500 10th Street NW
Atlanta, Georgia 30332-0620
Phone: 404.385.4614
Fax: 404.385.0269

www.cacp.gatech.edu

Via E-mail: NIDILRRfuture@acl.hhs.gov

March 20, 2017

National Institute on Disability, Independent Living, and Rehabilitation Research
Administration for Community Living
U.S. Department of Health and Human Services
330 C Street SW, Room 1304
Washington, DC 20201

Re: National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR) Draft Long Range Plan, 2018-2023

Enclosed are comments submitted by the Rehabilitation Engineering Research Center for Wireless Inclusive Technologies (Wireless RERC) in response to NIDILRR's Call for Comments for its Draft Long Range Plan, 2018-2023. Should you have any questions concerning our comments, please do not hesitate to contact me via email at helena.mitchell@cacp.gatech.edu.

Respectfully submitted,

Helena Mitchell, Ph.D.
Principal Investigator, Wireless RERC
Executive Director, Center for Advanced Communications Policy
Georgia Institute of Technology
Enclosure

National Institute on Disability, Independent Living, and Rehabilitation Research
Administration for Community Living
Washington, DC 20201

COMMENTS OF
THE REHABILITATION ENGINEERING RESEARCH CENTER
FOR WIRELESS INCLUSIVE TECHNOLOGIES (WIRELESS RERC)

The Rehabilitation Engineering Research Center for Wireless Inclusive Technologies[1] (Wireless RERC) hereby submits comments in response to the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR) Draft Long Range Plan, 2018-2023. The mission of the RERC for Wireless *Inclusive* Technologies is to promote the integration of established wireless technologies with emerging wirelessly connected devices, sensors, and services for an inclusive, transformative future where individuals with disabilities achieve independence, improved quality of life, and enhanced community participation.

For more than 15 years, the Wireless RERC at the Georgia Institute of Technology has been actively involved with research, development, and regulatory activities concerning the accessibility of current and emerging advanced information and communications technologies, including wireless devices. Our comments are based on the Wireless RERC's subject matter expertise and empirical research findings.

First, we note that the proposed NIDILRR Long Range Plan, 2018-2023 advances prior long range plans in order to provide continuity and stability, while recognizing the significant contributions of disability, independent living, and rehabilitation research to empowering a growing population of Americans with disabilities. The stated aims of NIDILRR's Long Range Plan, and the research it supports, are consistent with federal disability policy to promote equal opportunity, full participation, independent living, and economic self-sufficiency for individuals with disabilities.

[1] The **Rehabilitation Engineering Research Center for Wireless Inclusive Technologies** is funded by a grant from the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR grant number 90RE5025-01-00). NIDILRR is a Center within the Administration for Community Living (ACL), Department of Health and Human Services (HHS). The contents of this document do not necessarily represent the policy of NIDILRR or ACL, HHS, and you should not assume endorsement by the Federal Government.

The following comments address specific sections of the long-range plan, followed by the reasons we support them:

BACKGROUND (p. 2-3)

> The long-range plan offered several key findings from NIDILRR's regional listening sessions in support of the Long Range Plan development process, including themes of "**Choice and Control Matters**" and "**Access to Technology Would Make Life Better**" (p. 3). Specifically, the long-range plan noted: "*Whether it's access to affordable and accessible housing or a ride to the doctor's office, people with disabilities want meaningful choices that respect a desire for safety, security, and their valuable time. This is consistent with the trend toward person-centered planning, which respects the goals and wishes of the end user of goods and services, rather than the choices offered by a provider or care planner"* (pp. 2-3). It also observed: *"People described frustrations with their inability to gain access to cell phones, durable medical equipment, and assistive technology. Poverty, lack of existing sources of reimbursement, and policy challenges were given as barriers to access"* (p. 3).

Wireless RERC research concurs with these observations. Consumers with disabilities expect meaningful choices for wireless and other technologies that enable them to engage in employment and to participate in society. Data from the Wireless RERC's 2015-2016 Survey of User Needs (SUN) finds that 83% of respondents own a wireless phone, with 71% indicating ownership of a smart phone and 50% indicating ownership of a tablet.[2] These results suggest that the considerable capabilities and functionality offered by smart devices have a strong appeal and address important access and assistive technology needs of people with disabilities as a group.

