

Contact: Rachel Boon

**REQUEST FOR NEW CENTER AT IOWA STATE UNIVERSITY:  
CENTER FOR WIRELESS, COMMUNITIES AND INNOVATION**

**Action Requested:** Consider approval of the request by Iowa State University for a new Center for Wireless, Communities and Innovation in the College of Engineering.

The Council of Provosts and Board office support approval of this request.

**Background:** Broadband has become an essential utility for rural communities and industries, and advanced wireless is expected to serve as a key-driver of future-generations of broadband technologies and services. It is now time to chart a future when advanced wireless becomes a key enabler for affordable, universal rural broadband, and key wireless technology breakthroughs are pioneered in the rural regions and replicated to the rest of the world. Wireless will become a key domain of rural innovation and community development while enabling application transformations in precision agriculture, rural education, advanced manufacturing, renewable energy, automated transportation, telehealth, community services, and many other applications. Leveraging the world's only rural wireless living lab ARA1, which is a \$16M externally funded research project in Central Iowa, and building upon ISU's strength in wireless and applications research, the Center for Wireless, Communities and Innovation (or WiCI Center in short) will help shape this future, to position Iowa State University and the state of Iowa at the forefront of rural wireless and broadband innovation. This will drive drive research, education, and innovation in advanced wireless and its applications in smart and connected rural regions, as well as providing economic and community development

**Need for proposed center.** The WiCI Center is motivated by the need for rural broadband services as well as the need for rural leadership in broadband innovation. Broadband is a foundation for next-generation rural industries such as precision agriculture, and it is essential for rural education as well as community services such as telehealth. Yet 39% of the rural US lacks broadband access, and most agricultural farms are not connected at all. In addition, broadband technologies continuously evolve at a fast pace, and it is important to make sure that rural communities play a leadership role in broadband innovation. This is so that optimal, rural-focused broadband technologies are developed based on the unique needs of rural communities and industries. Otherwise, given that innovators in urban regions such as Silicon Valley lack first-hand insight into rural needs and lack motivation to prioritize addressing rural broadband needs, rural regions would always lag behind in broadband services if they only tried to apply urban-focused broadband technologies to rural settings.

The WiCI Center is also inspired by the following opportunities that hold great potential of enabling Iowa to become a national leader in rural broadband technology innovation:

- Rural first in advanced wireless and application innovation: Iowa is a leader in many rural industries (e.g., agriculture, manufacturing and renewable energy) that represent high-priority application domains of advanced wireless (e.g., 5G and beyond). This leadership, together with the need for co-designing wireless systems and applications in early stages of advanced wireless innovation and the fact that many high-priority wireless applications (e.g., automated ground and aerial vehicles) are best tried first in rural regions before their urban pilots, well positions Iowa in leveraging the first-mover advantages to develop the wireless innovation capacity and community which help establish Iowa's long-term leadership in wireless and broadband innovation.

- The fast progress in wireless technology, increasingly more spectrum availability, and need for mobility support make wireless an integral element of future-generation rural broadband solutions.
- Telecom softwarization and innovation democratization: The mega trend of telecom softwarization is such that major innovations in future-generations of wireless and broadband solutions will be driven by innovations in software systems. The emergence of open-source/open-innovation telecom software platforms (e.g., open-source 5G software systems such as OpenAirInterface and SD-RAN) further reduces the barrier to innovation, so that innovators in Iowa can have access to the state-of-the-art innovation platforms to drive the evolution of advanced wireless and applications.
- The ISU-led ARA1 project is the only rural wireless living lab in the U.S. and the world, and it helps Iowa develop transformative programs for pushing the frontiers of wireless technologies and applications, as well as for building the Iowa-local innovation capacity and community.
- U.S. leadership in advanced wireless (e.g., 5G and beyond) has become a national priority, and there will be significant federal investment into wireless research and innovation, for instance, with the expected \$9B “5G for Rural America” FCC program.
- Establishing Iowa as a national leader in wireless and broadband innovations will also position Iowa to serve as a national growth center<sup>2</sup> to drive innovations in Iowa, Midwest, and beyond.

Activities and objectives of proposed center. To address the rural broadband challenge and to realize the vision of Iowa leadership in broadband technology innovation and associated economic and community development, the WiCI Center will pursue the following inter-related activities:

- Research in advanced wireless and its applications in precision agriculture, rural education, advanced manufacturing, renewable energy, automated transportation, telehealth, community services, among others;
- Innovation and entrepreneurship to translate research into real-world impact and to foster university-industry collaboration in research and innovation;
- Education and workforce development to create pipelines of students, researchers, and innovators in advanced wireless and applications and STEM in general;
- Community building and empowerment to create ecosystem partnerships and to lead integrative research, education, innovation, and economic and community development activities.

