 patents issued when foreign patents are included. Additionally, ISU technologies resulted in 47 license and option agreements in the last fiscal year, 22 of which were with Iowa companies. ISU currently has 118 license and option agreements that are yielding income. Iowa companies reported \$1.7 million of revenue from sales of ISU licensed technologies in calendar year 2020, and eight startup companies were formed to commercialize ISU technologies. Globally, total sales revenues of ISU licensed technologies were \$62 million. Additionally, 123,000 bushels of ISU-developed soybean varieties were planted across the Midwest.

The **Regents Innovation Fund** program at Iowa State has a competitive research component that pairs ISU faculty members with Iowa companies (mostly new to young startups) to commercialize their research discoveries. Please see **Appendix 3** for a complete report on Regents Innovation Fund uses and results.

Research

Iowa State received \$559.1 million in **total external funding** in FY21, a new record, and the third time in the past five fiscal years that total external funding eclipsed \$500 million. The FY21 total was bolstered by \$90.2 million in federal COVID-19 Higher Education Emergency Relief Funding (HEERF). The university received \$231.1 million in **external sponsored research funding** in FY21, down 8.6% from the \$253 million received in FY20. Funding from federal agencies in FY21 was down \$31.2 million, or 16.8%, from FY20's federal research funding record of \$186 million. The university also received a total of \$255.7 million in **non-federal external economic development and research funding** from a variety of sources including – but not limited to – commodity groups, corporate and industry sponsors, non-profit organizations and individual donors. A total of \$51.5 million in research and economic development funds for FY20 came from commodity groups and corporate and industry sources. **Non-federal sponsored research** funding for FY21 totaled \$76.3 million, the second-highest amount in the past five fiscal years. Of this total, \$12.2 million came from companies headquartered in Iowa or that have a significant footprint in the state.

In Iowa, research plays a vital role in keeping us healthy, in growing our economy, in maintaining our competitiveness in today's global market, and in keeping our world sustainable for generations to come. From work that supports Biosciences and Manufacturing 4.0 initiatives, to research that improves the health and wellness of our people and planet, here are just a few examples of new projects funded in FY21 that are helping the state become its best possible version of itself:

- Iowa State is home to a new NSF-funded initiative focused on enhancing rural broadband connectivity and bridging the divide between urban and rural areas both in the state and the nation as a whole. [ARA Wireless Living Lab for Smart and Connected Rural Communities](#) is led by Iowa State Electrical and Computer Engineering professor, Hongwei Zhang. ARA is receiving \$8 million in federal funding from the [Platforms for Advanced Wireless Research](#) (PAWR) as well as a matching investment in cash and in-kind contributions from PAWR industry consortium partners. ARA's ultimate goal of enhancing rural broadband connectivity can have a profoundly positive impact on improving the economic sustainability of rural communities by:
 - Supporting the state's growth in the Biosciences, in digital and precision agriculture, in particular;
 - Making industry and manufacturing in rural areas more vital and competitive; and
 - Fueling greater innovation and entrepreneurship across the rural landscape.
- Iowa State and U.S. Department of Energy (DOE) National Laboratory, Ames Laboratory, have become a national research epicenter for the rapidly emerging field of plastics upcycling. An award of \$2.7 million from the Defense Advanced Research Projects Agency (DARPA) is just one of multiple grants received by researchers Aaron Sadow, Chemistry professor, Erich Cochran, Chemical and Biological Engineering professor, and Robert Brown, director of the Bioeconomy Institute. This innovative work in plastics upcycling opens economic opportunities but also offers creative solutions for resolving the world's mounting issues with waste and is an important step toward a more sustainable future.
- Rizia Bardhan, associate professor of Chemical and Biological Engineering, [received an award of \\$586,553](#) from the Department of Defense (DOD) Army Medical Research

Acquisition Activity (USAMRAA) to explore the use of 3D culture systems and high-throughput Raman spectroscopy screening to enhance individualized treatment for colorectal cancer (CRC) patients. Bardhan is collaborating on this project with: [Jonathan Mochel](#), associate professor of Biomedical Sciences in Iowa State's College of Veterinary Medicine; Soumik Sarkar, ISU associate professor of Mechanical Engineering; and Bhuminder Singh at Vanderbilt University School of Medicine.

A sampling of additional noteworthy new projects that received federal research funding during the 2021 fiscal year include the following:

- Gregory Phillips, professor of Veterinary Microbiology and Preventive Medicine, is leading a team that is using innovative artificial intelligence to study how to improve the effectiveness of vaccines by gaining a better understanding of how the microbiome interacts with the human immune system. [Phillips received an initial award of \\$551,032](#) from the Defense Threat Reduction Agency (DTRA) in FY21. The overall project includes two additional option years with an estimated total award of just over \$1.6 million.
- Andy King, assistant professor in Iowa State's Greenlee School of Journalism, received an [initial grant of \\$396,908](#) from the NIH National Cancer Institute (NCI) for a four-year project that is estimated to receive more than \$1.5 million in total funding. Both incidence and death rates due to colorectal cancer (CRC) are disproportionately higher among Black Americans, compared to non-Hispanic White Americans. King is leading a multi-institution team that is studying communication related to colorectal cancer screening (CRCS). The ultimate goal is to identify messages and information that are most effective in supporting adherence to CRCS recommendations and ultimately improve screening acceptance and behaviors in at-risk communities.
- [Jonathan Claussen and Carmen Gomes](#), both associate professors of Mechanical Engineering, received a one-year grant of \$664,521 from HHS and the Centers for Disease Control and Prevention (CDC) to develop better, cheaper, quicker, more accessible testing for the coronavirus that causes COVID-19. The project, which started with a \$15,000 seed grant from the Iowa State Office of the Vice President for Research, focuses on developing a saliva test similar to test strips used to monitor glucose levels in people with diabetes. The tests could be easily done at home, workplaces or a doctor's office with no expensive lab equipment. Results would be available in about 20 minutes, and the cost of the test is expected to be less than \$6.
- Soumik Sarkar, associate professor of Mechanical Engineering and a Walter W. Wilson Fellow in Engineering, received an initial FY21 award of \$1.9 million from NSF and USDA-NIFA on a five-year \$7 million Cyber-Physical Systems (CPS) Frontier grant. Sarkar is leading a multi-institution, interdisciplinary research initiative that could bring unprecedented levels of efficiency and sustainability to production agriculture. The team is focused on transforming current cyber-physical systems and capabilities in agriculture by developing a novel, context-aware cyber-agricultural system that encompasses sensing, modeling, and actuation activities to enable farmers to respond to crop stressors more cost-effectively, with greater agility and with less impact on the environment than current practices.
- Many small and rural communities across Iowa and throughout the U.S. are shrinking, and evidence shows this a trend that is unlikely to be reversed in most instances. Kimberly Zarecor, professor of Architecture in the College of Design, received an NSF award of \$1.5 million to spearhead a project that encourages communities to adapt

to shrinkage rather than fight against it, with the goal of helping them mitigate the negative effects of population loss on quality of life and community services. Zarecor's multidisciplinary team will develop and test new educational resources and data-driven tools to help rural Iowa communities implement effective strategies for smart shrinkage.

- Adina Howe, assistant professor in Agricultural and Biosystems Engineering, [received a \\$1 million award from USDA-NIFA](#) to explore the connection between livestock manure management and antimicrobial resistance (AMR). The majority of antibiotics in use today are used in animal production. Antibiotic-resistant bacteria can end up in manure and can make their way into the environment when manure is applied to fields as fertilizer. Howe and her fellow researchers aim to figure out what resistant genes proliferate in bacteria and how widely those bacteria spread and persist in the soil.

Iowa State continues to help lead innovation and discovery in three priority [Bioscience platforms](#) – Biobased Products, Digital and Precision Agriculture and Vaccines and Immunotherapeutics – that are critical for continued economic growth and development in the state of Iowa.

The university strategically invested the \$813,000 the Iowa Legislature allocated in FY21, along with a one-time supplement of \$750,000 from [BioConnect Iowa](#), in key initiatives designed to foster greater university-industry collaboration and economic development. Here are just a few of Iowa State's Biosciences-focused accomplishments for FY21:

- [Nadilia Gomez](#) joined the university in the spring of 2021 and [Michael Roof](#) in the fall of 2020, as Chief Technology Officers (CTOs) for the Digital and Precision Agriculture and Vaccines and Immunotherapeutics platforms, respectively. With the fall 2019 hire of [Sundeep Vani](#) as CTO for Biobased Products, the university now has the three platform CTOs in place. The CTOs are working with platform leads and research teams to identify technologies with commercial potential and prioritize those opportunities for commercial development.
- Having all CTOs on board has accelerated industry outreach, resulting in more than 30 substantive engagements with startups and established companies within key industry segments.
- DOD has provided \$87.5M of funding over six years to [BioMADE](#), a university-industry consortium focused on advanced manufacturing of biobased products. Sundeep Vani was heavily involved in the development of the winning proposal, and holds a seat on the consortium's governing board, which positions Iowa State well for receiving funding for projects relevant to the BioMADE initiative.
- A seed grant program to support public-private research projects in the platforms started in FY20 and continued in FY21. Since the program's inception, grants have been awarded to support ISU/industry research projects with: Kemin Industries, Kent Corporation, Siegwark USA, Archer Daniels Midland (ADM), Medgene Labs, Arko Labs, Nittobo America, Elanco Animal Health, Genvax Technologies, LEAH Labs, Boehringer Ingelheim, Iowa Select Farms, and Corteva Agriscience.
- CTO Michael Roof, working with ISU Research Park, organized a successful virtual [Vaccines and Immunotherapeutics conference](#). The event drew 124 attendees – business development and senior R&D leaders in strategic decision-making roles – from numerous companies.
- Iowa State received a National Science Foundation (NSF) award of \$99,948 to host a [Digital and Precision Agriculture convergence accelerator workshop](#), in tandem with university

collaborators, North Carolina A&T and Penn State. Nearly 100 scientists, engineers and stakeholders participated in the May 2021 workshop that served as a brainstorming and ideation platform to identify critical needs and map out future strategic priorities.

- Nearly 20 faculty-initiated startup companies have licensed Iowa State-discovered technologies – [Skroot Laboratory Inc.](#), [SoyLei Technologies](#) and [3D Health Solutions](#), just to name a few.

Assistance to Communities

Through a partnership with ISU Extension, the **CyBIZ Lab student teams supported three community projects** performing market research and economic analysis efforts for small, rural communities in Iowa.

Pappajohn Center staff **spent 2,500 hours** visiting classrooms, community groups, and conducting training programs to share entrepreneurial and small business resources.

Assistance to Iowa communities is the focus of many of the programs managed by ISU Extension and Outreach. Some examples of direct economic development assistance to Iowa communities are provided below.

Extension Community and Economic Development

Local Government and Nonprofit Programming

In FY21, CED specialists conducted Introduction to Planning and Zoning workshops to 130 local government officials. The CED Office of State and Local Government Programs (in tandem with the Iowa League of Cities) trained 391 municipal professionals at the Municipal Professionals Institute and Academy. Township Trustee and Clerk training was provided to 118 local municipal professionals. Grant Writing 101 training was provided to 444 nonprofit and local government individuals. CED's local government and housing team presented at affiliated local government programs and trained 207 individuals.

Strategic Planning and Goal Setting

CED provides goal setting and strategic planning services to help local governments and nonprofits address critical issues, identify priorities, and develop action plans to accomplish those priorities. In FY21, CED facilitated strategic planning and goal setting to 18 organizations, including those on the national, state, county, and local levels.

Iowa Retail Initiative

Iowa Retail Initiative (IRI), a part of ISU Extension and Outreach, is a three-part program designed to strengthen independent retail in Iowa communities. Community and Economic Development extension specialists provide the training and coaching. In FY21, 29 community and business leaders from 4 communities participated in IRI workshops or consultations.

Student Involvement in Community Development

In spring 2021, 18 Community and Regional Planning students developed alternative housing options for a former school site in Grand Junction and 6 Landscape Architecture students

developed site plan concepts for outdoor space for a Cedar Rapids homeless shelter through CED's PLACE program. The Office of State and Local Governments employed a student intern to assist in organizing and carrying out the 2020 Municipal Professionals Institute and Academy in July 2020. From June 1 to August 1, 2021, Iowa State University **Data Science for the Public Good (DSPG) Young Scholars Program** taught **9 student interns and 3 graduate fellows** to apply data science skills to solve local community problems through the identification and discovery of datasets that can be used to better analyze, visualize, and understand the problems and their potential solutions. The program is led by a coalition of land-grant universities in three states—Iowa State University; Oregon State University; Virginia Tech; Virginia State University—and the University of Virginia.

Iowa's Living Roadways Community Visioning Program

For the past 25 years, the Community Visioning Program has helped rural communities plan transportation enhancements using state funds from the Iowa DOT. To date, more than 250 Iowa towns have completed the process and collaborated with design teams to create conceptual transportation enhancement plans. More than two dozen towns have repeated the program. In spring 2021, Iowa's Living Roadways Community Visioning Program employed **12 student interns to assist in assessments and analysis in 10 communities**. In addition, private-sector firms contracted through the program employed 6 student interns as part of their design teams to assist with developing conceptual designs for client communities.

New Programming Initiatives

- The CED program is partnering with the Iowa Economic Development Authority through the Empower Rural Iowa grant and CDBG technical assistance program to conduct **Rural Housing Readiness Assessments (RHRA)** for Iowa communities. CED created the RHRA to help communities self-assess their housing needs, educate community members about housing decision points, guide them in creating a common vision for housing in their community, and create a 3- to 5-year action plan to accomplish that vision. In spring 2020, 11 rural Iowa communities were set to begin their housing workshops. Gathering in-person for the workshops was not always possible due to COVID-19 so the CED staff converted the RHRA program from a face-to-face series into an interactive, virtual workshop experience. Each town completed an action plan, and CED specialists provided follow-up assistance for next steps. CED's work in converting to the online format was recognized by the ISU Vice President for Extension and Outreach with an award for Innovative Program Delivery in February 2021. All 11 towns completed the RHRA process, accessing a total of \$100,000 in state assistance and raising a total of \$51,500 in local match dollars. More than 100 local leaders were trained to make better decisions about housing in their local communities; they provide new knowledge and expertise at the local level. Increased leadership has been another result; in each community, several volunteers are leading work teams and moving tasks forward.
- In 2020, **the Municipal Professionals Institute and Academy (MPI/MPA) were moved to a completely virtual format** because of the COVID-19 pandemic. While the educational component of MPI/MPA was mostly effective, participants missed out on the networking experience available only in an in-person setting. At the same time, participants enjoyed the convenience of not having to spend time and money to travel. As a result, CED local government launched a "blended" format for MPI, which consists

of winter and fall virtual sessions and a four-day in-person event in July. The combination of online and in-person learning will take the best of both worlds, while acknowledging that while it's not always best to learn online, it does save attendees the time and expense of travel.

- **The Great Iowa Road Trip** was a weekend event planned to help revive Iowa's small businesses and small towns. The event, which was held April 30 and May 1, 2021, was a coordinated, mapped tour of open doors at businesses and attractions in southern Iowa. CED partnered with several community development organizations to organize the event, training 84 businesses and managers. Of those 84 people, 44 business owners applied and 42 participated. A total of 5,320 people (general public and marketing interaction for the event) attended, and 140 youth participated in activities and attractions put on by the businesses and museums.

Community Food Systems Team

Local Food Leader and Community Food Systems Certification Programs

The Local Food Leader and Community Food Systems certification programs have been offered since 2015 as a joint effort of the Farm, Food and Enterprise Development (FFED) and Community and Economic Development (CED) units of Iowa State University Extension and Outreach. Due to COVID-19, the program team transitioned these courses to an entirely virtual format. Both virtual courses sold out for fall 2020, with 16 participants in the Local Food Leader cohort and 21 in Community Food Systems cohort. Participants attended from 36 states and included extension employees, farmers, community planners, and nonprofit staff. Participants consistently comment in trainings and homework assignments on the high value they place on these trainings. Their knowledge gained will make them more effective practitioners and will benefit their communities by improving healthy food access and food security.

Online Farmers Market

The COVID-19 pandemic abruptly closed restaurants and schools in March 2020. For farmers selling food to those outlets and with farmers markets at risk as well, it immediately created uncertainty about the upcoming growing season. Northeast Iowa ISU Extension and Outreach program specialists collaborated with Decorah area farmers and the Iowa Food Hub (IFH) to create an online farmers market to bridge the gap until markets opened later in the summer. One farmer noted "The online market helped offset that revenue loss for our farm. It also provided an opportunity to connect with consumers that may not have otherwise been aware of our farm or the things that we sell. The online market has impacted our farm very positively. It has provided a way to supply our local communities in a collaborative effort with many other producers in a way that did not previously exist here."

Twenty-four farms participated in the online market in 2020. Customers placed 3,100 orders and purchased \$85,800 of products. Farm sales ranged from \$64 to \$23,580 for the year including individuals, small retailers, and child care centers. The online market continued to operate during the winter months and added product from its wholesale suppliers to maintain a diverse product offering. Customer feedback has been overwhelmingly positive. One customer shared that "this is one of the best responses to the pandemic. All my family and friends throughout the USA have commented they wish they had this program." A producer noted, "Without the hard work and dedication of people from ISU Extension, Iowa Food Hub and countless others, our farm and others would have been much worse off."

ISU Community Food Systems 2021 Annual Event

Supply chain breakdowns during the COVID-19 pandemic of 2020 highlighted the critical need for secure, effective local food systems focused on equity. Iowa State University Extension and Outreach has hosted a national annual event for food system practitioners since 2015. The 2020 conference was held virtually and provided a space to promote, engage, and learn with other food systems practitioners while providing insight for community-based food systems actions and strategies. The conference featured a total of 19 presenters and 87 registered attendees. A satisfaction survey distributed digitally showed >75 percent of respondents felt welcomed during the event, felt their voice was heard, and felt included in the interactive breakout sessions. Most respondents claimed they learned helpful information and resources that were beneficial and relevant to their work. Attendees indicated an overall satisfaction rating of 4.4/5 (88 percent) for the event presentations. All respondents stated the event gave them a better understanding of potential projects that may be beneficial to their community.

Major Economic Development Collaborations

Iowa State University takes great pride and pleasure in its collaborations with both private and public sector partners. These collaborations are essential to achieving the university's and the state's economic development goals. The first five sections below identify new collaborations begun or formalized this past year. The remaining sections describe on-going significant state and regional collaborations:-

Iowa State, University of Iowa John Pappajohn Entrepreneurial Centers partner on Kauffman Challenge Grant

The Iowa State University and University of Iowa John Pappajohn Entrepreneurial Centers collaborated to submit and were awarded a Kauffman Foundation Challenge Grant providing \$100,000 to focus on increasing the number of SBIR and STTR grants awarded to faculty in Midwest institutions. The Challenge Grant planning team includes Iowa State University and economic development staff at U of I as well as BioConnect Iowa, to reach out to institutions in Iowa, Nebraska, Kansas and Missouri to research and share best practices. The efforts will continue into 2022.