Anecdotal evidence suggests that alternative inferface functionality provided by wireless devices and apps, such as wayfinding in the community using GPS and maps with audio output, empower people with vision disabilities to travel independently in their

[2] Morris, J.T., & Sweatman, W.M. (2016). "SUNspot – Wireless Device Ownership by People with Disabilities," vol. 2016, no. 1. Available online at http://www.wirelessrerc.org/2016-sunspot-01-wireless-device-ownership-people-disabilities

communities. Similarly, video calling/chats have helped individuals with hearing loss communicate without the help of a relay service or other mediating technology. Tablets have become a key communication and learning platform for individuals with complex communication needs. However, challenges to access and usability of wireless devices and services remain. As new iterations of mobile wireless technology devices and networks are deployed, such as the Internet of Things (IoT), previous solutions can be broken or overwritten. NIDILRR's observation that "accessibility must be built into each innovation to ensure that people with disabilities can access and use the new technology" (p. 21) underscores this fact. Researchers, engineers, advocates, and the wireless industry must continue to push for ever greater access to these critical technologies, especially through the adoption of inclusive design and development practices. NIDILRR investments for research in this area have continued to promote technology access and consumer choice.

I. RESEARCH AND DEVELOPMENT AGENDA (pp. 8-18)

> NIDILRR's Research and Development activities occur in the three interrelated domains of 1) community living and participation, 2) employment, and 3) health and function, and the long-range plan notes: *Its research and development agenda for the next five years involves building on its current investments, moving them along the stages of research and development, while also initiating new research in development fields, with the goal of improving community participation outcomes for people with disabilities"* (p. 8).

Toward this end, Wireless RERC research has supported outcomes in these domains, with the greatest emphasis on community living and participation. Of particular note has been the Wireless RERC's ongoing commitment to ensuring that individuals with disabilities have equal access to Wireless Emergency Alerts (WEA). Historically, people with sensory disabilities have had inadequate access to emergency information due to the lack of technology in the language and modality that best accommodates their communication needs. Advances in technology and trends towards personalization and customization of the user experience make the

promise of complete access achievable. Further, the WEA system is the first national emergency notification system that was mandated by law to be proactively inclusive of people with disabilities.[3] As such, Federal rulemakings concerning WEA always consider the impact of revised rules on people with disabilities.[4] In the initial rollout of the system, the accessibility provisions were limited to a distinct alerting tone and vibrating cadence. Since wireless providers have limited control over cell phone design, many of the accessibility promises concerning WEA relied on cell phone manufacturers enabling customizability of the device for the individual user. As smart phone technology increasingly included built-in accessibility features, people with disabilities could enable features to improve the accessibility of WEA messages. Nevertheless, users continued to report experiencing access barriers.

In 2015, a national online survey (*2015 WEA Survey*) was conducted to gain a greater understanding of factors that constrain WEA utility for people with disabilities. Survey respondents with disabilities expressed concerns with the receipt of WEA alerts (i.e. notification signals), system consistency, and requests for additional features.[5] The findings were shared with the Federal Communications Commission (FCC) via their rulemaking process, and recent rule changes have been adopted that aim to remediate identified barriers. Still, more questions have arisen, such as whether and how to incorporate wearables, tablets, and other wirelessly connected devices into the WEA framework. As more answers are found, more questions are discovered; so it goes with communications access and policy. With the ever-evolving capabilities and use-cases for technologies, anticipation of how they will impact people with disabilities is critical to staying ahead of the regulatory curve. Combining research, development, and policy activities can have an exponential impact on availability, accessibility, and usability of connected technologies. When working to improve access to technologies that are governed by Federal agencies, the policy component is crucial to ensuring transfer of research knowledge into industry practice.

---

[3] Title VI, Section 603 (b)(3)(F) of the *Warning Alert and Response Network Act of the Security and Accountability For Every Port Act of 2006* (SAFE Port Act) (PL 109-347).

[4] Federal Communications Commission. (2004). *In the Matter of the Review of the Emergency Alert System, Notice of Proposed Rulemaking.* (EB Docket No. 04-294). Available at https://apps.fcc.gov/edocs_public/attachmatch/FCC-04-189A1.pdf.

