

Designing from the Rural

Insights

- Rural areas' technological needs require solutions that are not readily apparent or possible from an urban perspective. Urban hand-me-down solutions are not enough.
- There is no single location for the rural in computing. Rurality is diverse: It is in almost every country on Earth and so resists easy definition.

Human-computer interaction is dominated by urban spaces, particularly superstar cities that have become hubs of education and technological innovation [1]. In many ways, this is natural for HCI: These cities, such as San Francisco and Boston, are home to most major tech companies and universities, as well as the majority of tech's financial and human capital. They stand in the popular imagination as bastions of the future, the places from which innovative design emerges. However, in allowing attention to drift almost exclusively to these cities, we bypass an important question: What are we missing when we focus only on the superstars?

HCI is not alone in overlooking the rural. Though 45 percent of the world's

population—over 3 billion people—lives in rural areas, contemporary economic development policies marginalize rural residents. Rural people are generally not perceived as rich sources of potential innovation, but instead as a problem to be solved or to be designed away. The rural landscape itself is often seen only as a source from which resources can be extracted, whether oil, food, timber, or cheap labor; rarely is it acknowledged for its social or cultural benefits. Inspired by postcolonial and feminist computing scholars, who ask what it means to exist on the periphery of tech movements, we wonder: What could it mean to shift rural areas from the periphery to the center of design? We



began to see answers at a workshop on rural computing at the 2018 CSCW conference, which coalesced around the idea that rural communities are invaluable and vastly underutilized sites of innovation and knowledge [2].

The time is ripe for the radical foregrounding of *rural computing*. By rural computing, we mean understanding, designing, and building computing technologies that are particular to the needs, aspirations, and practices of rural communities around the world. As researchers and professionals tasked to influence the design and use of sociotechnical systems, it is our responsibility to ensure that rurality is well represented in design insights. In doing so, we argue here for a recentering of rural areas; we seek to design *from* the rural rather than *for* the rural (from the urban perspective). We emphasize that the

design problems of the rural merit more than urban hand-me-down solutions.

RURAL COMMUNITIES ARE A RESOURCE

From the city center's perspective, rural communities are often literally far away and figuratively out of sight. It might seem that rural communities' technology needs are just about catching up with what is available in urban communities. But rural communities have their own particular characteristics that shape what technologies are appropriate. For example, rural residents' occupations are more likely to be in primary production (e.g., agriculture, forestry, fishing), whose practices are organized differently from the white-collar work that is the dominant center of technology design (hello, files and folders; where are our fields, forests,

and seas?). Rural people have often developed their own infrastructures before companies got around to seeing them as worthwhile targets for development; this happened when the telephone was making its way throughout North America in the early 20th century [3] and continues today as rural communities start their own ISPs [4]. Rural communities are also culturally different from cities, leading to different opportunities for culturally appropriate design.

In HCI, we know that specifics like these should make a difference, yet city living tends to be the default background for design. As a simple example, apps and websites designed with city dwellers in mind tend to demand more bandwidth than is available to rural dwellers, leaving them on the outs of a digitally structured society [4].

With HCI's growing consideration of social impact and social justice, we call attention to the possibilities for rural communities to broaden our perspectives on who we design for and what practices are worth designing for. By considering what matters to rural communities, we as designers and researchers have a unique opportunity to dissipate negative historical trends in technology design. In the following,

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we give examples from our work of how researchers and practitioners can design with rural communities to move away from deficit models, take into account the embeddedness and bias of technologies, and respect the existing and future innovative practices and designs by rural communities.

ENVISIONING RURAL DESIGNS WITH THE LGBTQ FUTURES PROJECT

Huddled around stacks of Legos, a small group of college students works on a model of a building that addresses their needs: safe spaces to meet other lesbian, gay, bisexual, transgender, and queer (LGBTQ) people in a rural college town. The building is depicted as a storefront that is, at first glance, empty except for some scattered furniture and a large red kiosk lit up with the request, "Pick your room." Scrolling through the kiosk, it offers seemingly disparate scenarios such as a dance party or a cat cafe. Select a scenario, the students explain, and the room will populate itself using embedded artificial and virtual reality technology. When presenting this, the students speak excitedly about the opportunities to address their and their friends' social needs.

This room was one of several social technologies created during a series of participatory design workshops called

The LGBTQ Futures Project. The workshops, put together by a research team from three Michigan universities, sought insights into what the future of technology might look like for rural LGBTQ people.