MIT VMS – A second Kauffman Foundation-funded grant has brought together all five John Pappajohn Entrepreneurial Centers (Iowa State, Iowa, Drake, UNI, and NIACC) to be trained in and implement MIT's Venture Mentoring Service program, established to build a strong network of mentors for Iowa's startup companies. Staff from each of the JPECs participated in virtual training and will launch the Iowa VMS pilot in the fall of 2021.

Techstars Iowa – Iowa State University, the University of Iowa, and Grinnell College partnered with Techstars Global to establish the first ever Techstars Iowa program in Des Moines in 2020. University partners are involved in applicant pitches, mentoring, and serve as advisors to the Techstars Iowa program. Techstars Iowa launched its second cohort in the summer of 2021. To date, four Iowa startups have participated in Techstars Iowa.

Iowa Department of Transportation Partners with CIRAS on Disadvantaged Businesses

CIRAS has received a \$133,000 grant from the Iowa Department of Transportation (DOT) to help economically and socially disadvantaged businesses develop so they are better able to compete for highway construction projects and other DOT-funded projects.

CIRAS will provide one-on-one assistance to companies who qualify as Disadvantaged Business Enterprises (DBE), small business that are at least 51 percent owned by women or minorities, about the best ways to position themselves for government bidding opportunities and market themselves to prime contractors and government agencies.

The grant includes promoting the DBE program to companies that aren't yet part of it and to host quarterly networking or matchmaking events to connect DBEs with prime contractors and government agencies. In addition, CIRAS will engage a Technical Advisory Committee to act as a sounding board for the kinds of services needed to support DBEs.

CIRAS Partners with State on Manufacturing 4.0 Initiative

CIRAS collaborated with the Iowa Economic Development Authority (IEDA) and a variety of additional public and private entities to drive the Manufacturing 4.0 initiative. The first phase of the initiative focused on defining the key strategies needed to ensure Iowa's manufacturing sector remains competitive as the world transitions to Industry 4.0.

CIRAS continues to partner with IEDA on this initiative through supporting the new Technology Investment Grant Program. As part of this program, CIRAS will provide manufacturers with 3-75 employees a no-cost Industry 4.0 assessment prior to applying for the grant. This approach allows manufacturers to be informed about the key opportunities and risks surrounding an Industry 4.0 implementation prior to applying for state funds.

Iowa's Community Colleges, CIRAS, and others form Industry 4.0 Training Consortium

Iowa's 15 Community Colleges and the Iowa Association of Community College Trustees formed a new consortium with CIRAS, the Association of Business and Industry (ABI), the Iowa Department of Education (DE), the Iowa Economic Development Authority (IEDA), Iowa Workforce Development (IWD), Professional Developers of Iowa (PDI), and the University of Northern Iowa (UNI) focused on developing and deploying awareness and training on Industry 4.0.

This effort, based on recommendations from the IEDA Manufacturing 4.0 initiative, brings together the manufacturing ecosystem to implement an education and awareness strategy statewide. The consortium will develop curriculum to meet training needs of all sizes of manufacturing businesses throughout Iowa. In addition to customized training for the existing workforce, the group will develop and enhance certificate, diploma, and degree programs to ensure employers have access to advanced skills training and career pathways now and in the future.

Iowa State University Collaborates on Technology Transfer Services

Iowa State University and the University of Northern Iowa (UNI) continue in their partnership in technology transfer. The partnership allows UNI to leverage Iowa State University resources for technology transfer. UNI has the option to manage the protection and commercialization of their innovations or can choose to have the Iowa State University Research Foundation provide those services. ISURF has also entered into an agreement with Drake University to provide technology transfer service as well. ISURF first licensed UNI technology in FY20 which has already resulted in licensing revenue; ISURF began negotiations to license a Drake technology in FY21.

ISU Partnership with Cultivation Corridor

Iowa State University has representatives on the Board of Directors of the Cultivation Corridor, a regional economic development initiative to attract ag-bioscience firms to Iowa that was launched in April 2014. Other board members include Iowa Economic Development Authority, leading Iowa companies in the ag-bioscience industry, and Iowa commodity groups. ISU also serves on the Advisory Cabinet of the Executive Director of the Cultivation Corridor. ISU's Office of Economic Development and Industry Relations works closely with the Cultivation Corridor, providing university expertise and services to support the Corridor's efforts.

Statewide Committees, Councils, and Task Forces

Many representatives from ISU serve on committees that promote economic development programs. Those committees include the following: the Iowa Business Council's Business-Education Alliance, the Iowa Innovation Corporation, the Biosciences Alliance of Iowa, Association of Business and Industry Advisory Council, the Iowa Lean Consortium, Professional Developers of Iowa, the Iowa Business Council, Innovate Iowa, Technology Association of Iowa, the IEDA Advanced Manufacturing Working Group, Capital Crossroads, the Cultivation Corridor, and the Iowa Chamber of Commerce Executives. SBDC additions: Iowa Economic Development Authority Board, Future Ready Iowa, Renew Rural Iowa Entrepreneurial Roundtable, Iowa Rural Development Council, Brownfield Advisory Committee, Iowa Waste Reduction Center, Value Added Agricultural Sustainability Team.

Midwest Grape and Wine Industry Institute

The Midwest Grape and Wine Industry Institute, supported by the College of Agriculture and Life Sciences and ISU Extension and Outreach, was formed in 2006 by the Iowa Board of Regents as a result of the state's evolving grape and wine industry.

The goals of the Institute are to:

- conduct research to evaluate cold-hardy grape varieties that can thrive in the Midwest;
- conduct enology research and develop vinification techniques;
- assist with implementation of the Iowa Quality Wine Consortium program, a quality assurance stamp of approval;
- establish an outreach program to the industry by offering training opportunities to cellar workers and winemakers;
- form partnerships to develop job training programs specific to growing grapes and wine making

Iowa has 99 licensed wineries and 245 commercial vineyards. At the end of 2020, total wine, cider, and mead production totaled 307,267 gallons, down slightly from 2019. Sales were reported at 276,274 gallons. Wine sold at wineries represented 42 percent of sales, while the remaining 58 percent was sold at wholesale. The grape and wine industry in Iowa is maturing but continues to grow. According to a 2012 study by Frank, Rimerman + CO. LLP, the economic impact of the Iowa wine and grape industry on the state's economy is \$420 million.

Future Plans

Iowa State University greatly appreciates the resources and support that it receives from the Board of Regents and the legislature to carry out its economic development initiatives and activities. The primary purpose of this report is to show the huge economic and quality of life

impacts we have been able to achieve for the state with the resources entrusted to us. The following sections identify how we plan to use additional resources to enhance the impact of university technology transfer and service on the creation of jobs and wealth in Iowa.

Small Business Development Centers

By helping its clients improve and grow their businesses, the SBDC generates new tax dollars for the Iowa treasury in the form of sales tax revenue from increased client sales and income tax revenue from new jobs created by clients. In state fiscal year 2020, SBDC clients generated an increase of \$415 million in sales, \$182 million in capital invested in Iowa businesses, and created 2,245 jobs. These rather large numbers were driven by the SBDCs COVID-19 response, as mentioned earlier in this report. All information reported by the SBDC is verified and attributed to the assistance of the SBDC by the client through the client milestone collection process. SBDC is a good investment for the State of Iowa!

SBDCs across the state helped their clients achieve the following success for the state.

- **Over \$34,000,000 in sales EVERY MONTH**
- **Over \$498,000 in capital investment in Iowa Companies EVERY DAY**

The SBDC also has a technology center designation allowing us to provide more in-depth counseling to entrepreneurs who have ideas or innovations that have potential for commercialization. In February 2021, SBDC launched the Rural Business Innovators (RBI) program. RBI is an entrepreneurial training program that focuses on finding commercialization opportunities in Iowa's rural areas in an effort to increase wealth and create jobs in rural Iowa. The first co-hort of nine tech companies have been meeting and developing their business models. <https://sites.google.com/iastate.edu/ruralbusinessinnovators/home>

Cybersecurity awareness has been a priority for SBDC. We have developed a dedicated webpage that has a comprehensive cybersecurity assessment guide, as well as hosted a series of cybersecurity webinars that are also available on the site. We are working closely with the Secretary of State Office to promote cybersecurity awareness and have provided blog posts for their newsletters as well as a cybersecurity booklet they will be distributing at the Iowa State Fair. <http://iowasbdc.org/cybersecurity/>

The SBDC is also providing training to our rural areas across the state to help build and create wealth for Iowa businesses that may not typically have access to additional resources. The training program consists of both in-person and virtual trainings and assistance to develop stronger brands and assist businesses in commercializing their products. SBDC has also produced on-demand training videos for entrepreneurs interested in starting a business. They are called Smart Start and are available in both English and Spanish. <https://iowasbdc.org/on-demand-training/>

It should be noted that SBDC is working diligently to collaborate and partner with other organizations throughout the state, both public and private, to ensure that we are not duplicating efforts and to leverage each other's resources and efforts.

ISU Pappajohn Center for Entrepreneurship

The Center for Entrepreneurship, which is celebrating 25 years in 2021, is working diligently to expand opportunities for entrepreneurial learning and business support as part of President Wintersteen's campus-wide initiative in entrepreneurship. The center has worked with faculty and staff in all of the colleges to support the development of programming and experiential learning opportunities for the growing number of students interested in pursuing entrepreneurship as an academic area of study or because they want to pursue their ideas, inventions, or product creations as a business venture. The center has partnered with the director of the Student Innovation Center to bring Pappajohn Center programs and services to campus for more convenient delivery and the opportunity for students to collaborate across disciplines in this new collaborative space that opened fall 2020 but will be dedicated formally in fall 2021.

In August 2020, **ISU Startup Factory** moved under the Pappajohn Center for Entrepreneurship. The program provides opportunities for undergraduate students, graduate students, faculty and staff to create scalable businesses that address technical, societal or other challenges. Entrepreneurs in the Startup Factory receive formal training, resources, and access to a network of business mentors, advisors, counselors and investors. To date, **nine cohorts have completed the program. Cohort 10, with 8 new startups, launched in 2021 under the leadership of a new program director. A total of 78 startups have completed the program.**

The Pappajohn Center for Entrepreneurship and ISU Startup Factory have been aligned together organizationally to better integrate educational training and support for entrepreneurs of all types and to provide business support and resources for entrepreneurs across campus.

In the fall of 2020, ISU Startup Factory and its partners, BioConnect Iowa and Venture Net Iowa, received a \$525,000 Economic Development Administration grant to launch a new statewide Go-To-Market Accelerator, which is currently running with five cohort companies representing the med-tech, biotech, animal vaccines, manufacturing, and education industries.

ISU Startup Factory is playing a key role in launching a new mentoring program in partnership with MIT's Venture Mentoring Service and the four other Pappajohn Centers. This collaborative initiative, funded by the Kauffman Foundation, will provide industry-specific resources and potential funding support for startups all across Iowa.

The Pappajohn Center facilitated review panels to select the faculty who received the 2021 Regents Innovation Fund technology commercialization grants. Ten (10) faculty P.I.'s will receive \$448,000 in support to further commercialize their technologies in collaboration with industry partners.

CyBIZ Lab teams will continue to partner with faculty grant recipients in the Regents Innovation Fund program to help validate business opportunities stemming from university research discoveries with the goal of increasing the number of startups at the ISU Research Park, providing potential employment opportunities in Iowa for students and graduates from across disciplines.

The Techstars Iowa partnership with partners at Iowa State University, the University of Iowa, and Grinnell College, will celebrate the close of its second cohort in September 2021.

The Pappajohn Center, in partnership with the Ivy College of Business, SBDC, and Home Base Iowa, is planning a 2022 summer program for Veterans interested in pursuing a startup or small business venture.

Working collaboratively with the CTO's, I-Corps leadership, OIC, and VPR, the collective focus is on increasing the number of technologies and startups moving through the university. Concurrently, educating students in entrepreneurship and innovation will produce more entrepreneurial thinkers and innovators to solve small and large problems, ideally producing greater employment opportunities in Iowa for graduates.

Iowa State University Research Park

ISURP underwent a significant expansion in recent years which doubled the developable acreage and included commercial amenities such as a restaurant, fitness center, child care facility, walking and biking paths and a 38-acre park that are expected by young professionals today. Projects completed in the last year have largely focused on expansion of current tenant facilities and infrastructure. The third phase of the demonstration park (Tedesco Environmental Learning Corridor) developed in partnership with Story County Conservation, was completed in August of 2020. This connects the trail infrastructure at ISURP and Ames to the High Trestle network near Kelley/R38. In addition, John Deere's 2019 investment in a sprayer facility, which added 33,000 square feet and a development location for Deere was leveraged with a \$1.8 million infrastructure grant from EDA that expanded roadways and brought utilities to the surrounding 38 acres. That work was also completed last year. Deere has continued to expand their research investments across campus and through ISURP and BCRF. They also are in the process of expanding their second location at RP, where most of their recruitment initiatives are housed.

ISURP's recent growth and the shift in our tenant base from largely startups to a mix of both startups and well established international companies has assisted the financial viability of the research park and positioned the organization to weather the challenges associated with the pandemic. Long term leases with well-established companies allows ISURP to assist startups with a greater operational risk tolerance. We have dedicated staff full time to connecting research park innovators and prospects to Iowa State University, and largely, aside from non-pandemic associated churn, our tenant base remains stable.

Like much of the campus and surrounding community, it is imperative to our long term success to keep students on campus, as increasingly our tenant base relies on student workers to fuel recruitment strategies and long term growth initiatives. Positioning ISURP staff full time working towards connecting tenants to the resources available at Iowa State (aside from talent acquisition) is an intentional strategic effort to broaden the engagement strategies of our largest tenants into research and infrastructure investments to maintain a tenant-base with interests that include research/infrastructure in addition to talent acquisition.

Iowa State is renowned as a research institution. From veterinary science to agricultural related pursuits, to a robust engineering program, there are new developments coming out of the University on a daily basis. And companies large and small are paying attention and the opportunity for the ISURP to initiate connections between the two offers robust opportunities. Travel restrictions, work from home orders and all of the havoc caused by COVID-19 have represented a unique opportunity for Iowa State researchers to share their work with corporate interests with speed and efficiency not previously recognized. We feel optimistic that while most of our tenant companies are not yet fully back at work, most are doubling down their efforts to explore new research and development opportunities with Iowa State and that we are able to deliver these engagement meetings with unparalleled efficiency. In fact, despite not being fully out the other side of the COVID-19 pandemic, the research park has the lowest vacancy rate in recent years and needs to expand spaces to meet current demand.

In recent years, a number of companies with an international reach have opened innovation hub/offices at ISURP, each of them sharing a common interest in the benefits of having a physical presence in close proximity to the university.

Also, this past year several more Iowa-based companies established operations in the Research Park to get better connected with the research expertise and infrastructure at the university as well as the workforce talent being developed on campus. We believe innovation “hubs” will continue to be an emerging opportunity for tenant attraction. As we look to the future and the new order that will inevitably become new workforce solutions, partnerships with companies as they retool and rethink work strategies in the wake of the pandemic will include remote training facilities and operations as an emerging area of interest, in particular as they align with Iowa State’s strengths. To that end, we recently retooled our affiliate program to include a co-working option.

Pre-pandemic, ISURP was finding great enthusiasm from corporate partners on the shared vision of an agricultural technology hub facility where companies with aligned interests in agriculture/technology could locate with shared communal space and high bays. COVID-19 initially put most of those discussions on hold, but our partners tell us they remain interested in pursuing such a facility and we lack space to backfill new tenant partners into current multi-tenant facilities. Any new funds to the ISU Research Park would be utilized to support costs associated with the expansion of ISURP and the region in the area of agriculture/technology to establish Iowa as the center of gravity for all things ag tech, as well as to increase our efforts to attract and retain tenant companies and the highly skilled workforce necessary to fill those jobs.

The Center for Industrial Research and Service

CIRAS has been supporting the growth of Iowa industry since 1963. As Iowa recovers from the COVID-19 pandemic, the need for people statewide continues to be the top issue across industry. As businesses formulate strategies to maintain growth, CIRAS continues to build our focus on proven and emerging strategies to respond to workforce needs. In addition to new strategies focused on finding, training, and retaining people, we will continue to grow our ability to help manufacturers implement new technologies to increase output, cybersecurity controls to protect the business, and new ways of finding local suppliers for a more resilient supply chain.

New funding of \$1 million per year for expanded services can be leveraged to bring in an additional \$1 million of federal grants and fees to help Iowa businesses implement real solutions to solve their workforce problems. Historically, funding at this level has led to companies reporting \$100 million of new sales and investments and 1,000 jobs created or retained.

ISU Research Foundation (ISURF)

The Iowa State University Research Foundation has been self-supporting since 1992 and over the last ten years has returned more than \$12.9 million to Iowa State University and the Ames Laboratory to support the research enterprise. ISURF continues to distribute royalty revenue in accordance with the royalty sharing policy, and funds in excess of those needed to support ISURF's operations will be utilized to support research initiatives as recommended and approved by the ISURF Board of Directors.

ISU Extension and Outreach

Extension and Outreach works across ISU colleges and with external partners to provide technical assistance, research-based education, and access to the resources of ISU to improve the competitiveness of farmers and businesses and quality of life in the state. Iowans want an economy that can form new businesses, grow existing industry, enhance communities, and recruit companies to the state. Iowa's STEM jobs are expected to grow 10% by 2027, with median earnings in Iowa STEM jobs at \$32.98/hour. Iowans see the need to stop the "brain drain" and take steps to develop the state's future workforce, connecting youth with opportunities here in Iowa.

With additional funding, ISU Extension and Outreach will expand economic opportunities and development projects to broaden Iowans' entrepreneurial aspirations with education and technical assistance. Extension and Outreach also will address the distinct needs of minority populations, as well as a burgeoning local foods industry and many struggling rural downtowns. These are only a few of the basic needs and urgent trends facing this state.