[5] Center for Advanced Communications Policy. (2015). *Optimizing Ability of Message Receipt by People with Disabilities: WEA Survey Findings Final Report*. Unpublished manuscript, Center for Advanced Communications Policy, Georgia Institute of Technology, Atlanta, Georgia.

Current Wireless RERC research and development activities into emerging and next generation wirelessly connected devices may further community living and participation outcomes for individuals with disabilities. Wirelessly connected devices have become nearly ubiquitous, impacting our daily activities and independent living outcomes, thus requiring reconceptualization of the most fundamental systems in our society. In 2001, when the first competition for the Wireless RERC opened, wireless technology was on the cusp of a revolution. Rudimentary internet access was available on a limited number of "(not-so)-smart" mobile phones. WiFi was a novelty and the "cloud" was still largely a concept. Our strategies for 2016-2021 focus on advancing access to and use of current and next-generation wireless technology, including IoT, for people with disabilities, while remaining cognizant of the need for key legacy services to retain their accessibility, so individuals have more avenues to support independence and inclusion in education, employment, community participation, and emergency services.

II. Cross-Cutting Research and Development Activities (pp. 19-27)

> NIDILRR also has identified three cross-cutting research and development activities, including 1) technology for access and function, 2) disability statistics research, and 3) the ADA National Network. Regarding **technology for access and function**, specifically, the draft long-range plan notes: *"Technology is the application of knowledge through scientific means to solve practical problems. NIDILRR recognizes that research and development are interdependent and inseparable. For practical purposes, NIDILRR expects that research will employ scientific methods to answer research questions and fill gaps in knowledge…NIDILRR expects that development will employ systematic methods to produce models, methods, tools, standards, applications, devices, and systems that address problems of and difficulties encountered by diverse populations of people with disabilities"* (p. 19).

The Wireless RERC strongly supports NIDILRR's focus on cross-cutting research and development activities, particularly in the area of "**technology for access and function**."

Technologies for people with disabilities are not necessarily limited to a single domain. Wearable devices, for example, may support health and function through apps to empower individuals in their own care. The very wearables also may be used to accomplish work-related activities, as well as connect people with family and friends through social networking. Technologies to improve the lives of individuals with disabilities are not confined to a single domain, and a model that accounts for cross-cutting research will provide a more flexible and versatile framework for these areas.

> NIDILRR also recognizes four technology domains: rehabilitation, assistive, service, and system technologies. Of particular note are system technologies that: "*provide improved access to and usability of critical infrastructures used by people with disabilities and others in the general population. These include information and communication technology, the built environment, public transportation, and health care infrastructures"* (p. 20).

The Wireless RERC supports NIDILRR's recognition of system technologies, which are no less important than rehabilitation and assistive technologies that historically have been NIDILRR's research and development emphasis. We would like to draw special attention to the Internet of Things (IoT), as it is an emerging system (or framework) that bridges digital and physical environments. At the Wireless RERC at Georgia Tech, we believe it is essential that increased accessibility of information and communications technologies (ICT) and services in general, and IoT, specifically, be encouraged given that access to these key technologies can enhance inclusive and independent living for people with disabilities. If properly designed and developed, IoT can realize its potential to empower all citizens, including people with disabilities, to achieve an improved quality of life and greater social and economic inclusion. IoT technologies, such as environmental sensors, smart objects, and wearables, are powerful tools because they can provide the user with a variety of inclusive and assistive information services in real-time.[6] The actualization of this objective is somewhat complicated by the fact

[6] Domingo, M. C. (2012). An overview of the Internet of Things for people with disabilities. *Journal of Network and Computer Applications, 35*(2), 584-596. doi:10.1016/j.jnca.2011.10.015.

that, while improvements have been achieved in recent years, many IoT designers and developers do not have a clear understanding of (a) the technical requirements of accessibility, (b) the needs, preferences, experiences and expectations of persons with disabilities, and (c) inclusive design approaches to address these needs.[7] Since "smart" environments and devices are still emerging, there is a real opportunity to "get it right the first time" and not have to retrofit, craft add-ons, or be reactive to litigation. This, once again, underscores the need to ensure fully inclusive collaborative consultations with the full range of stakeholders including public sector officials, vendors and manufacturers, and citizens. As such, disability research and development that focuses on IoT technologies and applications should be explicit in NIDILRR's Long-Range Plan.