LGBTQ people living in rural areas face unique challenges. Resources normally associated with LGBTQ communities (e.g., community centers, bars, bookstores) require denser populations of people to sustain them. Rather than think of these challenges to rural communities as deficits (i.e., low population density, limited access to social resources), these workshops wonder what we are missing if we don't center the experiences of these rural people. The storefront described above is an example of a proposed technology that came about because participants saw the need for safe spaces for social interaction. They were aware that normative understandings of what LGBTQ safe spaces are (i.e., single-purpose spaces) would not be possible in their communities. Instead, they envisioned a flexible space that, with the help of AR/VR technologies, could serve many different community members' unique needs.

Opportunity: Rural has special expertise. Rural spaces are often thought of as being behind the times.

Consequently, a common assumption is that rural populations just need time or an infusion of resources to catch up to the technology use of their urban counterparts. This perception provides an easy explanation of why rural areas lag in new technology adoption, but it is incomplete. Rather, rural areas require solutions that are not readily apparent or possible from an urban perspective.

For researchers and practitioners who work in rural spaces, this is an important lesson in reflexivity. As we are likely to be based in more densely populated hubs, we need to recognize that many of us have close ties to the vested interests of urban populations. By acknowledging our biases, we may avoid parachuting, dehistoricizing, and imposing upon rural communities with technological change they don't want or need. Ethnographic methods of inquiry, participatory design, and co-design with rural stakeholders are all potential strategies to combat these biases. Such engagement will not be easy. Popular media continually tells rural residents that they are "behind." Rural residents who have long not reaped the benefits of research and technology may be wary of new engagement.

Researchers must allow residents to feel they have expertise and a legitimate voice. In many cases, building quality

partnerships with communities is critical to working successfully in rural areas. The following illustrates how community partnerships can help avoid the trap of outside researchers parachuting into rural spaces, leading to more effective solutions.

EMBEDDEDNESS AND BIAS IN THE TRIBAL DIGITAL VILLAGE NETWORK

By the early 2000s, the Indian reservations in San Diego County had little access to Internet connectivity, despite their proximity to the San Diego metropolitan area. This disparity was and continues to be representative of Internet availability on U.S. tribal lands. Tribal lands lack broadband Internet access for reasons that stem from historic antagonistic and colonial relationships between tribes and the U.S. government, including geographic remoteness, high rates of poverty, and limited economic capital. However, things would change drastically in the region when a partnership between Southern California tribal governments, tribal community members, and a researcher at UC San Diego established the Tribal Digital Village Network (TDV Net) to connect regional tribal learning centers and regional environmental measurement instruments to the Internet. Now the TDV Net serves 86 tribal buildings and approximately 350 homes in areas unserved or underserved by other Internet service providers.

Despite TDV Net's successful penetration, after 10 years, only 10 percent of residents living in tribal lands had Internet access. In order to understand how network architectures might address this disparity, a partnership was formed in 2014 between TDV Net and computer scientists at UC Santa Barbara with the goal of conducting an ongoing network-traffic trace analysis to better characterize Internet usage and

performance in a tribal context.

Sixteen terabytes of collected packet headers later, some of the first quantitative studies of tribal traffic were conducted and published in 2015, leading to new insights into how tribal realities and information needs translate into ICT usage patterns. Unnamed roads and homes without addresses manifest as a lack of online-shopping traffic, due to a lack of shipping options; high levels of online gaming reflect a lack of economic opportunities as well as a desire to maintain social relationships through shared experience.

Ongoing collaboration between TDV Net and computer scientists has led to the deployment of cutting-edge network technologies in tribal spaces, as well as the design of opportunistic network architectures that operate in a context defined by the needs and realities of tribal users, such as supporting the development and circulation of culturally relevant, locally produced content or enhancing data sovereignty (tribal control and ownership of data generated by the tribe) through the design of edge-based network architectures.

Opportunity: Rural needs are different. The straightforward solution—provide Internet access to unserved areas—seemed obvious enough to decision makers outside of tribal lands but failed to produce a significant impact on tribal internet access until a local partnership was established. TDV Net's insider knowledge of the community generated insights and designs that made it possible to collaboratively produce solutions that would have been difficult without local partners driving the solutions.

The trap of technological determinism is a risk for any technologist trying to understand a community's needs as an outsider, but the risk is especially salient for rural

residents. This model demonstrates how long-term engagement with rural communities invites researchers to think about designing infrastructure and technologies in a way that honors and magnifies community information goals.