Summary of ISU Economic Development and Innovation Data	
a. Number of disclosures of intellectual property (excluding data sets)	144
b. Number of patent applications filed	114
c. Number of patents awarded: U.S. issued patents	50
total issued patents (world-wide)	71
d. Number of license and option agreements executed on institutional technologies: in total	47
in Iowa	22
e. Number of license and option agreements yielding income	118
f. Revenue to Iowa companies as a result of licensed technology (CY19)	\$1.7 million
g. Number of startup companies formed (through licensing activities) in total	8
in Iowa	8
h. Number of companies in research park and incubators pre-incubator companies	33
private	82
university related	19
i. Number of new companies in research park and incubators pre-incubator companies	25
private	10
university related	0
j. Number of employees in companies in research park and incubators	1,913
k. Royalties and license fee income	\$2.9 million
l. Total sponsored funding received	\$559.1 million
How much of this is for research	\$231.1 million
m. Corporate sponsored funding received for research and economic development: in total	\$51.5 million
in Iowa	\$12.2 million
n. Iowa special appropriations for economic development, in total	\$3.474 million
SBDC	\$0.936M
CIRAS Technology Assistance Program	\$1.365M
ISU Research Park	\$0.122M
Regents Innovation Fund	\$1.050M
o. Research expenditures (federal, state and local; business; nonprofit; institution funds; all other sources, FY19):	\$268.6 million
p. Licenses and options executed per \$10 million research expenditures (FY19 AUTM Survey)	1.2
q. Sales of licensed products by Iowa-based companies (CY20)	\$1.7 million
r. Number of employees for current Research Park tenants and incubators, as well as former tenants that are still in existence in basic form world-wide	8,066
Note: Unless noted, the data provided above are FY21 data.	

Appendix 1: CIRAS, SBDC, and ISURF company and community projects

United Equipment Accessories (UEA), a Waverly manufacturer of slip rings landed a \$1.7M contract from the Federal Aviation Administration after CIRAS helped the company understand the government bidding requirements and learn how to write a formal proposal. Hemen Dattani, sales director for UEA, was tasked last March to explore federal contracting opportunities so UEA could leverage a newly forged research and development partnership to expand design capabilities and make the company competitive in new markets. He worked with a CIRAS government contracting specialist for weeks learning how to interpret the government's requirements. The nature of the project meant that UEA had to do more than simply provide a product—the company would need to write a proposal explaining how it would meet the FAA's needs. "This is selling by writing," Dattani said. "It's very different in many ways, and totally new for us. The CIRAS PTAC was very instrumental in guiding me through each step of the way."

Weiler Inc., a Knoxville-based heavy equipment manufacturer, worked with CIRAS to understand a specific failure mode of a component and how to proactively detect the potential concern. The product was from a new process used by Weiler to make rock drills, causing cracking at and under the drill's surface. "CIRAS helped us hone in on the specific type of failure that we had," said Weiler's project engineer Mark Prachar. He added, "It helped us develop our grinding process and in-house nondestructive evaluation (NDE) inspection techniques." Weiler estimates that CIRAS helped the company avoid an estimated \$10 million in lost sales.

Woofables, a Coralville-based manufacturer of gourmet dog treats, expects to triple in size over the next three years after CIRAS gave it the confidence to expand its service of two different parts of the market for high-quality treats. "It was making us schizophrenic to serve both of these markets," said Woofables co-owner Laura Taylor. "CIRAS just gave us the confidence to say, 'We don't want to pick one. We want to serve both.'" The change comes after Taylor decided to take advantage of a pandemic-driven lull in business last year to launch a substantial review of the company. CIRAS supported Woofables through strategic planning, market analysis, e-commerce, and improving the factory to make their production lines as efficient as possible.

The Dimensional Group, a maker of custom packaging and commercial printing products in Mason City, facing a downturn in business due to the COVID-19 outbreak pivoted to produce much needed face shields with the help of CIRAS. CIRAS connected the company with another Iowa company to begin the production of shields within ten days. "To go from nothing to shipping product in eight or ten days, that is something that never happens," said The Dimensional Group president Adam Gold. This Iowa-based partnership produced more than 1.3 million face shields within the two months, eventually reaching nearly 2 million with the majority going to the State of Iowa to be used throughout the state.

World Class Industries, a Hiawatha-based assembly and supply chain integration company expects to see at least \$5 million a year in new business after CIRAS facilitated a partnership with Timilon, an air purification company. Iowa entrepreneur and Timilon investor John Pappajohn reached out to CIRAS partner North Iowa Area Community College (NIACC) Pappajohn Entrepreneurial Center (JPEC) searching for Iowa companies that possibly could assemble EnviroKlenz purifiers. CIRAS and the NIACC JPEC used internal data and

manufacturing expertise to identify companies with the manufacturing capabilities, capacity, and quality necessary to meet the company's needs, recommending six firms to Timilon, including World Class Industries (WCI). WCI was selected by Timilon and began producing 24,000 units per year just a few months after the initial inquiry. Ryan Murphy, director of business development for World Class Industries, said Timilon liked "our ability to scale with their business, as well as our capability to provide ideas throughout the process to improve the manufacturability of their product."

Yulia Dannen, D&S Services, 2021 Deb Dalziel Woman Entrepreneur of the Year. Yulia is an immigrant from Russia and has used her drive and tenacity to build a successful financial services company in Mason City. Through the help of the North Iowa Area SBDC, she has built her business to work with troubled taxpayers who need assistance in getting a fresh start. She also provides accounting, payroll, individual and tax preparation services. She is also a proud member and promoter of the Targeted Small Business program, which is run by IEDA. <https://iowasbdc.org/wp-content/uploads/2021/07/Deb-Dalziel-2021-Brochure-Yulia-Dannen.pdf>

Bruce Teague, Caring Hands & More, 2021 Neal Smith Entrepreneur of the Year. Bruce starting his company at the age of 19, realizing he has a passion working with end of life patients and their families. He began has company in a mobile home with only 2 employees, and has grown to 10 group living locations and 90 employees in the Iowa City area. He is extremely active in his community, serving as the Mayor of Iowa City. He advocates strongly for minority owned businesses. <https://iowasbdc.org/wp-content/uploads/2021/07/Neal-Smith-2021-Brochure-Bruce-Teague.pdf>

Critical Material Recycling - Ames Laboratory researchers developed an environmentally-friendly process to selectively recover rare earth elements critical to consumer electronics, electric cars, and wind turbine generators. ISURF is working with a local Iowa company to transition the patented technology into commercial practice. The Iowa company has received over \$1.2 million in federal Small Business Technology Transfer (STTR) funding to help scale-up the technology.

Improving Outcomes for Iowa's Poultry Industry - Iowa State University researchers discovered that a particular bacteria could be used as a probiotic in poultry to decrease hatchling mortality and reduce the amount of harmful bacteria present in the flock. ISURF entered into an option agreement with an Iowa-based feed company for the technology, with the company sponsoring over \$115,000 in additional research at Iowa State to further mature the technology.

Appendix 2: Training and Related Educational Activities

Center for Industrial Research and Service (CIRAS)

In the face of the global COVID-19 pandemic, CIRAS was able to pivot to virtual education in days. While the pandemic forced the cancellation of in-person trainings, most of them were moved online, and dozens of new COVID-related trainings were developed and launched. Throughout the pandemic, CIRAS hosted over **300 online events, educating over 9,300 attendees**. Based on success with this model and continued feedback from industry, CIRAS will continue with a significant virtual component for the foreseeable future.

CIRAS hosted the first-ever Iowa Lean Consortium virtual conference, with over 200 attendees from 73 organizations. The event, customarily the largest single educational event hosted by CIRAS, was held online in 2020 for the first time due to COVID-19. CIRAS hosted Attendees learned leading-edge ways to engage their workforce and improve productivity, a critical component to solving Iowa's workforce shortage. Globally known speakers, national experts, and Iowa leaders, provided multiple ways for companies to experience Lean remotely. CIRAS and our partners joined forces to offer 25 different trainings, mostly virtual, focused on Industry 4.0 technologies. **Over 580 people attended technology specific trainings** with topics including: 3D printing, digital scanning, automation, digital design, and cyber-security.

CED in ISU Extension and Outreach empowers communities to shape their own futures through research, educational programming, community engagement processes, data analysis, and data synthesis. CED has multiple community development specialists in place with expertise and/or experience working with minority-owned businesses and community business leaders. The unit facilitates countless meetings and workshops annually through which organizations and individuals discuss issues and reach consensus on solutions and action steps. CED serves as an essential conduit between Iowa's communities and the resources of Iowa State University, creating partnerships with private and public sectors for the betterment of Iowans.

In FY21, CED offered **Introduction to Planning and Zoning Workshops** virtually to 130 planning officials throughout the state.

The **Geospatial Technology Training Program** conducted one **ArcGIS** two-day short course for 18 planners and local officials from throughout the state.

Leading Communities: A Place-based Leadership Program is a research-based leadership program developed by ISU Extension and Outreach. It is designed to promote community engagement and increase capacity among community members for addressing common issues and problems. In FY21, 94 local leaders in six communities completed the Leading Communities curriculum.

Agriculture and Natural Resources Extension and Outreach (ANR) provides research-based information and resources to educate Iowa's farmers, producers, and agribusinesses. Much of Iowa's economy thrives on the state's rich agricultural heritage. ANR programs impact all Iowans, whether they live in rural or urban areas, and have

been developed to improve quality of life. ANR specialists are engaged with farmers, researchers, organizations, agencies, agribusiness, and communities at state, regional, and national levels.

“Growing Together” promotes healthy food access for families with low income through a partnership of ISU’s SNAP-Ed (coordinated through Human Sciences Extension and Outreach), Master Gardener volunteers, ISU Research and Demonstration Farms, and Iowa food pantries. In 2020, Master Gardener volunteers and their partners grew, harvested, and donated 81,328 pounds of fresh produce throughout the growing season, which equates to more than 243,000 servings of fruits and vegetables for food pantries. In addition, 1,016 individuals with low income participated in direct gardening and produce preparation education.

The **On-Farm Food Safety Team** (from College of Agriculture and Life Sciences, Human Sciences Extension and Outreach, and the Department of Food Science and Human Nutrition) has been leading two, million-dollar Food and Drug Administration grants and one, million-dollar USDA grant focused on food safety for fruit and vegetable growers in Iowa and the North Central Region. Within Iowa, nine Produce Safety Alliance training sessions were held with 130 participants. The team also runs the North Central Region Center for Food Safety Modernization Act Training, Extension, and Technical Assistance, and conducted an additional 50 Produce Safety Alliance trainings, educating 891 growers in the region.

The **Farm Management Team** has successfully led Central Iowa ag marketing clubs for more than 20 years and added online resources called the Iowa Commodity Challenge to the program in 2010. The marketing clubs and online resources focus on crop marketing risk management education and tools. Evaluation results in 2020 indicated the impact of improved crop marketing knowledge was more than \$21 per acre and more than \$1.7 million for all evaluation respondents.

Over half of Iowa farmland is owned by someone who does not currently farm, of which 34% is owned by owners with no farming experience, and the remaining 24% is owned by retired farmers (Farmland Ownership and Tenure Survey). **Farmland Leasing programs** were held in 86 locations across the state and led by farm management specialists to provide education to Iowans and out-of-state landowners on farmland leasing topics. The programs reached 1,444 individuals, including non-farming landowners (63%), followed by active farmers (20%), and a mix of ag professionals such as ag lenders, attorneys, accountants, and farm managers. Eighty-three percent (211) of the program evaluation respondents are using a written lease in their leasing arrangements. Of those responding to the survey, 44 were not using a written lease. When asked what changes would be made for the next year, 22 (50%) were going to move to using a written lease. Having a written agreement has been encouraged for several years during the leasing program and the number using only an oral agreement continues to decline, improving the records and relationships in leasing arrangements for all parties involved and reducing chances of misunderstanding or conflict during the lease period. Leasing meeting attendees influence 1.1 million acres of rented land in the state, representing \$242 million in economic value impacted by the program.

- **Iowa Pork Industry Center** partnered with Iowa Department of Agriculture and Land Stewardship (IDALS) and the Iowa Pork Producers Association to form an emergency

command center (Resource Coordination Center) in response to the impending packing industry shutdown due to COVID-19. The team developed a handbook, created a web page, and set up an emergency call center to help producers and to address issues arising from the pandemic disaster. Additionally, resources and expertise were identified at Iowa State University and made available to assist producers through this unprecedented time. The RCC assisted over 100 producer systems in navigating through the pandemic disaster.

The Beef Team held 9 Advanced Calving Clinics from 2018-2020 with more than 350 participants from 3 states. Topics included cow nutrition, neonatal calf health and care, hands-on sessions on normal calving and dystocia, and first aid. In August 2020, a survey was sent to 240 participants who attended a calving clinic in the last 3 years. Participants gained knowledge to improve calving success that led to an average benefit of \$7.56 per cow and a total benefit of \$375,900 value to the Iowa cattle industry and economy.

Swine building investment and depreciation is a major portion of the cost of operation for swine operations. Regular building inspection and maintenance can increase the life of buildings, reducing annual costs, preventing system failures, and reducing inefficiencies that can negatively impact animal health, production, and economic returns. A series of virtual and in-person **Protecting Swine Building Investment** workshops were held to increase knowledge of swine building and manure storage structure maintenance issues; 203 swine building managers attended a workshop series and 182 planned to implement a maintenance checklist or improve existing checklists as a result of the program.

The Pesticide Safety Education Program (PSEP) provides information through a variety of venues on the safe and effective use of pesticides. The PSEP provides recertification programs throughout Iowa and in 2020 trained 10,596 Commercial/Noncommercial/Public Pesticide Applicators and 13,359 Private Pesticide Applicators through Continuing Instruction Course (CIC) programs. The PSEP also develops study manuals and other educational publications. In 2020, over 21,000 pest or pesticide-related educational publications were distributed to the public and the PSEP website had over 28,000 unique site visits seeking pest management or pesticide safety information. The PSEP is also involved in the EPA Worker Protection Standard (WPS) education with over 45 individuals completing WPS training courses through ISU Extension and Outreach.

Crops Team faculty and staff held the annual two-day “Soil Fertility Short Course” to increase knowledge on effective soil fertility practices. Forty agronomists and farmers attended the course. Evaluation results showed that all respondents better understood the science of soil fertility and ISU’s nutrient recommendations, found the course helpful, and would recommend friends and neighbors to attend in the future. Over half have changed soil testing and recommendation procedures after this course, 70% have gained confidence when discussing soil fertility with their dealers, and 80% have reviewed provided materials since attending the workshop and reported increased profitability of at least \$11 per acre on a minimum of 11,500 acres they manage or advise.

Iowa 4-H Youth Development programs are headquartered at Iowa State University and available through ISU Extension and Outreach offices in all Iowa counties. 4-H is the premier youth program of the United States Department of Agriculture and Cooperative Extension and is the nation's largest youth development organization. Highlights from the past year include the following:

- **Checkout STEM** is a curriculum partnership between Iowa 4-H, Human Sciences Extension and Outreach, the ISU School of Education, and the Ames Public Library. [Checkout STEM](#) focuses on literacy and STEM knowledge for youth in grades K-3 and their families. It is part of a learning kit available for families to check out in libraries across Iowa.
- **Crops Feed the World** is a set of online learning modules designed for youth in grades 4-12 to learn more about crop sciences and crop production.
- **STEM Lit to Go Iowa** is a curriculum focusing on literacy and STEM knowledge for grades K-3. Each lesson includes children's books written by or focused on Iowa authors. STEM Lit to Go connects literacy development with STEM concepts. All 100 extension offices have a kit with all of the books featured and materials for each lesson.

Despite the COVID-19 pandemic, approximately 1,000 youth were exposed to the mobile **Forward Learning Experience bridging 21st Century Skills, STEM, and creative problem solving**. Youth saw and experienced first-hand emerging design technologies such as virtual reality, 3D digital and physical prototyping, and circuit bending. This provided 4-H youth throughout the state a vision of their future as 21st century citizens, positively impacting their communities and world around them using STEM skills and creative thinking. As outreach visits became possible during the pandemic, FLEx was a part of almost 9 events, STEM festivals, summer camps, and county fairs across Iowa.

Human Sciences Extension and Outreach provides research-based information and education to help families make decisions that improve and transform their lives. Specialists work with Iowa State's College of Human Sciences and in partnership with other organizations and agencies to meet the needs of Iowa families.

The **Volunteer Income Tax Assistance (VITA) program** trains community volunteers to provide free tax preparation to families with low and moderate income. The service is provided in local communities. During the 2021 tax season, Human Sciences Extension and Outreach worked with community partners to recruit and train 58 volunteers who helped 1,332 Iowans with low and moderate income to file their 2020 income tax returns – a slight increase over the previous year. Creating awareness of eligibility for the Earned Income Tax Credit (EITC) is an important part of VITA programs. The EITC enhances the lives of workers with low and moderate incomes by augmenting wages. In turn, this flow of income makes a substantial economic impact in local communities. Volunteers helped 341 filers claim the EITC they were qualified for, receiving \$496,767 in the 13 counties (Allamakee, Black Hawk, Bremer, Emmet, Cerro Gordo, Chickasaw, Mitchell, Palo Alto, Hamilton, Howard, Winneshiek, Wright, and Tama) that participated in the extension-community partnerships. Special efforts were made to increase awareness of the Earned Income Tax Credit (EITC) and VITA programs in rural Iowa.

Iowa's hardworking families need reliable and skilled child care to be able to work and contribute to Iowa's economy. Iowa loses an estimated \$935 million annually because of insufficient child care and poor-quality child care options for families. Human Sciences Extension and Outreach has responded to high workforce turnover and the increasing demand for training and professional development. **Online educational offerings are now widely available to support recruitment and retention of the child care workforce and to improve quality of care.** Online classes are easily accessed through computer, tablet, or smart phone. During FY 2021, a total of 22,344 early care and education professionals participated in 90,285 hours of online educational programming. Evaluation data from these 22,344 individuals showed significant increases in improved skills and knowledge of child development, early learning, managing children's behavior, nutrition, and health and safety practices.

Human Sciences Extension and Outreach specialists have taught the **ServSafe® food safety certification** program for more than 25 years as registered instructors for the National Restaurant Association Educational Foundation's internationally recognized food safety certification program. In 2021, 2,033 Iowans participated in ServSafe® classes taught by extension specialists, with 76.5 percent successfully earning the Certified Food Protection Manager credential. (Iowa's Food Code requires at least one supervisory employee in licensed foodservices be certified in food safety through an approved program.) Eight classes in Spanish were offered at various locations around the state.

Appendix 3: Regents Innovation Fund Program

RIF Commercialization Infrastructure and Campus-Wide Entrepreneurial Culture Program

The ISU Research Park and EDIR entrepreneurial programs received \$602,000 of Iowa State University's \$1,050,000 RIF allocation, and is administered through the Office of Economic Development and Industry Relations (EDIR) via the Pappajohn Center. The funds provide support for units that contribute to building and enhancing the innovation and entrepreneurial ecosystems at Iowa State. A summary of the RIF funding received by each unit is provided below, while their achievements and activities are provided elsewhere in this report.