Relationship to mission and strategic plan. With its focus on integrative research, education, innovation, and community development in advanced wireless and applications, the WiCI Center contributes to ISU’s land-grant university mission, and it aligns with all of the ISU Grand Challenge Research Themes: 1) advancing data-driven discovery and secure cyber-systems, 2) creating next-generation materials and manufacturing technologies, 3) building sustainable human and natural ecosystems, 4) enabling healthy lives, and 5) developing global citizens and vibrant societies.

Relationship to other centers/institutes at the university. With a focus on both advanced wireless and its applications in various domains such as agriculture, transportation, rural education and community transformation, the WiCI Center will serve as a partner with many other ISU centers/institutes and help enable transformative initiatives that would be infeasible otherwise. For instance, the ARA wireless living lab, an inaugural initiative of the WiCI Center, will bring state-of-the-art wireless connectivity to all the ISU agricultural farms (crop, horticulture, and livestock) around Ames, enabling data-driven ag sciences and engineering that would be

infeasible otherwise. ARA will also enable transformative research, education, and innovation activities at the ISU Institute for Transportation (InTrans), Virtual Reality Research Center (VRAC), Electrical Power Research Center (EPRC), and Institute for Design Research and Outreach (IDRO).

Relationship to centers/institutes at other universities in Iowa and potential for collaboration. There is no existing center/institute at any other colleges and universities in Iowa that focus on the vision and mission of the WiCI Center.

The WiCI Center welcomes participation of colleagues from other institutions. In fact, one task of the WiCI Center is to establish a broad public-private partnership to drive the realization of the WiCI Center vision, and the partnership will engage colleagues from other colleges and universities in Iowa. For instance, the ARA1 project team has been in touch with colleagues from University of Iowa (Tom Schnell at the Operator Performance Laboratory, Octav Chipara in the Department of Computer Science) in exploring collaboration opportunities. The ISU Presidential Initiative TechTHRIVE has engaged with Hawkeye Community College.

Resources, facilities and equipment required. Besides faculty members, research staff, and students who will lead the research, education, and innovation initiatives, the WiCI Center will have the following personnel leading the center management and operations:

- Center Director: lead center strategies and overall management
- Program manager: manage various research, education, and innovation initiatives of the center, with a focus on finance, partnership, and project oversight
- Program assistant: assist center operations such as proposal submission and management, and administrative tasks
- A Leadership Team will also be established out of the Center faculty and staff members to lead the center execution.

To facilitate center activities, a shared space with offices and meeting rooms for the center faculty, staff, and student members will be invaluable. This WiCI Center space will also help establish the center identity and facilitate interactions with various external partners.

The following equipment will be helpful:

- Office computers and meeting room facilities (e.g., projector and screen).
- Research infrastructures such as the ARA wireless living lab. (ARA has already been funded through a \$16M investment from the National Science Foundation and USDA National Institute of Food and Agriculture.)

Expected funding sources. The WiCI Center is inspired by the ARA1 wireless living lab project, and the funding for the Center is in place for the first five years from the following sources:

- \$350K: seed investment from the ISU Office of the Vice President for Research
- \$450K: support from the ISU College of Engineering, College of Agriculture and Life Sciences, College of Human Sciences
- \$200K: support from PI sources (such as PI incentive accounts) who are participants in the ARA and related projects

Other projects led by Center faculty members will also support the early-stage Center operations. The center will be sustained using externally-funded resources, e.g. ICICLE, which is an National Science Foundation funded Artificial Intelligence Center grant, among other federally funded projects.

The WiCI Center is anticipated to attract significant external funding. Current funding, through the \$16M investment into the ARA1 project from the National Science Foundation (NSF) and USDA National Institute of Food and Agriculture (NIFA), will contribute to support for five years; we will leverage this five-year time window to develop the Center capacity in leading major national and regional initiatives, thus creating the pipeline of resources to sustain and grow the Center over time.

Center finances will be closely monitored and planned in a proactive manner, and Center expenditures will be adjusted accordingly. Leadership will use agile and lean approaches in managing the center, and any contingencies will be managed proactively. Sudden loss of external funds without months/years of advance warning signs is unlikely, and leadership will manage center expenditures and personnel accordingly.

Evaluation plan. Each spring, the WiCI's activities, metrics, progress and goals will be jointly reviewed by the Office of the Vice President for Research, College of Engineering, and other colleges of WiCI faculty members. The Director will be provided a written performance assessment based on that review. In addition, the Center will be reviewed in depth in its fifth year, and every seven years thereafter.

Date of implementation. Upon approval by the Board of Regents.