> NIDILRR's observes: "*Advances in scientific knowledge and technologies are rapid and accelerating. High power and energy density batteries, the internet of things, cloud computing, machine learning, big data and analytics, rapid design and fabrication, advanced materials, and pervasive information, computing, and communication technologies may all be adapted or built upon to address problems of or encountered by people with disabilities.*" (p. 20).

Current Wireless RERC activities include research into and development for IoT, including accessible wearables technologies. We note that many challenging issues remain to be addressed, both technological and social in nature, before the IoT concept is effectively adopted. It is vital to draw attention to the fact that input from people with disabilities is a key objective for the design process, including surveys of user preferences and creation of prototypes that benefit a wide range of potential users. These inclusive practices are especially pertinent given the fact that people with disabilities often are early adopters of technology. Inclusive IoT development integrates design thinking and inclusive policy approaches to generate more flexible, responsive technology outcomes for people with disabilities.[8] The most significant consideration for persons with disabilities being able to take full advantage of

[7] Baker, P. M., Gandy, M., & Zeagler, C. (2015). Innovation and wearable computing: A proposed collaborative policy design framework. *IEEE Internet Computing*, 19(5), 18-25.
[8] Ibid.

the inclusive potential of IoT is to ensure that all of the stakeholders in the ecosystem address both accessibility and usability when developing new products and services. There are a wide variety of companies and organizations, in many industrial sectors, that influence or are influenced by the IoT in some way, including device manufacturers, handset manufacturers, networks and application developers, extending even to adjacent industries such as the fashion and automotive sectors. To create a fully inclusive IoT that works for everyone, accessibility and usability must be a consideration at every stage of the design and development process.

As noted above, IoT represents a case in which people with disabilities frequently are early adopters of appropriately designed technologies. They are their own best advocate for obtaining the most reliable consumer products. Individuals with disabilities provide critical input at each stage of Wireless RERC projects ranging from surveys, to focus groups, to constructing prototypes, to retesting and refining, and ultimately partnering with industry or government to incorporate design and innovative accessibility features into their product line. For over 15 years, the Wireless RERC has demonstrated the critical value of user testing to verify the usability and accessibility of wireless products, and this practice will continue as we work on advanced and emerging technologies such as IoT. To the extent that NIDILRR and its grantees can influence accessible design and its adoption by industry, we believe that these technologies will advance the promise of NIDILRR's Long Range Plan.

III. Activities that promote the quality and use of NIDILRR-sponsored Research and Development (p. 27-33)

We also support the 2018-2023 Long Range Plan's emphasis on identifying **stages of research and development** (pp. 26-27) and **knowledge translation** (pp. 30-31). It is vital that NIDILRR-funded research not remain on the lab bench, but, rather, make it to the marketplace and into the hands of consumers with disabilities. We also observe that access to *mainstream* technologies has become equally important as ensuring innovations in assistive technology.

In summary, the Wireless RERC supports the NIDILRR goals of 2018-2023. The ability to research, develop, train, and build the capacity of future designers, engineers, and researchers

is a testimony to the significance of long range planning. Planning and funding have contributed to increasingly allowing people with disabilities and those with functional and situational limitations to become a part of the growing wirelessly connected ecosystem. As stated earlier, the landscape was in its infancy in the early 2000s. Today, because of sustained Federal government and NIDILRR funding, across a wide berth of R&D activities, people with disabilities can experience improved quality of life and community participation. As such, inclusion is no longer an afterthought.

Respectfully submitted,

Helena Mitchell, Ph.D.
Center for Advanced Communications Policy and Wireless RERC

Nathan W. Moon, Ph.D.
Center for Advanced Communications Policy and Wireless RERC

Salimah LaForce
Center for Advanced Communications Policy and Wireless RERC

Maureen A. Linden, MSBME
Center for Assistive Technology and Environmental Access and Wireless RERC

Paul M.A. Baker, Ph.D.
Center for Advanced Communications Policy and Wireless RERC