Summary of FY21 RIF Commercialization Infrastructure and Campus-Wide Entrepreneurial Culture Program

Unit	FY21 RIF Commercialization Infrastructure and Campus-Wide Entrepreneurial Culture Program (\$602,000 of \$1,050,000 RIF Allocation)	Award Amount
ISU Research Park	Support for operations of the ISU Research Park	\$245,000
ISU Startup Factory	Support for operations of the ISU Startup Factory	\$150,000
Small Business Development Center	Support for operations of the Small Business Development Center	\$105,000
ISU Pappajohn Center	Support for entrepreneurial programs at ISU	\$72,000
OIC	Support for commercialization activities at ISU	15,000
JPEC/CyBIZ Lab	Support for industry relations functions at Iowa State and other technology transfer activities across campus.	\$15,000

RIF Commercialization Program

The RIF commercialization program, which is administered within EDIR, received \$448,000 of Iowa State's RIF allocation and pairs ISU faculty with Iowa companies on projects to create or improve products or processes. These funds are a **critical source of gap funding**. They represent a unique resource that can be applied toward the success of Iowa companies. A summary of FY21 funded projects is included below. Fifty-five startup companies have been assisted, including **35 new companies that were started as a direct result of RIF and its predecessor program Grow Iowa Values Fund (GIVF) funding**. **Over the past 12 months, several of these startups have attracted significant private, state and federal funding, raising over \$3.5 million in early stage investment to facilitate commercialization and first sales**. In total, **more than 100 Iowa companies have participated** in the program.

*A number of external funding applications were still pending at the time of reporting and not all award amounts were reported.

Summary of FY21 RIF Commercialization Program Projects

Principal Investigator	FY21 RIF Commercialization Program Projects (\$448,000 of \$1,050,000 RIF Allocation)	Award Amount
Shan Jiang	Additive and formulation for improving waterborne coatings	\$50,000
Eliot Wlner	Advancing VIPRE competitiveness	\$49,073
Eric Cochran	Contractor-applied soybean-oil based polymer modifiers for sustainable asphalt pavements	\$50,000
Ratnesh Kumar	Self-powered IoT for structural health monitoring: integrated vibration sensor and energy harvester	\$50,000
Chenxu Yu	Machine-learning enabled non-invasive Raman spectroscopy test for diagnosing chronic wasting disease (CWD) in live animals	\$40,623
Wenzhen Li	Upcycling of waste nitrogen by a membrane-free alkaline electrolyzer (MFAEL)	\$25,000
Abhishek Sarkar	Magnetic field assisted fast charging of lithium-ion batteries	\$50,000
Adam Thoms	Evaluation of RAB as turf fertilizer	\$50,000
Houqiang Fu	Wide bandgap semiconductors based power electronics	\$33,900

The University of Iowa

FY21 Annual Economic Development Report

The University of Iowa ranks as one of the top-200 overall universities in the world and remains ranked by Reuters as one of the top-100 most innovative universities in the world. These recognitions are indicative of the quantity and quality of the research and educational experiences supported daily at the University of Iowa. These activities subsequently translate into positive impact on the economy of Iowa. The university's existing strategic plan calls to "Support the translation of intellectual work into applications to enhance economic development." This strategy will be implemented through:

- Creating increased opportunities for entrepreneurial education, new venture creation, technology transfer, with a specific focus in medtech and edtech innovation, and
- Connecting faculty, staff, and students to organizations and subject matter experts to solve unmet needs in social, health, technical, and business problems

A robust strategy incenting economic development, on a campus like the University of Iowa, is key to transforming ideas into impact benefiting Iowans and beyond.

Subsequently, this report provides a description of the UI's key initiatives in the economic development space—Protostudios, UI Research Park, Translational Research Incubator, UI Research Foundation, UI Ventures, MADE, Center for Advancement, John Pappajohn Entrepreneurial Center (JPEC), UI Pharmaceuticals, and activities at the College of Engineering.

I. Organizing to Support Economic Development

The Chief Innovation Officer, who reports to the Vice President for External Relations with a dotted-line report to the President, oversees and coordinates the economic development activities for faculty, staff and graduate students at the University of Iowa. Of the UI organizations listed below that contribute to economic development efforts, five report directly to the Chief Innovation Officer: Protostudios, UI Research Park, Translational Research Incubator, UI Ventures, and MADE.

In FY21, the "Innovation Team" focused its efforts around several broad themes, including:

Focus on MedTech and EdTech. The University supports a broad array of research and development efforts and possesses expertise across a wide range of disciplines, but external reviews commissioned by the State of Iowa identified highly concentrated capabilities in the medical technology and education technology sectors. At the University, efforts are focused on exposing faculty, staff and students to the system of support which exists within the university

and in the surrounding community to assist them in transitioning their research or other ideas towards commercialization, and enable student participation.

Mobilizing an External Network. Drawing on a broad network of contacts in the medical device industry and the venture capital community, the Innovation Team is exposing UI start-ups and entrepreneurially minded faculty, staff and students to skills and connections heretofore not readily available on the Iowa campus. The network of individuals able to assess start-ups, offer strategic and experiential assistance, and connect them to talent not resident to Iowa. These volunteers are complemented by an expanding stable of Entrepreneurs in Residence.

Creating a Concierge Service to Support UI Faculty Innovations. Under the direction of UI Ventures, the Innovation Team has begun laying the groundwork for a comprehensive suite of services to assist UI faculty looking to engage the innovative process. This service has and will continue to connect entrepreneurial faculty and companies with strategic support from medtech venture capital and industry knowledge, FDA guidance, intellectual property or clinical study guidance and reimbursement strategies. In FY21, emphasis was on growing the nascent support structures, which were launched in FY20, and continued outreach for Biomedical engineering, and the Colleges of Dentistry, Nursing, Medicine, Pharmacy and Education.

Extending Advanced Prototyping Services to Medical Innovators. With the financial support of the IEDA, Protostudios acquired an advanced anatomical printer to assist medical device innovators. The new machine is located inside the UI Hospitals and Clinics and has enabled Protostudios to better reach, engage and support medical innovators. Throughout FY20-21, this new office established itself and is now serving increasing numbers of clients devising medical device products and concepts.

Expansion of GAP Funding Programs. In both FY19 and 20 in partnership with the College of Medicine, the Innovation Team designed and administered \$100,000 GAP funds to promote faculty innovation in medical device and software. The Innovation Team solicited entries, review by external experts, coordinated the evaluation of the entries, and administered the funds. That model has rolled out to include competitions at the Colleges of Engineering, Nursing, and Education thus far. Encouraging proof of concept and translational projects is a key building block in the Economic Development pipeline. In addition to meeting practical and clinical needs, the projects provide a resource for innovative faculty to promote a more inventive culture.

III. University of Iowa Economic Development Infrastructure



University of Iowa
Research Foundation

Research and scholarship from faculty and staff at the University of Iowa often lead to the discovery of innovations that can improve the quality of life for people in the state, the nation, and worldwide. The University of Iowa Research Foundation (UIRF) works to obtain intellectual property protection—like patents and copyrights—on these innovations and partners with industry for the commercial development of new products and services.

UIRF is part of the Office of the Vice President for Research and works to deliver UI innovations out into the world by:

- Building relationships with researchers through intellectual property protection and commercialization;
- Working collaboratively with industry through intellectual property licensing and other partnerships

UIRF manages a diverse portfolio of inventions including educational materials, engineering advancements and physical materials, imaging and diagnostics technologies, and a variety of therapeutic inventions.

Technology transfer is an integral part of all Research 1 universities in the U.S., and UIRF has been serving as the University of Iowa’s technology transfer office since its founding in 1975. Many at UI are familiar with UIRF’s largest commercialization success: the Department of Microbiology and Immunology’s CMV promoter. This 1983 invention was licensed by UIRF to over 120 companies and generated over \$170 million for the inventor and the university. Because of the phenomenal success of this invention, the university community often overlooks the number of other UI inventions currently on the market, including:

- the Zimmer Biomet Trabecular Metal Total Ankle;
- the English-language mobile app tutorial *Sounds of Speech*;
- IDx-DR, the first ever diagnostic artificial intelligence algorithm to receive FDA approval (for detection of diabetic retinopathy); and
- a mobile learning platform that aids dental and nursing students worldwide.

In the last few years, UIRF has inked deals with companies for products ranging from cranial plates for traumatic brain injury, gene therapies for cystic fibrosis (UIRF's licensee was acquired in 2018 as part of a \$3 billion deal with Sumitomo Dainippon Pharma), CRISPR tools to treat neurological disorders, a new high school equivalency exam, a dietary supplement for companion animals, a device to treat atrial fibrillation (UIRF's licensee was acquired by Boston Scientific this year), to LED gas sensors (UIRF's licensee had its first commercial sale this year).

After nominations from UIRF, two UI inventors have been inducted into the National Academy of Inventors. Through its commercialization efforts, UIRF helps our researchers expand the relevance of their work to have a direct impact on people's lives.

In addition to the public impact, UIRF's activities directly enhance UI's research mission in ways large and small:

- Revenue from licensing paid to colleges, departments, and the OVPR, in the amount of \$14.8 million in the last ten years.
- Many UIRF licensing deals lead to sponsored research in the UI inventors' labs, and all sponsored research agreements, including SBIR/STTR grants, include intellectual property and licensing provisions.
- Many grantors—foundations, companies, consortia, and increasingly federal agencies—expect grantee institutions to demonstrate their robust commercialization capabilities and sometimes detailed commercialization plans in grant submissions.
- Those same granting agencies impose strict, detailed requirements for reporting on inventions made using their funds. For federal agencies, the Bayh Dole Act outlines these requirements from disclosure to patenting activity to licensing to detailed financial reports. Enforcement of these requirements has become more diligent and strict in the last four or five years. UI's research partners HHMI and the VA have similar requirements.
- Federal and foundation grants require researchers to make their research tools widely available. As an alternative to one-off, sometimes time-consuming material transfer agreements (also known as MTAs) requests, UIRF makes these tools available through revenue-bearing licenses. UIRF currently has over a hundred research tools licensed to various companies.

In the past five years, UIRF has worked on over 500 disclosures with over 800 UI researchers from all colleges (including 13 CLAS departments).

protostudios

Protostudios (<https://protostudios.uiowa.edu/>) is a state-of-the-art, rapid-prototyping facility located in the MERGE co-working space in downtown Iowa City and at UIHC. It works with UI researchers, researchers from other Iowa universities and healthcare institutions and community members to develop fully functional prototypes of product ideas, allowing

innovators to test, redesign, and determine manufacturing paths and demonstrate usability to investors. Protostudios primary focus is on biomedical and electronics prototyping with access to 3D printers (plastics, metals, ceramics) milling, laser/wet jet cutter, printed circuit board fabrication, and consulting from on-staff industrial designers and engineers. Anatomical modeling of human organs prior to complex surgeries is developing into a key value add of Protostudios.

The creation of Protostudios was funded through a \$1.5 million Strategic Infrastructure Fund grant from the Iowa Economic Development Authority, and the authority approved a \$500,000 grant to outfit additional space for new equipment that expands the organization's capabilities.



The UI Research Park (<https://researchpark.uiowa.edu/>) leases building sites and space to growing technology companies that require sustained research relationships with the university. The Park is home to a business incubator program that has nurtured over 100 UI start-ups and other new ventures since its founding. Incubator tenant companies can draw on both the research and business resources of the university, including access to UI libraries, hazardous waste management services, support for SBIR/STTR grants (Small Business Innovation Research/Small Business Technology Transfer federal grants), educational seminars, networking opportunities, and shipping/package handling.

The BioVentures Center (BVC) in the park contains wet laboratory modules that can be shared for life science companies and office/dry laboratory modules for engineering and technology-based companies. The BioVentures Center wet lab space is currently, and has a waiting list.

The Park is also home to three of the university's specialized core facilities. These facilities provide technical support services critical to the growth of start-up companies as well as existing industry partners:

- Center for Biocatalysis and Bioprocessing operates a microbial fermentation facility and specializes in both upstream and downstream bioprocessing with expertise in process scale up for food products, biofuels, biopharmaceuticals, and other biotechnology products.
- National Advanced Driving Simulator conducts research and development on driving safety for the government, military, and industry partners.
- State Hygienic Laboratory is the state's environmental and public health laboratory, serving all ninety-nine Iowa counties as well as out-of-state clients by testing and tracking infectious diseases and illnesses.



The Translational Research Incubator (TRI) (<https://uiventures.uiowa.edu/translational-research-incubator>) serves as the wet-lab counterpart to Protostudio's dry-lab program. The TRI space, located in the Medical Laboratories building on the university's campus is a complement to the UI Research Park as it can house up to four early-stage research-based biomedical or life science companies focused on commercializing technology developed at the University of Iowa.

Much of the support for TRI goes to purchasing equipment that can be shared among the company tenants. This allows companies to focus their limited resources on technology-specific development to maximize their funding -and do so in close proximity to their day jobs. The space is ideal for small start-ups that need to conduct early-stage proof-of-concept experiments, often with SBIR/STTR funding, in order to attract the investment needed to expand operations at the UI Research Park and other locations in the eastern Iowa region. The TRI space is currently full with a waiting list for occupancy.



UI Ventures (<https://uiventures.uiowa.edu/>) assists university faculty and staff in creating new companies based upon their research. It facilitates connections between the faculty and outside mentors, services and investors and serves as a liaison between the company and university services. Working closely to support the University of Iowa Research Foundation, UI Ventures actively engages with outside investors and business experts to improve visibility of UI companies and bring business expertise to campus. In addition, UI Ventures manages the TRI incubator and operates the MADE program to encourage faculty and staff innovation and entrepreneurship throughout campus.

MADE



Iowa MADE (<https://iowamade.org/>) is a first of its kind program, in the nation, whose mission is to encourage and facilitate the UI community to bring innovative, need-based products to market with the goal of enhancing economic development at the university as an extension of research and scholarship.

MADE is a manufacturing and e-commerce initiative launched in FY18 with 3 objectives: 1) bring simple, low volume technology to market utilizing local Iowa manufacturing whenever possible; 2) contribute to a cultural transformation around innovation on campus; and 3)

provide students with an opportunity to learn first-hand the tools necessary to bring a product to market. The program crosses technology sectors with the first products to launch being low risk medical devices developed at UIHC across several departments. Products are available for sale through the iowamade.org website and revenue is used to reimburse development costs to encourage continued support of innovation and development. All technologies remain available for licensing to an external company through UIRF.

An undergraduate student operations team maintains the FDA compliant quality system, manufacturing, product management, marketing, and sales. These students have the unique opportunity to gain in depth real-world experience and leadership skills on campus to complement their classroom education.



The John Pappajohn Entrepreneurial Center (Iowa JPEC) (<https://www.iowajpec.org/>) offers nationally recognized comprehensive entrepreneurial education programs that are available to all Iowans. At the undergraduate level, Iowa JPEC and the Department of Management and Entrepreneurship offer a BBA in Management with an Entrepreneurial Management Track (on-campus and online) to Tippie College of Business students. Iowa JPEC and the College of Liberal Arts and Sciences offer a BA in Enterprise Leadership (on-campus and online). In addition, Iowa JPEC offers the Technological Entrepreneurship Certificate for engineering students, the Certificate in Entrepreneurial Management for all undergraduate students, the Certificate in Arts Entrepreneurship for arts students, and the Certificate in Media Entrepreneurialism for journalism and mass communication students. Advanced entrepreneurship courses are also offered to MBA students at several locations across the state of Iowa as well as virtually.

Iowa JPEC and its university partners also play an important role in the development of Iowa-based technology and high-growth start-up companies. Whether providing one-on-one consulting services and group training, working with start-up companies on technology transition, directing UI students on advanced field study projects, or providing training and seminars to business executives, Iowa JPEC seeks to support the next generation of entrepreneurs and business leaders.



The University of Iowa Center for Advancement (UICA) (<https://www.foriowa.org/>) advances the UI through engagement and philanthropy, and its Corporate and Foundation Relations group promotes economic development through connecting corporate partners with the UI's strengths. In addition to connecting established companies with the university, the Center for Advancement is a key player in tapping UI's extensive alumni base to support entrepreneurship and technology commercialization through monetary resources and, equally important, advice and expertise.



UI Pharmaceuticals (<https://uip.pharmacy.uiowa.edu/>) is a fee for service entity on the University of Iowa Campus that provides contract drug manufacturing (CDMO) services to academic, biotech, and pharmaceuticals clients. These services range from early-stage formulation development, analytical method support, clinical trial material manufacturing, to commercial product manufacture and support. It is organizationally structured as a division of the UI College of Pharmacy and employs approximately 85 pharmaceutical professionals. UI Pharmaceuticals has been operating for nearly 45 years and supports the manufacturing and testing of both clinical and commercial products. The seven departments that comprise the program are as follows:

- Sterile Manufacturing
- Non-Sterile Manufacturing
- Quality Assurance
- Analytical Services
- Preformulation and Formulation Development
- Business Development
- Engineering and Facilities

Center for Biocatalysis and Bioprocessing

The Center for Biocatalysis and Bioprocessing (CBB) (<https://cbb.research.uiowa.edu/>) is an academic center on the campus of the University of Iowa focused on advancing biotechnology through the creation and dissemination of discoveries in the biocatalytic sciences. The Center's core missions are to 1) enhance student education, 2) promote faculty research, 3) support economic development, and 4) grow a thriving workforce in biotechnology.

The Center is proud of its exceptional microbial bioprocessing facility that operates within the University of Iowa Research Park. This facility provides a unique campus environment to promote its education, research, economic and workforce development missions. As an internationally recognized contract development and manufacturing operation (CDMO), the CBB facility specialized in the optimization and scale-up of complex bioprocesses for the production of pilot-scale, high valued bio-based chemicals. Most notably, the CBB's facility fills a worldwide niche to produce recombinant proteins of commercial and research value.

A fraction of these proteins is produced under strict standards defined by the U.S. Food and Drug Administration (FDA), referred to as *current good manufacturing practices* (cGMP). The CBB's cGMP suite operates under the 2008 FDA guidance for Phase I clinical studies, which means the products produced under this standard can be used to determine the safety and efficacy of putative therapeutics. The CBB's cGMP operation is ideally suited for startup companies with limited budgets who need information for the Chemistry, Manufacturing, and Control (CMC) section of their Investigative New Drug (IND) applications required by the FDA before Phase I clinical trial testing can begin. Products manufactured in the CBB's cGMP suite can be used for toxicity testing, stability analysis, and, finally, administration to human volunteers in the phase 1 clinical trial. The CBB operates the only facility in the State of Iowa that manufactures vaccines and therapeutic proteins for Phase I clinical trials in people.