To look for ways to establish long-term, high-quality community partnerships that can help protect against “parachuting” research, HCI might look to the extension model employed by some universities. Extension programs focus on closing the loop between research and people, bringing knowledge gained from research to those it is meant to serve through a range of learning opportunities. Extension agents are often embedded in rural communities, maintaining close relationships with community centers and other leaders that serve as avenues for rural computing researchers to establish meaningful long-term partnerships with communities. Without investing the time in generating relationships and localized knowledge, researchers simply do not have the data necessary to achieve a nuanced understanding of a community's technology use and needs. Research focusing on embeddedness and long-term partnerships has a much better chance of producing solutions that are *driven* by rural users, instead of being *imposed* on them.

CAMERA MEN IN RURAL KENYA: ALTERNATIVE FORMS OF CONNECTIVITY

In rural Kenya, camera men are men with digital cameras who travel from village to village and take pictures of people (e.g., school photos, glamour shots, and family portraits). They then travel to *maduka ya picha* (photo studios) in bigger towns to print these pictures, later returning to rural areas to distribute them. This is one way in which rural residents effectively navigate the lack of high-speed Internet access. In this case, poor connectivity is not a liability but rather an asset: It creates a livelihood for the camera men, and more important, creates a human network of information exchange between villages and towns. These human infrastructures merit more attention among technologists, governments, and technology companies working to connect the unconnected because

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they reveal alternative relationships between people and technology, and remind us that rather than being places that lack technology, rural areas offer us useful insights for imagining more diverse forms of Internet connectivity.

Western technology researchers have characterized rural parts of Africa as regions that lack technology infrastructures, in particular Internet access. Technology companies continue to develop innovative technologies that provide connectivity to remote areas on the continent. These efforts are motivated by assumptions that rural residents desire the same access that exists in urban areas. This may be the case; however, such assumptions downplay the innovative practices that already support information exchange in rural areas.

Opportunity: Rural is innovative.

Here we see the opportunities lost when rural areas are characterized as lacking in technology adoption, and as a problem that can be solved by adding more technology. The Kenyan camera men are important pieces in an alternate—not inferior—information infrastructure that would be threatened by the naive solution of just adding more technology. These are innovative assemblages of human and non-human infrastructures that we may miss by simply focusing on more populated areas.

By recognizing the need to see and understand this alternate information infrastructure, we gain the opportunity to reimagine how technology might be used, leading to a more diverse understanding of the role of technology in social systems. The flow of innovation should not be a one-way street from populated to rural spaces. Technologists, in any domain space, have the opportunity to learn from rural innovation and technology practices.

LOCATING AND DESIGNING FROM THE RURAL IN COMPUTING

There is no single location for the rural in computing. Rurality is diverse: It is in almost every country on Earth and so resists easy definition. Universalizing vast geographies through a simple definition of rural, such as population size, is antithetical to understanding

its unique culture and contributions; it obscures the range of experiences encompassed. Across different regions and people, rurality may be characterized by extreme poverty and/or lack of access to resources. Equally it may be characterized by local innovation or advanced technologies used in precision agriculture, outdoor recreation, and other rural industries.

As our examples illustrate, a path toward recognizing the rural without essentializing it is to understand how different people speak to and perform the rural. By grounding the rural in how its members talk (their discourse), we can better articulate the intersection of the rural and its identity with technology, design, values, and practices. Noting how and where members draw boundaries between themselves and others can also point us to new understandings of concerns that rural populations are acutely sensitive to such as location and privacy.

Through the course of our workshop, it became apparent that, as rural computing researchers, we all face a delicate balancing act. We must amplify the already innovative practices happening in rural communities for HCI, while drawing out the uniqueness that defines rural spaces. It is perhaps this multiplicitous nature of the rural that draws us to it—some of us have roots in the rural, while others admire the alternatives it presents us to urban living. What is undeniable is that there is an interdependence between cities and rural communities. If researchers and practitioners can begin to see rural communities on equal footing to their urban cousins—as sources for design inspiration for all users—rural computing is then also about showing what designs for cities can learn from rural communities. Our role is not simply designing for, or even designing with, rural communities but rather designing *from* the rural. Rural computing is thus not a niche area but rather offers exciting opportunities that benefit design for all of us.

ENDNOTES

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