From the standpoint of economic development, the Center's microbial bioprocessing facility provides an unmatched expertise in biotechnology that attracts clients from around the world. Clients range from international corporations to virtual startups. In addition, the facility's professional staff supports clients who are preparing SBIR/STTF grant applications and our staff consults for companies preparing IND applications for the FDA. An exciting initiative for the CBB's biomanufacturing facility is a potential partnership with an international company to produce recombinant-reagents targeted for the cultivation of specialized cell for novel cell and gene therapeutics, including those for personalized medicine. These r-reagents represent a critical part of the national supply chain for biomanufacturing of the next generation of biotherapeutics.

College of Engineering

The UI College of Engineering (<https://engineering.uiowa.edu/>) is educating nearly 2,000 undergraduates and 280 masters and PhD students. The College recently completed a \$37 million, 65,000-square-foot addition to the Seamans Center for the Engineering Arts and Sciences. The addition includes expanded classrooms, collaborative learning spaces, learning and discovery in fluid mechanics, sustainability, advances in teaching and conducting research in computer-aided design and simulation, and fosters engineering and the arts.

There are 15,265 engineering alumni living and working throughout the world – 4,432 alone in the state of Iowa – many with corporate and personal ties to the College through recruitment, mentoring, guest seminars, faculty consulting, sponsored research, financial giving, and other interactions. Among distinguished alumni are eight members of the National Academy of Engineering.

Key research units at the College of Engineering include:

- [Center for Bioinformatics and Computational Biology](#) -- High-performance computational and informational resource to help researchers learn about genetic basis of human disease and other biomedical phenomena. Also enables interdisciplinary research in basic life sciences and applied medicine.

- [Iowa Technology Institute](#) -- Conducts basic and applied research in modeling and simulation and comprises the following seven units: Advanced Manufacturing Technology Group (AMTech); Biomechanical of Soft Tissue Program (BioMost); Musculoskeletal Imaging Modeling and Experimentation MIMX); National Advanced Driving Simulator (NADS); Operator Performance Laboratory (OPL); Reliability and Sensory Prognostics Systems (RSPS); and Virtual Soldier Research Program (VSR).
- [NADS — National Advanced Driving Simulator](#) -- Home to the largest driving simulator in the US, the National Advanced Driving Simulator (NADS) has been a leader in driving safety research for more than 20 years. Through work with students, faculty, staff, programs, and university-wide collaborators, NADS partners with government, industry, and academic leaders to improve safety by researching the connection between drivers, motor vehicles, and road users.
- [IIHR — Hydroscience & Engineering](#) -- Acknowledged international leader in fluid mechanics, environmental hydraulics, and water and air resources. Home of the Iowa Flood Center, engaged in flood projects in several Iowa communities and employs several graduate and undergraduate students participating in flood-related research; and the Lucille A. Carver Mississippi Riverside Environmental Research Station, which conducts unique interdisciplinary educational and research programs focusing on river ecology in a holistic way.
 - [IFC — Iowa Flood Center](#) -- Born out of the 2008 floods, the Iowa Flood Center at the University of Iowa provides Iowans with accurate, science-based information to help them assess and understand their flood risks. The center's goal is to improve flood monitoring and prediction capabilities in Iowa, while developing strategies to help mitigate and prevent future flood damages.
 - [IGS — Iowa Geological Survey](#) -- The Iowa Geological Survey has a rich scientific history in the state, serving Iowans for more than 150 years through the collection and analysis of geologic and groundwater data. With this information, the IGS helps effectively understand Iowa's natural resources for long-term sustainability and economic development.
- [Iowa Institute for Biomedical Imaging](#) -- Aims to foster multi-disciplinary and cross-college research and discovery in biomedical imaging and image analysis, and improve training and education.
- Interdisciplinary Research Centers
 - [Carver Family Center for Macular Degeneration](#)
 - [Center for Global and Regional Environmental Research](#)
 - [Center for Health Effects of Environmental Contamination](#)
 - [Center for International Rural and Environmental Health](#)
 - [Environmental Health Sciences Research Center](#)
 - [Heartland Center for Occupational Health and Sustainability](#)
 - [Iowa Injury Prevention Research Center](#)
 - [Iowa Superfund Basic Research Program](#)
 - [John and Marcia Carver Nonprofit Genetic Testing Laboratory](#)
 - [NSF Center for Environmentally Beneficial Catalysis](#)
 - [Orthopaedic Biomechanics Laboratory](#)

- [Photopolymerizations Center \(NSF I/UCRF\)](#)
- [Public Policy Center](#)
- [UI Informatics Initiative](#)
- [UI Water Sustainability Initiative](#)

III. UI’s Economic Development Activities in FY21

Impact on economic growth in Iowa

- The UI Research Park is home to 32 companies, employing over 2500 total employees, 800 of those located on the park. Total payroll associated with Park companies is more than \$2.9 million.
- UI Ventures currently supports 47 companies including 1 that formed in FY20.
- MADE had 4 products on the market in FY21 and students continued to develop an additional 7 products originating from the Colleges of Medicine and Dentistry, and the UIHC Dept of Nursing.
 - Two MADE student graduated and had multiple job offers directly related to their work at MADE.
- Protostudios resumed client work in August of 2020. By early 2021 Protostudios monthly billings had surpassed pre-COVID levels.
- The Protostudios UIHC office opened in August of 2020. UIHC Client traffic has been high with meetings almost every day.
- About 60% of Protostudios’ projects are medically related.
- 2020 also saw the first academic introduction of the Protostudios designed and manufactured teeth. Hundreds of these have been sold and used by students to practice dental procedures. Each tooth design was guided by dental college professors to provide the look and material feel of real teeth. Each tooth consists of multiple 3D printed layers mimicking major tooth components e.g. enamel, dentin, pulp, nerve, and decay.
- The fully vaccinated Protostudios’ team traveled to both UNI and Iowa State to meet with our sister organizations (TechWorks & CIRAS). Communication and cooperative development continues with each of them.
- The second student employed by Protostudios graduates in December and has accepted a job in Decorah Iowa. His job is a virtual parallel to his Protostudios job experience.
- Iowa JPEC

○ Start-up Companies Served (New Business Starts)	233
○ Program, Seminar & Workshop Participants	4,808
○ Estimated Job Creation	364
○ Hours dedicated to Clients	13,605
○ Total Clients (Individuals receiving assistance)	833
○ Total Youth Impacted (K-12)	51,394
○ Seed Money Awarded	\$606,200

- Total Participants Across All Programs) 10,522
(Including Academic, Outreach, and Youth)
- UI Center for Advancement assists with aligning recruiting efforts and providing access to UI faculty and staff. It promotes corporate partner and foundation student scholarship and programming opportunities. UICA facilitates UI's partnership with ICR Iowa to promote "Boomerangs" to return to the state to fill job openings.
- In FY21 UI Pharmaceuticals worked with ~100 different clients to manufacture and testing ~120 individual lots of material, resulting in ~\$18.8M in total revenues. Of particular note these projects include two NIH Task Order programs for investigational drugs to treat Jansen metaphyseal chondrodysplasia (<https://uip.pharmacy.uiowa.edu/news/2020/12/ui-pharmaceuticals-awarded-nih-ncats-grant-dosage-form-development-and-manufacturing>), and COVID-19. Additionally, UI Pharmaceuticals support of client Actuate Therapeutics, resulted in the receipt of Fast Track FDA Designation for their product 9-ING-41 for the treatment of adults and children with advanced refractory cancers (<https://uip.pharmacy.uiowa.edu/news/2021/08/ui-pharmaceutical-client-actuate-therapeutics-receives-fast-track-fda-designation-9>). UI Pharmaceuticals currently supports client programs across the United States as well as in Europe, Asia, Africa, and South America.
- The Center for Biocatalysis and Bioprocessing supported projects with 5 clients based in Iowa, 11 clients from elsewhere in the U.S., and 5 located outside the U.S. in FY21.
- Industry partnerships at the College of Engineering offer support for research and technology development in addition to experiential learning opportunities for Iowa engineering students. In FY21, notable partnerships included:
 - Collins Aerospace (gift funding and sponsored research with Tom Schnell)
 - Carver Trust (lab kits, student support, faculty support, labs with focus on biomedical engineering)
 - Deere Foundation (gift funding and programmatic support in Mechanical Engineering)
 - Providing students with opportunities to work with businesses, particularly Iowa businesses, is a priority for the College of Engineering.
 - 125 unique engineering students participated in a co-op or internship in FY21.
 - 96 of those students were in the state of Iowa
 - 76.8% were in the state of Iowa
 - Engineering students worked for 117 different employers

Promotion of economic growth in Iowa

- UI Ventures continues to build a stronger economic development pipeline through programs that support business executive interactions, coaching and connections with investors, business strategy support, and other startup resources. In FY21, UI faculty/staff companies were awarded \$5,508,545 in SBIR/STTR grants across 9 companies and 8 companies secured equity funding totaling \$57,050,000. One spin out company was acquired for \$295 million.
- UI Research Park's BioVentures Center traditionally monthly host lunch and learns in collaboration with SBDC and JPEC throughout the year for start-up companies and the multi-purpose room and other conference rooms in the BVC are used by several

collaborating groups, including the Iowa Innovation Corporation and the Iowa Economic Development Authority (IEDA). These activities were suspended due to COVID but are anticipated to return once allowed.

- Iowa JPEC:
 - Academic Program – Iowa JPEC delivers campus-wide and online undergraduate education and technology innovation coursework in the MBA program. Majors (BA or BBA) and certificate programs exist for all undergraduate students at UI including specialized programs for students in engineering, performing arts, and journalism. During FY21, 4,566 students enrolled in 135 classes, 334 students received a degree and 130 students earned an entrepreneurship certificate.
 - Bedell Lab Student Incubator – The student incubator housed at the 10,000 sq. ft. Bedell Entrepreneurship Learning Laboratory has 17 private offices for the most advanced start-ups, numerous co-working spaces for the others, and several conference rooms. This campus-wide program is open to students from every college and major. The students receive intense mentoring and support as they launch or expand their businesses. The program, one of the first of its kind in the nation, has impacted 1,503 students since opening in 2004. During FY21, the Startup Incubator supported 45 student start-ups made up of 61 students. An example of a student startup supported by the Startup Incubator in FY21:
 - Hawkeye Surgical Lighting, founded by Anthony Piscopo (19BS Biology), a second-year medical student in the Carver College of Medicine, and David Christianson, a third-year neurosurgery resident, partnered to solve a decades-old operating room problem—poor lighting and visualization during surgery. They created a compact surgical light that causes gliomas (cancerous brain tumors) to glow bright red, a technology previously only available through bulky multimillion-dollar microscopes. Piscopo and Christianson built the idea into a feasible business by participating in Iowa JPEC’s UI Innovators (NSF I-Corps) Workshop. They are continuing to grow the company in the graduate student track of the Hawkeye Summer Accelerator program. Their minimum viable product is currently being tested on human patients in 10 different operating rooms at University of Iowa Hospitals & Clinics.
 - Hawkeye Summer Accelerator - Throughout the twelve-week program, accelerator teams meet daily to launch their start-up by using Lean LaunchPad methodologies. Through brunch-and-learns, work sessions with experienced mentors, weekly pitches, and lectures, the Hawkeye Startup Accelerator aims to drive the start-up process for students, while increasing their start-ups' chance for success. In FY21, 15 teams and 24 students participated.
 - Business plan and pitch competitions – Iowa JPEC hosts and sponsors a variety of elevator, business model and business plan competitions for UI students. During FY21, a total of \$599,450 was awarded to start-ups.

- Innovation Challenge – In order to increase campus-wide entrepreneurial activity and accelerate technology commercialization, a new year-long training program and competition launched in FY20. Administered by the John Pappajohn Entrepreneurial Center and co-sponsored by the Office of the Vice President for Research, UI Research Foundation and Office of the Chief Innovation Officer, the program had 117 participants in FY21.
- IdeaStorm Competitions are entry level pitch competitions that require no prior experience. Students simply share their idea with the crowd in two minutes or less. This introduced 118 new students to entrepreneurship in FY21.
- Game Changer – This is a new online event that provides participants with a platform to develop ‘impact driven entrepreneurship’ that will address a United Nations Sustainable Development Goal. During FY21, 16 students participated.
- Jacobson Institute for Youth Entrepreneurship – The Jacobson Institute is a comprehensive program that enriches K-12 students’ lives through classroom and practical educational experiences. Programming and impact include:
 - BizInnovator Program – Curriculum and teacher training focused on entrepreneurship and business. In FY21, 283 teachers from 250 schools in 41 states used the curriculum nationwide and impacted 12,756 students.
 - STEM Innovator Program – This professional development program for teachers infuses innovation and entrepreneurship into K-12 classrooms. In FY21, 361 educators from 145 schools in 18 states received curriculum, training, and support, impacting 37,903 students.
 - Summer Camps – Offered online (COVID), Naperville, IL and West Des Moines, IA. 51 youth from 7 states participated. Participants ranged in age from 5th-12th grades.
 - Innovator Competition – Competition for high school students to showcase their business startup, invention, or innovation. 431 students from 101 schools across 28 states participated. A total of \$6,500 in seed capital was awarded.
- Seminars, Workshops, and Lecture Series – Iowa JPEC hosted more than 94 different opportunities last year for students, faculty, and people from the community. In FY21, over 4,808 attendees came to learn from experienced entrepreneurs on a variety of topics.
- Alumni-Student Mentoring Program – This program was established to connect entrepreneurship students with esteemed alumni to enhance students’ professional and personal development for future success. In FY21, 275 students were paired alumni mentors.
- Okoboji Entrepreneurial Institute - Iowa JPEC established the annual, week-long Okoboji Entrepreneurial Institute (OEI) in a partnership among state of Iowa universities and colleges, as well as Iowa Lakes Corridor Development in 2006. Today, this summer program continues to provide students with an immersion into entrepreneurship and

business strategy and develop an outstanding network of peers and business professionals. In FY21, this program was not held due to COVID-19.

- Student Organizations – Several campus-wide clubs and organizations focused on entrepreneurship are sponsored by Iowa JPEC.

Summary of FY21 economic development activities

- UIRF:

	FY16	FY17	FY18	FY19	FY20	FY21
Disclosures	151	93	143	83	95	101
Licenses + options	40	58	51	48	37	47
Patent applications	297	148	153	160	146	95
Provisionals	88	49	35	42	36	40
PCTs	29	29	17	16	24	13
Regular US	142	83	44	53	38	26
Foreign	126	36	57	49	48	16
Issued patents	67	42	74	54	72	86
US	25	24	27	22	17	29
Foreign	42	18	47	32	55	57

- Wellmark Venture Capital Fund
 - Four companies funded at \$100,000 each
- Business Consulting Program
 - Iowa clients served 70
 - Industries include: profit, non-profit, NGO, start-up/entrepreneurial, retail, engineering, financial, veterans' services, software/IT, manufacturing, restaurant, research, event coordinating
 - Iowa counties represented 13
 - Johnson, Polk, Scott, Linn, Muscatine, Plymouth, Iowa, Woodbury, Cerro Gordo, Blackhawk, Jackson, Benton, Buchanan, Dallas, Clinton, Dubuque, Scott
 - Hours dedicated to one-on-one consulting 12,636
- Institute for International Business
 - Iowa clients served 3
 - Industries include: international trade, food processing/consumer products, medical devices
 - Iowa Counties represented: Benton, Des Moines, Johnson
- Iowa Innovation Associates (IIA) Internship Program
 - Student internships 23
 - Iowa businesses served 18
 - Iowa counties represented 5
 - Linn, Johnson, Polk, Dubuque, Scott Industries include: Agriculture, Real Estate, Non-Profit, event planning, Environmental, Automotive, Finance, Medical, Data Analytics, software/IT, retail, marketing
- National Science Foundation NSF I-Corps Program

- Number of businesses 39
- Number of participants (faculty & staff) 50
- Hawkeye Summer Accelerator
 - Number of teams 15
 - Number of participants 24
- Small Business Development Center
 - Start-ups companies served (new business starts) 14
 - Total clients counseled (individuals assisted) 322
 - Estimated job creation 123
 - Hours dedicated to clients 903
 - Total capital – loans + equity \$7,147,629
 - Workshops 0

Support of Economic Development Outreach in Iowa

- UICA has presented its Impact Report to dozens of corporate partners to demonstrate specific examples of campus wide engagement with those partners. Examples of engagement include recruitment, experiential learning, board and speaking activity, as well as philanthropic support. The compilation of this information in one report enables UI's corporate partners to evaluate and extend their engagement with the university.
- Venture School Entrepreneurial Training Program – Iowa JPEC offers an immersive “Lean LaunchPad”, business model canvas, eight-week boot camp training program named Venture School to accelerate start-ups. Venture School is offered in multiple locations across Iowa. The program emphasizes real-world entrepreneurship through experiential learning, a flipped classroom, and immediate feedback. During FY21, workshops were offered in Coralville/UI, Davenport/EICC, Iowa City, Cedar Falls/UNI, Des Moines, Sioux City, Dubuque and Mason City/NIACC. There were 80 teams made up of 99 entrepreneurs.
- UI Small Business Development Center – The UI hosts an SBDC that serves a five-county area (Cedar, Johnson, Iowa, Poweshiek, and Washington counties). During FY21, the UI SBDC served 322 start-ups. This contributed to the creation of 124 jobs and \$ 7,147,629.44 in equity being raised.
- Institute for International Business (IIB) – The IIB is dedicated to advancing knowledge and international skills in business and educational communities through research, education, and consulting. During FY21, 25 International consulting projects were completed by University of Iowa students and faculty.
- Business Consulting Program – Iowa JPEC offers business consulting services to entrepreneurial and start-up companies around the state. During FY21, 103 projects were completed for 70 clients in 22 counties (Johnson, Polk, Scott, Linn, Muscatine, Plymouth, Iowa, Woodbury, Cerro Gordo, Blackhawk, Jackson, Benton, Buchanan, Dallas, Clinton, Dubuque, Scott)
- Iowa Innovation Associates Internship Program – Iowa JPEC provides funding support enabling Iowa start-ups to hire UI student interns as they work to grow their businesses. In FY21, 23 students were placed in 18 start-ups in these Iowa counties: Linn, Johnson, Polk, Dubuque, Scott

- Pappajohn Entrepreneurial Ventures Competition – In partnership with the Pappajohn entrepreneurship centers at ISU, UNI, Drake, and NIACC, Iowa JPEC sponsors this annual competition to support start-ups around the state. Each year, over \$50,000 is awarded in total to three companies.
- Wellmark Venture Capital Fund – Iowa JPEC is the regional administrator of the \$5 million Wellmark Venture Capital Fund that supports the creation and growth of new businesses throughout the state. Iowa JPEC screens applications, performs due diligence, evaluates business concepts, and assists applicants with their business plans. Iowa JPEC partners with area angel investors, equity fund managers, lenders, the Iowa Economic Development Authority and the Small Business Administration to help business owners secure additional funding. During FY21, four businesses each received \$100,000 in funding.
- NSF I-Corps Training Program) – The University of Iowa was awarded a multi-year National Science Foundation (NSF) I-Corps Site grant in FY15 to support UI faculty, staff, and student entrepreneurs. This program is a joint effort between the Office of the Vice President for Research and Economic Development, UI Ventures, and Iowa JPEC. The goal of this program is to accelerate 90 faculty and staff start-ups. During FY21, 39 start-ups made up of 50 faculty and staff participated.
 - Viewpoint Molecular Targeting, Firefly Photonics, and Theion Agriculture are examples of an early-stage businesses being supported by this program.
- Regional Partnerships / Eco-system Development – Iowa JPEC partners and engages with numerous local, regional, and statewide organizations to support entrepreneurs and contribute to the vital entrepreneurial ecosystem. These organizations include chambers of commerce, economic development organizations, business accelerators, state agencies, other universities, and community colleges.
- National Engagement – Iowa JPEC engages with several national and international organizations focused on small business, entrepreneurship, economic development and technology commercialization. This includes not only membership but also committee participation and invitations to present best practices.

Regents Innovation Funds Spent to Promote Economic Development in Iowa

- Protostudios: \$248,369 for personnel and general expenses
- UI Research Park: \$79,396 for BioVentures Center personnel, operating/general expenses
- UI Ventures and MADE: \$557,435 for personnel, consultants, student interns, award and general expenses

The University of Iowa recognizes the important role it has to play in the state's economic development ecosystem. The university is committed to improving the quality of life in Iowa through a sustainable cycle of research and creative activity. Research at the University of Iowa makes Iowa a healthier, more prosperous, and attractive place to live. The university will continue to ensure that every dollar invested in research is leveraged by developing new economic opportunities for Iowans.



**University of Northern Iowa
Annual Economic Development and Technology Transfer Report – FY2021**

Section 1. UNI’s Economic Development Activities to Enhance Economic Growth in Iowa – Highlights and Summary

The University of Northern Iowa (UNI) provided economic development assistance throughout all of Iowa’s 99 counties for the 22nd consecutive year. UNI’s economic development outreach programs are housed in the Business and Community Services (BCS) division and work toward supporting the UNI strategic goal of contributing to the economic vitality of the state. Since 2000, BCS has engaged the entire university community in its outreach efforts, including faculty, staff, students, and alumni – all of whom play a critical role in enhancing economic development across Iowa. Client interaction made a solid rebound from FY20 and the pandemic challenges with a nearly 10 percent increase in unique clients served.

Specific areas of service offered by UNI BCS include: entrepreneurship, community and economic development, market research, environmental research and sustainability, metal casting, and additive manufacturing.

Some exceptional recognition and milestones in the past year include:

- James Hoelscher, Institute for Decision Making (IDM) senior program manager, served as the president of Professional Developers of Iowa (PDI), which is the professional association of more than 350 economic developers across Iowa. He is the fourth member of the IDM team to be elected PDI president.
- Drew Conrad, Institute for Decision Making (IDM) director, was awarded the Iowa Association of Business and Industry (ABI) Foundation’s annual Leadership for Iowa Award. The award honors a distinguished alumnus of the organization’s Leadership Iowa program who exemplifies outstanding leadership in his/her respective community and for the state of Iowa.
- Laurie Watje, Associate Director of the John Pappajohn Center, received the Regents Award for Staff Excellence.
- Dan Nickey, Associate Director of the Iowa Waste Reduction Center, was named to the Governor’s Carbon Sequestration Task Force Workgroup as well as Vice-Chair of the Iowa Energy Center Board of Directors
- Jennifer Trent, Program Manager at the IWRC, was elected to the United States Composting Council Board of Directors, the Executive Committee as Secretary, and the Chapter Advisory Committee as Chair
- UNI student entrepreneurs Rob Sales, RNS Foods, won the Global Student Entrepreneur Award for the Midwest Region, and Maddie Palmersheim, Virgo, was one of 25 national finalists in the Schultz Entrepreneurship Challenge



Summary of BCS' key economic development program outcomes for FY2021:

Overall

- Provided service in all 99 counties to 3,505 unique business, community, and governmental entities and served an additional 73,538 unique visitors to MyEntre.Net/IASourceLink
- Reached more than 302,000 Iowans through BCS programs and projects
- Engaged 124 faculty members and 240 students in the direct delivery of BCS client services, and another 2,525 students were reached by BCS programs
- Leveraged each \$1 invested by the state with \$5 in private grants, fees, or federal funding

Summarized Impacts on the Iowa Economy

- The Institute for Decision Making and the Additive Manufacturing Center led training programs related to Industry 4.0 in partnership with Iowa community colleges and CIRAS
- The Institute for Decision Making and Strategic Marketing Services conducted 3 Covid impact surveys and 70 individualized reports were provided to business associations and economic development regions across Iowa. The data was used by the Iowa Economic Development Authority to develop and deliver targeted business and industry assistance
- Market intelligence assistance has been provided to 320 companies by Strategic Marketing Services
- The Family Business Program conducted a 5-part series of workshops for family business and 4 succession planning and value building sessions and facilitated 56 peer group meetings
- IASourceLink, a partnership with IEDA, has now reached 370,000 unique users
- Military bases and depots saved at least \$500,000 annually in painting and coating costs due to better transfer efficiency through painter training provided by the Iowa Waste Reduction Center

Entrepreneurship, Business Development and Incubation

- Increased participation of entrepreneurs in IASourceLink online resources, a joint program between UNI and the Iowa Economic Development Authority (IEDA), to 73,538 user sessions
- Supported 1,370 Iowa businesses, a record high, with market information by the Business Concierge team
- Provided assistance to 163 second-stage Iowa companies in 67 counties through Advance Iowa, creating 360 jobs
- Incubated 18 student businesses in the John Pappajohn Entrepreneurial Center's (JPEC) R.J. McElroy Student Business Incubator, and 23 additional students were affiliate tenants
- Attracted 15 new companies to the UNI incubators
- Assisted 7 faculty and staff in further pursuing the commercialization of their research and related IP through a new UNI Innovators Program
- Offered 3 virtual cohorts of the Early Founder Program with 33 student entrepreneurs
- Served 14 businesses through the new student consulting program called Panther Biz HQ
- Completed 23 business valuation projects for Iowa companies through the Succession Iowa program
- Conducted 56 peer group meetings with a focus on next generation ownership through Advance Iowa
- Partnered with the Millrace to provide assistance to 22 co-working companies



UNI Economic Development and Technology Transfer Annual Report – 2021

- Graduated 90 innovators from Center for Business Growth and Innovation (CBGI) incubators during the past decade
- Served 390 new clients through UNI's Small Business Development Center (SBDC)

Local Economic Development

- Assisted IEDA with the creation and analysis of 3 COVID-19-related business impact surveys and provided more than 70 local impact reports from the survey data
- Received expanded funding from the Economic Development Administration (EDA) University Center program to focus on additional business impact surveys and provide assistance with intrapreneurship and innovation for local developers
- Provided strategic planning and comprehensive technical assistance to 80 community partners and 8 additional regional groups across Iowa through IDM
- Partnered with the IEDA and Iowa utility companies for an analysis of statewide existing industry survey data
- Continued to assist with local development organizations that annually average creating approximately 1,500 jobs

Waste Reduction, Environmental Assistance, and the Bioeconomy

- Completed over 1,100 residential energy efficiency projects for Iowans through Green Iowa AmeriCorps
- Conducted nearly 600 environmental outreach projects that engaged 3,500 volunteers, and facilitated 625 educational programs for nearly 25,000 participants. Green Iowa AmeriCorps also engaged 120 members in service for professional, hands-on training and skill development
- Distributed 1,100 acres of native seed for 40 county roadsides as part of the Tallgrass Prairie Center's (TPC) roadside vegetation project and published an interactive map to showcase native roadsides
- Provided environmental technical assistance and on-site reviews through IWRC to 111 Iowa small businesses, conducted 8 food waste projects, and certified 30 Green Breweries across the state.
- Expanded CEEE's Local Foods Program impact to \$30 million worth of locally grown food products purchased by institutional buyers from hundreds of Iowa farmers
- Prepared a National Hydrography Dataset for the Iowa Department of Natural Resources and published 300 images of Iowa state parks through the GeoTREE Center
- Provided recycling and reuse project funding and outreach services to 5 companies and 10 organizations through the Recycling Reuse Technology Transfer Center (RRTTC)

Advanced Manufacturing and Market Research

- Delivered painter training to 196 painters within all military branches at the Iowa Waste Reduction Center's (IWRC's) painting facility and at 4 satellite facilities
- Provided market research and competitive intelligence to 14 Iowa companies and organizations by Strategic Marketing Services (SMS)
- Served 52 Iowa foundries and supply chain companies with custom 3D sand-cast core and mold printing services through the Additive Manufacturing Center
- Hosted nearly 1,000 visitors to demonstrate additive manufacturing at the Additive Manufacturing Center
- Assisted all branches of the military with applied research for the manufacturing of cast parts
- Provided technical assistance and materials training to 15 companies across Iowa by the Material Innovation Service



Section 2. Technology Transfer and Intellectual Property

FY2021

	UNI
Number of disclosures of intellectual property	11
Number of patent applications filed	2
Number of patents awarded	1
Number of license and option agreements executed on institutional intellectual property	2
Number of license and option agreements yielding income	12
Revenue to Iowa companies as a result of licensed technologies	\$4,100,000
Number of start-up companies formed, in total and in Iowa	107
Number of companies in research parks and incubators	19
Number of <u>new</u> companies in research parks and incubators	15
Number of employees in companies in research parks and incubators	47
Royalties/license fee income	\$63,405
Total sponsored funding *Includes HEERF (COVID Relief)	\$72,363,000
Corporate-sponsored funding for research and economic development and revenue generation (excludes corporate philanthropy - all in Iowa)	\$1,181,000
i. Annual appropriations for economic development	\$1,460,740
ii. Regents Innovation Fund	\$900,000

Section 3. Overview of UNI’s Economic Development Programs

UNI outreach services for community and economic development activities are outlined in a table format on the following seven pages. The format provides a brief overview of each program, its purpose, those served, outcomes for the past year, and some aggregate outcomes as well. Together, the programs served 3,505 unique businesses and organizations in the past year and another 73,538 individuals through the IASourceLink.com entrepreneurial development system and the Business Concierge.



Section 3. Overview of UNI’s Economic Development Programs

Programs	Services	Those Typically Served	FY 2021 Results (listed)	Cumulative Results
Advance Iowa (AI)	Rural/Urban Consulting program focused small-and medium-sized existing business providing succession planning, strategic planning, business consulting, training, peer round tables	Small, medium enterprises	<ul style="list-style-type: none"> ✓ 163 companies assisted ✓ 4 seminars on Succession Planning & Value Building ✓ 5 Part series for family-owned companies ✓ 56 Peer Group Meetings ✓ 3 Seminars on Family Business ✓ Service to clients in 67 counties 	<ul style="list-style-type: none"> ✓ Project work with 1,108 mid-sized companies across the state in all quadrants and industries.
Center for Business Growth & Innovation (CBGI)	Rural/Urban entrepreneurship development, online entrepreneurship resources, business consulting, business training, business incubation	Small-and medium-sized businesses, entrepreneurs, entrepreneurial service providers, community leaders	<ul style="list-style-type: none"> ✓ Succession Iowa – completed 23 client projects ✓ 7 Webinars – 2,455 attendees ✓ Business Concierge served 1,370 small businesses ✓ Panther Biz HQ served 22 businesses with marketing and public relations support ✓ IASourcelink was accessed by 73,538 unique visitors 	<ul style="list-style-type: none"> ✓ IASourcelink has reached 370,000 unique users since its launch in 2012. ✓ Engaged more than 560 entrepreneurs in the Dream Big Grow Here grant contest since 2010. ✓ Over 7,500 business intelligence requests have been completed since 2010. ✓ 90 companies have graduated from the CBGI and Innovation Incubators. ✓ More than 50,000 live and archived webinar views since 2003.



Section 3. Overview of UNI’s Economic Development Programs

Programs	Services	Those Typically Served	FY 2021 Results (listed)	Cumulative Results
<p>Small Business Development Center (SBDC)</p>	<p>Rural/Urban entrepreneurship development, online entrepreneurship resources, business consulting, business training</p>	<p>Small and medium sized businesses, entrepreneurs, entrepreneurial service providers, community leaders</p>	<ul style="list-style-type: none"> ✓ SBDC served 390 clients ✓ 860 counseling hours provided ✓ 13 new business starts ✓ \$5.1 million in capital infusion supported ✓ 148 jobs created 	<ul style="list-style-type: none"> ✓ Since 2016, the UNI SBDC has provided over 4,000 hours of counseling in their 9-county service area. ✓ Contributed to the start of 79 business. ✓ Supported the infusion of \$11 million in capital.
<p>Center for Energy and Environmental Education (CEEE)</p>	<p>Technical assistance, educational programs and leadership in residential energy efficiency and weatherization, environmental conservation and water quality testing and mitigation, food insecurity, and sustainability efforts for k-12 school districts</p>	<p>Iowa residents, nonprofit organizations, teachers, students, school districts, city governments, utility providers, counties</p>	<ul style="list-style-type: none"> ✓ Secured grants to convene stakeholders across Iowa to develop a statewide plan to strengthen Iowa’s food system. ✓ Launched A Garden in Every Lot, involving AmeriCorps members in offering garden starter services to the underserved members of our metro area. ✓ Launched Sustainable Cities Program in Collaboration with multiple organizations to offer resilience/sustainability planning for small communities. 	<ul style="list-style-type: none"> ✓ Over the past 4 years, CEEE’s Environmental Health Program’s flagship project, Good Neighbor Iowa has helped 12,164 acres of turf be managed without pesticides, 210 parks across Iowa have pledged to manage their turf pesticide-free; 55 churches, 4 co-op groceries have gone pesticide-free. As a result, 19,271 children in 61 childcare centers and 40 schools were protected from exposure and 142,371 pounds of weed killers were not applied to Iowa’s watershed.



Section 3. Overview of UNI’s Economic Development Programs

Programs	Services	Those Typically Served	FY 2021 Results (listed)	Cumulative Results
<p>Geoinformatics Training, Research, Education and Extension Center (GeoTREE)</p>	<p>Geospatial technologies, education, research, and outreach activities for federal, state, local and tribal agencies</p>	<p>Federal, state, local, and tribal (FSLT) governmental agencies</p>	<ul style="list-style-type: none"> ✓ Developed processes and began conflation of National Hydrography Dataset in collaboration with Iowa DNR ✓ Updated Linn County GIS databases, solar radiation modeling for Linn County. ✓ Captured and published 300 images for DNR State Parks. ✓ Worked with UNI TPC under IDALS funding to develop virtual tour resources. 	<ul style="list-style-type: none"> ✓ Project work with hundreds of public agencies, academic groups/departments, and private companies. Development and delivery of many geospatial data and custom applications.
<p>Institute for Decision Making (IDM)</p>	<p>Hands-on community and economic development guidance and research</p>	<p>Economic development organizations, chambers of commerce, city councils, communities, utilities and others</p>	<ul style="list-style-type: none"> ✓ Assistance and research provided to 80 community organizations, 8 regional development groups, and 45 services. ✓ Partnered with the Iowa Economic Development Authority and Iowa utilities for an analysis of statewide existing industry survey data ✓ Assisted with the completion of a third statewide COVID-19 impact survey. ✓ Partnered in a statewide Industry 4.0 Partner Consortium. 	<ul style="list-style-type: none"> ✓ Served over 830 communities, counties and groups in all of Iowa’s counties to date ✓ Community clients report 1,500 – 2,000 new jobs annually as a result of IDM assistance ✓ Trained over 1,000 economic development professionals.



Section 3. Overview of UNI’s Economic Development Programs

Programs	Services	Those Typically Served	FY 2021 Results (listed)	Cumulative Results
Iowa Waste Reduction Center (IWRC)	Free, confidential, non-regulatory environmental and energy efficiency assistance for Iowa small businesses and public entities, food waste reduction assistance across Iowa, and industry training and education.	Small businesses throughout Iowa; food waste generators; military and industrial painters	<ul style="list-style-type: none"> ✓ Detailed one-on-one environmental assistance was provided to 111 Iowa small businesses, including 8 food waste reduction visits and 37 energy efficiency visits. ✓ Military painter training was conducted by IWRC staff at 4 satellite sites training 196 painters. 	<ul style="list-style-type: none"> ✓ Provided detailed assistance or on-site review to 6,340 Iowa small businesses. ✓ Certified 30 Iowa craft breweries. ✓ Provided 4,269 certifications to military painters and DoD contractors.
John Pappajohn Entrepreneurial Center (JPEC)	Research, entrepreneurship education, technology transfer, and capital investment programs	Students interested in entrepreneurship, UNI faculty and staff entrepreneurs, new ventures and rapidly growing small companies	<ul style="list-style-type: none"> ✓ 4,525 businesses and individuals were assisted through all JPEC programs ✓ 15 student business owners with 18 employees were provided dedicated office space and an additional 23 student business owners were provided business guidance. ✓ The JPEC staff offered three virtual cohorts of the Early Founder Accelerator Program to 33 students. 	<ul style="list-style-type: none"> ✓ The JPEC Student Business Incubator has provided space to more than 210 business owners since FY05 ✓ The Department of Marketing was renamed the Department of Marketing and Entrepreneurship. ✓ Since FY13, 3,006 College of Business Administration students have learned about and crafted an elevator pitch through presentations by JPEC instructors. ✓ Since FY13, 59 businesses and non-profits have had their projects completed by Entrepreneurial Strategy (MKTG 3586) students.



Section 3. Overview of UNI’s Economic Development Programs

Programs	Services	Those Typically Served	FY 2021 Results (listed)	Cumulative Results
<p>Metal Castings Center (MCC) and Additive Manufacturing Center (AMC)</p>	<p>Metal casting technologies, applied research, testing and training</p> <p>Additive manufacturing technology development and service to Iowa SME</p>	<p>Iowa casting users, foundries and foundry suppliers</p> <p>Iowa Small businesses including manufacturing and service organizations</p>	<ul style="list-style-type: none"> ✓ Iowa active contracts with 52 companies, provided outreach projects to 11 Iowa foundries and technical assistance to 50 additional foundries. ✓ Conducted DOD-sponsored research into front-line manufacturing of cast parts. Conducted projects in Manufacturing 4.0 technologies including real time process sensors and robotic manufacturing. 	<ul style="list-style-type: none"> ✓ More than 2,150 industry-funded projects have been completed to date and more than 100 clients assisted with additive manufacturing and cast metals technology.
<p>Materials Innovation Service (MIS)</p>	<p>Mechanical, physical and chemical tests of metals, polymers and cementitious materials</p>	<p>Serving Iowa manufacturers and suppliers</p>	<ul style="list-style-type: none"> ✓ Technical assistance and testing was provided to 15 companies across Iowa. 	<ul style="list-style-type: none"> ✓ Technical assistance or testing provided to approximately 200 companies with more than 2,100 hours of testing provided.
<p>Panther Initiative for Environmental Equity and Resilience (PIEER)</p>	<p>Environmental social justice awareness, education, outreach and research</p>	<p>Serving Iowans, especially those affected by environmental equity issues</p>	<ul style="list-style-type: none"> ✓ Outreach awareness and education related to environmental social justice to organizations in the Cedar Valley. 	<ul style="list-style-type: none"> ✓ Outreach and educational awareness provided to 5 organizations and more than 800 individuals this year, including community, UNI and governmental organizations.



Section 3. Overview of UNI’s Economic Development Programs

Programs	Services	Those Typically Served	FY 2021 Results (listed)	Cumulative Results
<p>Recycling and Reuse Technology Transfer Center (RRTTC)</p>	<p>Recycling and by-products research, education and outreach</p>	<p>Serving Iowa businesses, the recycling industry and Iowa citizens.</p>	<ul style="list-style-type: none"> ✓ Research project funding and outreach services related to recycling and reuse was provided to 5 companies and organizations. 	<ul style="list-style-type: none"> ✓ Over 42 RRTTC funded research projects Over 170 reports and publications available. ✓ Outreach and services provided to more than 7,800 individuals, including business/industry, K-12 students, teachers, and Iowa citizens.
<p>Strategic Marketing Services (SMS)</p>	<p>Market research and analysis</p>	<p>Businesses, entrepreneurs and non-profit organizations</p>	<ul style="list-style-type: none"> ✓ Market research and analysis services were provided to 14 Iowa organizations. ✓ Assisted the United Ways of Iowa in assessing the statewide impact of COVID-19. ✓ Assisted the Iowa Economic Development Authority in assessing the impact of COVID. 	<ul style="list-style-type: none"> ✓ Since 1990, market research and analysis services have been provided to 321 Iowa companies, many multiple times.



Section 3. Overview of UNI’s Economic Development Programs

Programs	Services	Those Typically Served	FY 2021 Results (listed)	Cumulative Results
Tallgrass Prairie Center (TPC)	Coordination and assistance for county roadside managers, farmers and agricultural conservation professionals; stewardship of source-identified foundation seed for native seed industry; educational materials on the tallgrass prairie ecosystem for educators	Iowa county governments, state DOT, USDA-NRCS, commercial native seed producers, county conservation boards, K-12 science educators and students.	<ul style="list-style-type: none"> ✓ Distributed >1100 acres-worth of native seed for 40 county roadsides. ✓ Hosted 4 Green Iowa AmeriCorps, employed 3 program assistants and trained 4 undergraduate researchers and two MS students. ✓ Produced Iowa-source foundation seed from over 30 ecotypes. ✓ Planted 15 acres of the 77-acre Irvine Prairie for benefit of students and surrounding communities. 	<ul style="list-style-type: none"> ✓ More than 50,000 acres of Iowa counties rights-of-way have been planted to native vegetation. ✓ 47 Iowa counties use ecologically integrated management on ~315,000 acres of public roadsides. ✓ Public and private land managers have access to 85 species of genetically diverse, source-identified seed, including grasses, sedges, and many species of wildflowers. ✓ 107 UNI students and recent graduates have gained hands-on practical experiences as TPC employees, and/or specific training on prairie restoration, since 2002.



Section 4: Regents Innovation Funding Report

UNI's FY2021 Regents Innovation Funding (RIF) Annual Report (also known as the Skilled Worker and Job Creation Fund) is on file at the University of Northern Iowa and was submitted separately. Projects and outcomes partially supported by the RIF are included in this annual report.

Section 5: Collaborative Projects

Each year, UNI works closely with the other Regent institutions and state, federal and local agencies on collaborative projects. The following projects represent a sampling of these collaborative projects.

Center for Business Growth and Innovation (CBGI) and Advance Iowa Partnerships Key to Success

- UNI's Business Concierge service provided information and business assistance to 1,370 direct business owners. IASourceLink: The IASourceLink program continues as a strong partnership between UNI and the Iowa Economic Development Authority. The program collaborated with the following regional, state, and local partners: Iowa Department of Revenue, Iowa Commission on the Status of Women, Iowa BioTech Connect, New Bohemian Innovation Collaborative (NewBoCo), Technology Association of Iowa, Pappajohn Entrepreneurial Center(s), Iowa Waste Reduction Center, SourceLink, U.S. Small Business Administration, Iowa Small Business Development Centers, Iowa Farm Bureau/Renew Rural Iowa, Iowa Area Development Group, Iowa Association of Business and Industry, BizStarts, Entrepreneurial Development Center (EDC), Main Street Iowa and more.
- CBGI hosted a Venture School cohort with the University of Iowa John Pappajohn Entrepreneurial Center. The seven-week course is focused on helping new companies find their value and scale. Community members and CBGI/UNI JPEC staff served as mentors for the teams. Twenty-two teams went through the cohort in FY21 in partnership with the Black Business Entrepreneurship Accelerator in Waterloo.
- CBGI/Advance Iowa collaborated with UNI Business Faculty, Brett Olsen to continue to grow the Succession Iowa program, assisting small and medium sized firms with valuation. CBGI staff and students worked with Professor Olsen to launch Succession Iowa and complete 23 business valuations during our first full year of operation.
- The UNI Advance Iowa program has collaborated with the Iowa Rural Development Council to represent the voice of closely held small businesses across the state. This includes a focus on succession planning and the immediacy of this issue from an economic development standpoint.
- The UNI Small Business Development Center and CBGI directors served as an instructors for the 24/7 BLAC Black Business Entrepreneurship Accelerator Venture School Spring Cohort. Eleven Black-owned small businesses participated in the program.



Center for Energy and Environmental Education (CEEE) Collaborated on projects with ISU and UI.

- CEEE collaborated with the Iowa Commission on Volunteer Service to host a significant AmeriCorps Program with more than 120 service members serving many Iowa communities, school districts and municipalities.
- CEEE and ISU Extension are working closely together on local food initiatives in Region 9 Extension, which includes Black Hawk and surrounding counties. UNI and ISU Extension have jointly funded a local food coordinator to expand local markets for local agricultural products among institutional buyers, and make locally grown foods visible to the residents of the region.
- CEEE works collaboratively with various faculty in the University of Iowa College of Public Health and environmental engineering to improve environmental health in Iowa.
- The Black Hawk County Health Department partnered with the CEEE to complete the Black Hawk County Community Food Assessment (CFA) with the directive of ensuring that the assessment looks at the entire food system to see how the region's food system measures up to being fair, sustainable, and racially equitable while addressing the priority issues of obesity and poverty.

The Geoinformatics Training Research Education and Extension (GeoTREE) Center partnered with state agencies, education entities, and local governments across Iowa

- GeoTREE updated the Iowa contribution for the National Hydrography Dataset in collaboration with the Iowa Department of Natural Resources.
- GeoTREE developed a web mapping application in collaboration with the UNI Institute for Decision Making, Strategic Marketing Services, and Iowa Economic Development Authority for a project related to COVID-19 impact on Iowa businesses.
- GeoTREE developed dynamic mapping and visualization resources for the UNI Tallgrass Prairie Center Prairie on Farms and Iowa Roadside Management Program as part of an IDALS funded project.

Institute for Decision Making (IDM) and Strategic Marketing Services (SMS) Collaborates with Iowa Economic Development Authority, Iowa Finance Authority, Iowa Workforce Development, Iowa utilities, local economic development organizations, and statewide associations

- IDM, in partnership with Strategic Marketing Services (SMS), assisted the Iowa Economic Development Authority (IEDA) and Iowa Finance Authority (IFA) with the development, implementation and analysis of two statewide COVID-19 business impact surveys. Survey 1 had nearly 14,000 respondents and Survey 2 had over 9,600 respondents. Collaborators included the Professional Developers of Iowa, the Iowa Restaurant Association, Iowa Association of Business and Industry, Iowa Business Council, Iowa Council of Foundations, United Ways of Iowa, Iowa Small Business Development network, Iowa Department of Education, and Iowa Workforce Development. Seventy summary reports were prepared for economic development organizations using data from Survey 1.



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- IDM, in partnership with Strategic Marketing Services (SMS), continued to assist the BEST of Iowa Management Team (Iowa Economic Development Authority, MidAmerican Energy, Black Hills Energy, Alliant Energy and the Iowa Area Development Group) analyze data from interviews completed with Iowa companies, which are in one of the 12 distinct industry clusters driving Iowa's economy or were identified as major employers by the BEST of Iowa Management Team. The interview data was collected by economic development organizations across Iowa. The findings were used in evaluating and revising the economic development assistance provided to Iowa companies by the state of Iowa, the utility companies and economic development organizations around Iowa.
- IDM continues to assist Iowa Workforce Development (IWD) with the implementation of laborshed surveys across Iowa that are utilized by economic development organizations in their work with existing businesses and prospective businesses that are considering an Iowa location. In partnership with the UNI Mathematics Department, IDM assisted IWD with updating the statistical model used to produce workforce estimates for laborshed areas and tested the feasibility of enhancements to the model. IDM also provided IWD technical assistance as they implemented a statewide surveying process that was being funded by IWD and the Iowa Economic Development Authority.

Iowa Waste Reduction Center (IWRC) Collaborates with State and National Partners

- The IWRC has partnered with the Iowa Recycling Association, the United States Composting Council (USCC), public sector organizations, and private industry to begin the process of bringing a state chapter of the USCC to Iowa.
- The Iowa Waste Reduction Center has collaborated with economists from UNI and Arizona State University, as well as the Iowa Brewer's Guild to continue a multi-year research project focusing on sustainability in craft brewing as part of the Green Brewery project.
- The IWRC has partnered with four DoD facilities to operate as satellite locations for the STAR4D painter certification course. Instructors from US Marine Corps US Army sites trained 196 painters.
- The IWRC collaborated with the Iowa Department of Natural Resources and the United States Environmental Protection Agency through the Strategic Goals Program to plan and produce three webinars providing pollution prevention and environmental assistance to Iowa businesses.

John Pappajohn Entrepreneurial Center (JPEC) Collaborations

- JPEC partnered with the University of Iowa to provide Venture School programming to the first all-black accelerator program launched in the state of Iowa. The Black Business Entrepreneurship Accelerator is a program of the non-profit, 24/7 Black Leadership Advancement Consortium. This initiative is an intentional and direct approach to address disparities highlighted by the 24/7 Wall Street Report (the 2018 report designated Waterloo/Cedar Falls as the worst place in the United States for African-Americans in terms of social and economic disparities. Twelve business owners participated in the fall cohort and 11 business owners participated in the spring cohort.



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- JPEC and CBGI partnered with the Cedar Valley CAPS program to create a virtual, two-day team building workshop to kick-off the CAPS program for both the fall semester and spring semester and assist 118 students from the Cedar Valley region with the Business Solutions strand.
- JPEC partnered with UNI's International Recruitment and Admissions Department and EdPrograms to present the Panther Cage Challenge to 55 Pakistani High School students who worked with UNI student entrepreneurs to develop their business pitch.
- JPEC provided coaching and pitch feedback to students participating in the Pi515 summer course. Pi515 is a non-profit located in Des Moines that empowers refugee and underserved youth by teaching coding, innovation, entrepreneurship and critical thinking skills.

Recycling and Reuse Technology Transfer Center (RRTTC) and Panther Initiative for Environmental Equity and Resilience (PIEER) Collaborates with regional organizations

- RRTTC continued for the second year to collaborate with UNI Study Abroad and with the Universidad Latina de Costa Rica. Ulatina students traveled to Iowa to participate in an English Language and Sustainability Immersion Program. Immediately following this experience, U.S. students traveled to Costa Rica to complete a Capstone course.
- The RRTTC worked with Cedar Falls High School and the school's Environmental Awareness Team to provide guidance to improve the recycling options throughout the school. The RRTTC was able to assist with providing 30 recycling containers to the school and helped the students with proper signage and education on collecting data to gather for future use in other programs.

Strategic Marketing Services (SMS) Partners with Iowa Organizations

- Meals from the Heartland was considering expansion options but wanted to identify which of their preferred locations would offer the best chance for community acceptance and success. SMS assisted Meals from the Heartland with secondary research to evaluate demographic factors favorable to charitable sponsorship and volunteering among four geographic areas: Cedar Rapids/Iowa City, Sioux Falls, Omaha and Kansas City.
- UNI's RRTTC developed a Green Business Practices survey to determine knowledge of and interest in green business practices among Iowa businesses. SMS assisted in streamlining, simplifying, and adjusting the survey to improve user experience. Additionally, SMS helped identify and build a list of businesses/contacts in the industries and locations specified by the RRTTC and qualified and recruited businesses/contacts to take the online survey.

Tallgrass Prairie Center (TPC) Partners with State Agencies and Statewide Organizations

- The TPC continued collaborating closely with the Iowa State University STRIPS team and the Iowa Nutrient Research Center. The TPC director is on the Leadership Team for STRIPS along with leaders from ISU-Agronomy, ISU-Entomology, ISU-Natural Resources Ecology and Management, and US Fish and Wildlife Service. The TPC shared results of its research and collaborate on field days, seminars and grant proposals.



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- The TPC collaborated with Practical Farmers of Iowa in hosting the first ever online course, “Botany Beginners” which eventually attracted over 570 participants from Iowa and 14 other states. The course included 6 webinars by various TPC staff, as well as 4 virtual field tours (2 conducted by TPC and 2 by PFI). The associated Facebook page has 438 members.
- TPC’s Prairie on Farms Program partnered with the Iowa Economic Development Authority (IEDA) on a Resilience Competition block grant. Additional partners with this grant include the University of Iowa, Iowa State University Outreach and Extension, Iowa Department of Natural Resources and the Iowa Flood Center. As a partner, the TPC works to assist Watershed Coordinators in 8 designated priority watersheds across the state of Iowa to reduce flood risk and improve water quality. The TPC assists county US Department of Agriculture Natural Resources Conservation Service offices and watershed coordinators in 8 watersheds across Iowa to provide tailored technical guidance on prairie restoration.
- The Restoration and Research Program collaborates with Iowa State University’s Iowa Nutrient Research Center, which is funding seed mix design research for nutrient reduction. The USDA Farm Services Agency supports research into cost-effective seed mix design for the Conservation Reserve Program, as well as evaluation of CRP pollinator habitat and study of the native seed supply chain.
- The Plant Materials Program hosted the second Native Seed Stakeholders workshop, inviting panelists and workshop leaders from Natural Resource Conservation Service, Allendan Seed Company, Iowa Department of Transportation, Wisconsin Crop Improvement Association, and many other entities involved in testing, growing or buying native seed. The program also collaborated with the USDA-ARS Plant Introduction Station in Ames, Iowa, on collection and stewardship of genetic diversity.
- Iowa Roadside Management coordinated with the Iowa DOT in the administration of a grant from the Federal Highways Administration that provided enough seed to plant over 1,000 acres of county roadsides in Iowa with native plants and coordinated with the Marion County roadside manager and Iowa DOT Living Roadway Trust Fund to plan and implement the 33rd annual roadside conference.

Metal Casting Center (MCC) and Additive Manufacturing Center (AMC) Collaborates with UI, ISU, Iowa Community Colleges and other educational institutions

- The MCC collaborated with the University of Iowa Mechanical Engineering and Art departments on several projects, the largest of which involves the Defense Logistics Agency and Steel Founders Society of America integrating additive manufacturing into their operations and supply chain. The UNI MCC is providing melting and pouring of cast steel for projects involving counter gravity casting, low turbulence gating system development as well as thermos physical property measurement for casting process simulation.
- The AMC is collaborating with Industrial Engineering faculty at Iowa State University on federally funded projects to evaluate and digitally record surface finishes on cast metal components. The work involves both digital capture of surface finish with future planned collaboration in robotic finishing of castings utilizing UNI robotic resources.
- The MCC has collaborated with Northeast Iowa Community College on a federally funded project to develop training materials for additive manufacturing.



Regents Innovation Fund Annual Report – FY21

University of Northern Iowa

For the past ten years, the University of Northern Iowa has received Regents Innovation Funds (now termed the Skilled Worker and Job Creation Fund) from the Iowa Legislature through the Joint Economic Development Appropriations Subcommittee. This funding is allocated to each of the three Regent institutions for projects to support business development, entrepreneurship, and innovation activities outlined in Iowa Code section 262B. UNI's projects focus on four primary areas: 1) Technology Transfer, Business Incubation, and Additive Manufacturing, 2) Entrepreneurship Outreach and Business Growth, 3) Regional Development, and 4) Competitive and Market Intelligence. This report outlines the programming and highlights results and projects in each of the four areas.

Project 1: Technology Transfer, Business Incubation, and Additive Manufacturing

Description of the project

Technology transfer efforts focus on assisting faculty and staff with disclosures and due diligence. UNI averages 10-12 intellectual property disclosures annually and two-to-three patent applications. Another strategy that has worked well for faculty and staff inventors is joint development agreements with the private sector. UNI will also continue the collaboration with the Iowa State University Research Foundation to help evaluate and commercialize intellectual property.

UNI has two successful business incubation programs to support community entrepreneurs, faculty spinoffs, and student entrepreneurs. The incubators and support facilities offer a physical link between the Iowa business community, campus innovators, and faculty researchers to support business growth. The 8120 Spark Zone is a hub facility on campus, coalescing University research and community entrepreneurs with quality business services to support incubation and growth. The R.J. McElroy Student Business Incubator is a part of the John Pappajohn Entrepreneurial Center and provides a physical location for student entrepreneurs to launch and grow their ventures.

The Additive Manufacturing Center (AMC) remains focused on Foundry 4.0 initiatives and supporting Iowa's Manufacturing 4.0 plan. Some specific areas of progress have been the installation of an automated investment casting shelling line, the integration of sensors and big data in the casting process (IoT), automation and robotics, and investment casting. Expanded engagement is planned with Youngstown State and the National Center for Defense Manufacturing and Machining (NDCMM) to provide support for the Department or Defense casting supply chain.



What results have been achieved in the past year?

UNI's incubators housed 18 businesses in the past year and 15 of these companies were new startups. In total, these companies have grown to 47 employees. Student entrepreneurs participated in three separate sessions of the Early Founder program, which resulted in increased participation in the Student Business Incubator. Of the students graduating from the incubator with a business, approximately three out of four remain in business or have become involved in a subsequent venture. UNI's incubation efforts also collaborated with Red Cedar to assist 22 additional companies in the Millrace Coworking space in Cedar Falls. An additional 107 companies were launched with UNI assistance. In the past decade, 90 community-based entrepreneurs have graduated from UNI incubators and into the regional economy.

Technology transfer efforts were impactful despite the challenges of COVID-19. An additional 11 disclosures were received and three demonstrate commercial potential and are moving forward. Approximately \$4.1 million in revenue was generated by small businesses and entrepreneurs using UNI technologies. Three late-stage faculty research projects were assisted with research grants for projects that demonstrate commercial potential, two joint development agreements were initiated, and there were two additional UNI intellectual properties that were licensed and are actively being offered to the market.

Additive manufacturing expanded this past year with additional equipment purchases and installation. Applied research in refractory materials was conducted for ceramic sands and with 3D printer manufacturers. The AMC is working with CESMII, The Smart Manufacturing Institute, to share progress in embedded IoT sensors for the metal casting process. UNI has been asked to become a satellite center for the CESMII organization. Faculty in the Department of Technology are also working towards this effort.

As visitors returned to the AMC, an open house was held in conjunction with Stratysis and 125 persons attended from area manufacturers and foundries. For the year, approximately 1,000 visitors were hosted at the AMC. Collaborations with other universities continues within Iowa by sharing facilities and expertise in additive manufacturing and metal casting. The AMC is also collaborating with universities outside Iowa including Youngstown State and Texas El Paso, combining joint expertise with specialties in computer data acquisition and wireless communication technologies.

Examples of projects

The Early Founders student entrepreneurship program in the John Pappajohn Entrepreneurial Center was conducted in the summer of 2020, winter break 2020-21 and early summer of 2021. The program continued its virtual format due to COVID-19 with 14 students participating in the summer cohort, 11 in the winter cohort and an additional 10 in the recent summer cohort. Most of the student businesses that have not graduated are now tenants in the R.J. McElroy Student Business Incubator. The Early Founders program is receiving additional private donor support and will be expanded.



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The AMC reorganized to place emphasis on Manufacturing 4.0 technologies, with a focus on sensors, IoT, automation, and additive manufacturing. Progress was made toward a fully automated investment casting shelling line. The AMC conducted applied research in refractory materials and ongoing research in wax and ceramics for additive manufacturing. Additional investigations were conducted with the American Foundry Association and include surface finish improvements through post processing methodologies. The AMC continued to support the defense industry supply chain in Iowa by providing engineering assistance and new and emerging manufacturing technologies.

Plans for next year

Plans for FY2022 include finalizing installation and demonstration of the burnout furnace for the automated investment casting shelling system along with robotic integration of a high temperature post-processing furnace. The system is scheduled to be operational by September 2021. The Investment Casting Institute will hold its annual meeting in conjunction with a tour of the newly automated shelling system. The AMC has received a new binderjet printer that will be used to support the research into direct printing of investment casting shells. A third large industrial beta-level sand printer will be installed and prepared for commercialization. The printer has been designed collaboratively by the company and the AMC and represents a significant improvement in speed from existing technology. The AMC will continue work on addressing industry needs for support and guidance in Manufacturing 4.0 technologies and shift emphasis to becoming a Foundry 4.0 Center.

Intellectual property workshops will be expanded to educate faculty, staff, and graduate students about the resources and assistance that is available to further develop technologies and ready them for commercialization. Innovator workshops will be continued for faculty and staff innovators to expand emphasis on commercialization. The Intellectual Property Team will work to grow the program from four participants and tailor the program to meet the unique needs of UNI.

Substantial reorganization of innovation programs has begun and will allow for more emphasis in innovation in the industrial sector and with the defense sector. Incubation services and space will expand to create an environment for more collaboration and spinoffs. Business transition will also be a priority and new partnerships are being formed to explore alternative types of business structures, including business coops.

Project 2: Entrepreneurship Outreach and Business Growth

Description of the project

UNI Entrepreneurship Outreach and Business Development programs focus on serving small-to medium-size enterprises through the Advance Iowa program. This is a statewide program in the CBGI, which has created new programming to fill gaps in the small- and medium-size



business ecosystem. The CBGI is the producer and manager of resources found at IASourcelink.com, which is an online resource guide for entrepreneurs. Other direct services offered alongside the IASourcelink program include the Business Concierge, which supports small businesses with their specific questions and research related to business growth. Student teams are engaged in helping small companies improve their digital presence through Panther Biz HQ.

The CBGI also works with family-owned businesses to improve their family governance and assist with generation transition of ownership. Additional services are helping to plan and prepare for the successful transition of business ownership and to provide leadership development services to prepare the next generation of business owners. Services are also offered to improve existing business operations and to help introduce innovation into the core strategy of our client companies.

What results have been achieved in the past year?

IASourceLink serves many businesses each year with direct assistance. A Chat Box was added to the site this past year and resulted in approximately 100 active chats each month. The success resulted in the need to add another program associate to the program. Overall, more than 73,000 people accessed the site to find Iowa business resources. CBGI partnered with the Iowa Department of Revenue to host seven webinars on IASourceLink with more than 2,200 attendees. The Business Concierge directly served 1,370 Iowa small businesses and service providers. Panther Biz HQ continued to engage students and they worked closely with 22 Iowa companies to improve their online marketing and brand presence. During FY21, 163 Advance Iowa clients were served in 67 Iowa counties. Since the program's creation, Advance Iowa has served 1,108 businesses in Iowa. In FY21, Advance Iowa continued the UNI Family Business Forum, hosting six breakfast series events in the fall of 2020 and spring 2021. This breakfast series was attended by 371 people representing 57 family businesses.

Examples of projects

According to an article by Astrachan and Shanker, titled "Family Business Contribution to the US Economy," family businesses generate more than 60 percent of US GDP and 75 percent of private sector jobs. These businesses are often the economic engine for rural communities across Iowa, providing employment, identity, and philanthropic resources to many places that Iowans call home. The UNI Family Business Forum returned for a third year, but moved to a virtual format due to COVID-19. The change to virtual resulted in an increased participation and more geographic diversity. The Family Business Program also expanded the Next-Gen Peer groups and started a Legacy Peer Group.

Through web form integrations and website automation, the IASourceLink team were able to grow direct connections with Iowa businesses through the Business Concierge by more than 50 percent, reaching an all-time high of 1,370 business interactions. Additionally, self-directed



guides were created that allowed more than 300 people to get immediate assistance they needed to start their business.

Plans for next year

Advance Iowa is making business ownership transition a major focal point of programming for the coming year. Recognizing that for many rural businesses, the prospective new ownership will come from within the organization or community, Advance Iowa is partnering with private sector service providers, private foundations, and state agencies to provide support to transition many of these operations to an employee owned model. An estimated 200 participants from 50 distinct geographical communities will participate in various work sessions aimed at educating current and future business leaders in employee ownership.

IASourceLink, the Iowa Business Concierge, and the Panther Biz HQ will all be expanded to further reach across Iowa. These programs will continue to integrate the student experience with small business support programs and will provide high-end services remotely.

Project 3: Regional Development

Description of the project

The Institute for Decision Making (IDM) continues implementation of the EDA University Center's Business Retention and Expansion through Innovation (BREI) project focusing on helping businesses enhance their innovation and helping economic development organizations (EDOs) enhance their BRE programming. This past fiscal year's project has had a particular focus on building awareness of Industry 4.0/Manufacturing 4.0 among EDOs and community leaders and IDM is a partner in the statewide Industry 4.0 Partner Consortium that was organized by Iowa's community colleges, and the Iowa State University's Center for Industrial Research and Service (CIRAS).

Moving forward, IDM will continue to assist local economic development organizations (EDOs) as they incorporate new discovery processes and protocols into their traditional BRE efforts, elevate their understanding of Industry 4.0/Manufacturing 4.0, and serve as catalysts for businesses utilizing technology for internal product development, process enhancement, and commercialization. Additionally, IDM will continue to facilitate an Intrapreneurship Resource Network (IRN) of service providers designed to enhance collaboration among the participants.

With the ongoing impacts of the COVID-19 pandemic, IDM led efforts to complete the third statewide business impact survey, which included a statewide report for the Iowa Economic Development Authority/Iowa Finance Authority (IEDA/IFA), a statewide report on nonprofits, and a statewide report on rural respondents for the Empower Rural Iowa Task Group and the Iowa Rural Development Council. IDM will conduct a fourth statewide business impact survey



during the next fiscal year, develop additional statewide and local survey data reports, and share best practices for assisting impacted businesses through the recovery process.

IDM continued to assist the Business Expansion and Strategic Trends (BEST) of Iowa program in adjusting the statewide implementation of BRE programming due to the COVID-19 pandemic. Efforts included revising the interview questions and processes used by local EDOs. IDM will continue to assist the BEST Management Team and EDOs with implementing the new interview questions and processes. IDM will assist with developing a statewide report documenting the existing industry interview results. IDM will also assist with updating the BEST of Iowa Local Reporting Template tool for local EDO's to utilize in comparing their existing industry data with statewide data.

Additionally, IDM continues to assist the Governor's Empower Rural Iowa and the Iowa Rural Development Council with regional and statewide rural development programming. IDM will also continue to assist the Iowa Department of Education, Iowa Workforce Development, and the Sector Partnership Leadership Council to support the regional sector partnerships around the state. IDM will continue supporting regional industry targeting, marketing, organizational management, and planning efforts as requested.

What results have been achieved in the past year?

During the past fiscal year, IDM continued implementation of the University Center's BREI project; with a particular focus on assisting EDOs, community leaders and service providers elevate their awareness of Industry 4.0/Manufacturing 4.0. IDM developed and delivered a series of Industry 4.0 trainings for local EDOs, regional economic development groups, community college district leadership teams, and other service providers. IDM joined the statewide Industry 4.0 Partner Consortium that has been organized by Iowa's community colleges, and the Iowa State University's Center for Industrial Research and Service (CIRAS). The Consortium's creation has been spurred by IEDA's release of the report "Seizing the Manufacturing 4.0 Opportunity: A Strategic Plan for Iowa's Manufacturing Industry." Despite the challenges with the COVID-19 pandemic, IDM continued to assist local EDOs in implementing business interviews designed to identify opportunities to assist those businesses to enhance their innovation. IDM continued to work with service providers in the IRN to assist businesses to foster innovation and technology utilization, innovative practices, and research and development.

IDM continued to assist the Iowa Economic Development Authority/Iowa Finance Authority (IEDA/IFA) gather information from businesses related to the ongoing impacts of the COVID-19 pandemic. IDM led the completion of a third statewide survey and a statewide analysis and a report was completed for IEDA/IFA for the survey. A statewide report on the rural respondents was completed for the Empower Rural Iowa Task Group and the Iowa Rural Development Council, and a statewide report on nonprofit respondents was completed on behalf of the Iowa Council of Foundations. More than 30 local and regional reports were produced for EDOs,



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chambers of commerce, and all of the state's Small Business Development Centers. Additionally, IDM provided several statewide presentations organized by Main Street Iowa and the Iowa Council of Foundations.

Due to the COVID-19 pandemic, IDM assisted the BEST of Iowa in revising the interview questions and processes used by local EDOs in their BRE programming. IDM helped with the analysis of the statewide existing industry interview data and development of an Annual Report. IDM assisted in updating the BEST of Iowa Local Reporting Template tool used by EDOs to benchmark their community's and region's data with statewide data. IDM also assisted with developing and presenting a webinar for EDO's on how they could utilize and present their local existing industry data.

Examples of projects

IDM assisted IEDA/IFA in gathering information from Iowa businesses on the impact of the COVID-19 pandemic. The third statewide survey was completed in February and March 2021 with 6,457 businesses responding. Once again, IDM worked with IEDA/IFA staff and other statewide organizations to develop the survey instrument and to encourage businesses statewide to complete the surveys.

Several statewide reports were developed. The first was a statewide analysis and report for IEDA/IFA. A statewide analysis of rural respondents was completed for the Empower Rural Iowa Task Force and the Iowa Rural Development Council, and a statewide analysis and reports were completed for the nonprofit respondents on behalf of the Iowa Council of Foundations. More than 30 local and regional reports were produced following the first survey for EDOs, chambers of commerce, and for all of the state's Small Business Development Centers.

As part of its continued implementation of the University Center's BREI project, IDM identified a need among Iowa's economic developers to elevate their level of awareness of Industry 4.0/Manufacturing 4.0. IDM developed and piloted an Industry 4.0 training session with one of the economic development regions in Iowa. The training was well received and other economic development regions expressed an interest in the training. During this time, IDM was asked to join the statewide Industry 4.0 Partner Consortium that has been organized by Iowa's community colleges and the Iowa State University's Center for Industrial Research and Service (CIRAS). As a member of the Consortium, IDM is delivering a series of Industry 4.0 trainings for local EDOs, regional economic development groups, community college district leaderships and other service providers.

Plans for next year

IDM will continue to assist businesses and local EDOs through the University Center's BREI project in the Cedar Valley region, and continue its participation in the statewide Industry 4.0 Partner Consortium by continuing to deliver Industry 4.0 awareness training in regions around Iowa. IDM will also continue to facilitate the IRN of service providers. IDM will assist in



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launching a fourth statewide COVID impact survey and provide a statewide report to IEDA/IFA, a statewide rural respondents report, and a statewide nonprofit report. IDM will also continue to provide customized local reports for EDOs, the SBDC's, and others.

IDM will continue to assist the BEST of Iowa program and help the BEST Management Team and local EDOs implement the new interview/survey process. IDM will assist with the analysis of the statewide data and the development of the statewide report. IDM will help to update the Local Reporting Template tool for EDO's to utilize in comparing their existing industry data with statewide data. IDM will provide training for local EDOs focusing on how they can better utilize their BRE programming based upon the data produced through their company interviews.

IDM will continue to support the economic development regions as requested with regional targeting, marketing, organizational management, and planning efforts. IDM will work closing with the Governor's Empower Rural Iowa Taskforce and the Iowa Rural Development Council to develop and implement rural development programming to assist rural communities and regions. IDM will also continue to assist with the statewide workforce efforts and the regional sector partnerships in partnership with the Iowa Department of Education, Iowa Workforce Development, and the Sector Partnership Leadership Council.

Project 4: Competitive and Market Intelligence

Description of the project

Strategic Marketing Services (SMS) develops and manages a competitive and market intelligence program for small- to mid-sized Iowa companies and organizations. The purpose of devoting investments to competitive and market intelligence projects is to foster economic growth across Iowa by stimulating business expansion opportunities. Accurate information is needed to make sound market entry or expansion decisions. Gathering and analyzing information to make sound business decisions is what SMS provides. Established businesses are required to pay at least one-half of their project cost with a match from RIF funds. SMS has a goal of assisting a minimum of 12 Iowa companies per year with either advanced market research projects or tailored consulting services. Priority is given to businesses in the state's target industry clusters.

What results have been achieved in the past year?

The economic impact of the COVID-19 pandemic continued to affect demand for our services. However, SMS again worked with our BCS partners to assist Iowa organizations in understanding the impact of the pandemic in our state. An example of this is our repeat work with IDM in assisting the Iowa Economic Development Authority (IEDA) in studying what Iowa businesses and organizations have experienced during pandemic recovery and how they continue to handle related challenges. Nearly 6,500 Iowa businesses and organizations provided survey responses. Topics included impact on revenue and employment, supply chain



issues, operational concerns, and impact of received financial assistance. The IEDA has utilized the study findings to continue providing needed resources and assistance programs. Additionally, regional, county, and local reports have been provided to economic developers, community agencies, and local decision makers for use in strategy and policy planning.

During FY21, SMS completed five Iowa projects with eight organizations including the BEST of Iowa Management Team comprised of the following organizations: Mid-American Energy, Iowa Area Development Group, Alliant Energy, Black Hills Energy, and the IEDA. Other organizations were the United Ways of Iowa, Charles City Area Development Group, and the Cedar Valley Regional Partnership.

Additionally, SMS provided three consultations to Iowa-based organizations. They included the Iowa 4-H program, Grow Cedar Valley, and the Janesville Consolidated School District.

Examples of projects

SMS in collaboration with IDM once again assisted the BEST of Iowa Management Team (IEDA, MidAmerican Energy, Black Hills Energy, Alliant Energy, and the Iowa Area Development Group) with their annual business study. However, with the unique challenges created by the COVID-19 pandemic in 2020, IDM and SMS expanded their work with the BEST of Iowa team to develop a new set of interview questions and an online interview tool since the local employer interviews needed to be conducted virtually. In a span of three months, 813 Iowa companies from 76 different counties were interviewed with SMS and IDM providing oversight and troubleshooting challenges that arose. This program collects existing business data through interviews with local employers by local economic developers. The data collected helps economic development organizations and their partners identify such things as business expansion opportunities or potential issues that could lead to a business downsizing or closure in their community. The statewide data also helps to inform and shape Iowa's economic development programs and policies.

SMS in collaboration with IDM assisted the United Ways of Iowa in assessing the statewide impact of COVID-19 on the ALICE (Asset-Limited Income-Constrained Employed) population in Iowa to inform how to best support Iowa ALICE families throughout long-term recovery and beyond. A statewide online survey was developed and deployed by local/regional United Way partners. A total of 2,967 surveys were collected and utilized for analysis. Key survey topics included COVID-19 pandemic concerns, overall impact on household income, changes in employment and household finances, impact on households, childcare and education, and assess federal stimulus receipt and utilization of funds. The United Way of Iowa shared key findings and data with their local/regional partners with the aim of providing targeted assistance directly to their constituents.

SMS, in collaboration with IDM, assisted the Cedar Valley Regional Partnership (CVRP) in assessing current wage data for targeted industry sectors and occupations among employers in Black Hawk, Bremer, Buchanan, Butler, Chickasaw, and Grundy counties. Just over 100 regional



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businesses provided wage and benefit information. This study will help the Cedar Valley Regional Partnership and Grow Cedar Valley track wage and benefit data by occupation type and aid in attracting new talent to existing industry and prospective employers.

Plans for next year

SMS will continue to consult with, and provide market research services for, Iowa businesses, public/private partnerships, utilities, economic development organizations, non-profit organizations, statewide associations, and government entities as SMS leverages RIF dollars to strengthen Iowa's economy. As pandemic recovery continues, Iowa businesses and organizations will benefit from market intelligence. SMS will continue planning to assist a minimum of 12 Iowa companies with advanced market research project studies or tailored consulting services. Iowa businesses/organizations will be eligible at a minimum to receive a discount of up to 50 percent of the project cost, but not to exceed \$10,000.