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Connecting Communities: User Research and Redesign of a Tool for Local Broadband Planning

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Executive Summary

We worked with the National Telecommunications and Information Administration (NTIA) and the State of Washington to help improve a tool, called the Broadband Connectivity Assessment, which supports advocacy for high-speed internet access in communities across the country. We conducted user research and interviewed participants who piloted of a beta version of the tool. While responses were overwhelmingly positive, participants did encounter some challenges while using the tool. We offer solutions to these usability issues through a redesign of the user experience and information architecture. Because the needs of participants vary, our final design recommendations focus on creating a tool that is flexible and can be adapted to the needs of any community.

Introduction

Launched in 2015, the National Telecommunications and Information Administration (NTIA)'s BroadbandUSA program "provides assistance to state and local governments, industry and non-profits that want to expand broadband infrastructure and promote digital inclusion…[by] supporting planning, funding, and implementing local broadband programs [1]. This initiative was responsible for the creation of the Community Connectivity Assessment, a planning tool and framework developed with input from local and state broadband leaders, advocates, and industry members. The assessment serves as a place for members of a community share knowledge about local broadband. It also helps prepare communities for advocacy work such applying for grants or other types of funding.

The Community Connectivity Assessment framework includes 12 planning modules divided into three overarching themes [1].

- Access: Infrastructure and Availability
    - Broadband Access
    - Mobile Access
    - Provider Engagement
    - Public Assets
- Adoption: Inclusion and Skills
    - Adoption and Use
    - Digital Inclusion
    - Digital Skills
    - Device Ownership
- Community: Leadership and Context
    - Leadership
    - Community Priorities
    - Stakeholder Engagement
    - Policy Environment

In May 2017, BroadbandUSA launched a beta version of the Broadband Connectivity Assessment Tool (BCAT), an online tool for completing the Community Connectivity Assessment. The beta version was tested with teams of up to 12 people in 15 locations around the country, including communities in Alabama, Missouri, Maine, North Carolina, Kentucky, and Washington. Teams were diverse, and typically included members of local government, internet service providers (ISPs), librarians, teachers, business leaders, and community members. The work could be split in any way the participants preferred, allowing those with specialized knowledge to work on areas of their own expertise. There were two levels of user administration: a team leader who could see all responses, create team responses, and had administrative privileges, and team participants who could contribute answers. Once completed, the assessment information would be compiled into a report, which the team could then use to advocate for their community. All participants had a common interest in improving their community's broadband access.

Overall, the beta was not as successful as the NTIA had hoped. Although some communities completed the full assessment, more than half did not. This project is an attempt to discover what worked, what did not, and how we might make the BCAT experience better.

User Research & Interviews with Participants

As mentioned above, the beta project included teams of up to 12 people in 15 locations around the country. This included smaller, more rural communities and several larger cities, such as Louisville, KY. Regardless of community size, it is important to consider how the stakeholders of any community are affected by this work. For this reason, we began our work with a stakeholder analysis based on value-sensitive design principles. Further context about the value-sensitive design approach is available in Appendix A. We grouped the stakeholders into two categories: direct stakeholders and indirect stakeholders.

Direct stakeholders are those who would actively interface with the Community Connectivity Assessment and the BCAT. While broadband access impacts everyone in a community, only a small portion of the population actually is actively involved in broadband planning and policy. Examples of direct stakeholders include BCAT team members (likely community representatives such as local government employees, local ISPs or broadband providers, business leaders, educators, or simply interested citizens), NTIA staff, and potentially other government entities that are working in conjunction with NTIA, as is the case with the State of Washington.

Indirect stakeholders are those who are impacted by the broadband efforts of the Community Connectivity Assessment, even though they may never interface with the tool itself, or even know of its existence. Examples of indirect stakeholders include broadband customers, employers, rural populations, low income households, ISPs, and policymakers.

Since the BCAT serves as an assessment of community broadband needs, it is critical to ensure that the recognized stakeholders represent a wide swath of the community. Understanding the importance of varying perspectives is something we want to encourage future BCAT users to think about. This was also something we considered prior to conducting interviews with participants.

We conducted ten interviews with eleven participants from seven of the fifteen communities that participated in the BCAT pilot project. Rather than having a highly structured interview protocol, we asked a few predetermined questions and then explored the things that emerged in the course of the conversation. This enabled us to engage in a relatively relaxed conversation, which helped us build rapport with the interviewees. It also enabled the interviewees to take the reins and discuss any topics they felt were important. As needed, we would redirect the conversation by asking questions that we felt were relevant to our project.

Examples of interview questions included the following:

- *What were you hoping to achieve? What was your goal in completing the assessment?*
- *How did the BCAT tool fit into the work you were already doing? Was your community already working on broadband efforts?*
- *Have you been able to take action because of the BCAT?*

We also left space at the end of each interview for participants to ask questions of us, which they seemed to appreciate.

Summary of Participant Responses

The overarching sentiment expressed by all interviewees was that they heartily believed in the goals of the project. Some were thrilled with their participation and had only minor suggestions, while others encountered frustrating technical difficulties that would stymie the progress of a typical user, but were highly motivated to persist despite the difficulties. A few were not able to complete much of the assessment, but were still quite encouraging in their feedback. All of the users we interviewed felt participation was worthwhile and said they would do it again.

Participants' goals were often related to gaining an understanding of current broadband situation in their community and/or being prepared to better advocate for the needs of their community. For instance, one participant said, "Our team has been working pretty actively for the past couple of years to try to improve the internet available in our county. Part of the project is you always have to know where you start from. You have to be able to measure where you are to be able to tell if you've improved." This was a common sentiment. While many teams had some sense how how broadband was working in their community, the BCAT helped them record quantifiable data to serve as a benchmark. This was one of the participants' favorite aspects of the project.

In the next section of this report, we will discuss some of the problems the users encountered. While we believe our proposed changes are necessary for participant success, don't let our comments about the challenges detract from key takeaway that all participants felt this work was valuable. If there's any lesson we learned from the interviews, it's that the participants are a highly motivated and enthusiastic bunch who agree that this work is important.

Finally, while the feedback we received from users was excellent and nuanced, we want to make it clear that our goal in interviewing the users and collecting the feedback was not to

dwell on the successes and failures of the BCAT beta project, but to better understand users' motivations and underlying goal for participation. The purpose of our work is to design a new version of the BCAT that will help users be more successful, not to rehash the details of how the beta project worked. In the next section, we discuss the challenges that users faced and the ways the assessment can be improved to facilitate greater success for the teams.

Further details about participants' responses are available in Appendix B.

Usability Challenges & Proposed Solutions

Our interviews helped us identify several thematic experiences that were in conflict with the overarching goals of the BCAT and some user experiences that ran counter to how people expected the tool to work.

For example, participant success was highly dependent on the role of the team leader and the team leader's ability to engage with stakeholders. These relationships were structured into the way the tool worked on a technical level via a limit of 12 participants per team. This is incongruent with the idea that the BCAT community-based project which should include input from many stakeholders. As a proposed solution, we suggest enabling teams to have more than 12 members.

These types of value-focused questions ("who should be involved?") were some of the greatest challenges for us in our role as designers. Approaching these questions required a thorough examination of the stakeholders, the values they hold, and the underlying philosophical basis for why the BCAT project exists.

Other participants experienced challenges that were frustrating but that should be easier to fix, such as an difficulty logging into the tool for the first time.

Below is an overview of these challenges as well as our proposed design solutions. They are not listed in any particular order. The details about how these solutions should be implemented are available in Appendices C, D, E, F, and G. Of particular note are Appendices C and D, which contain user stories and wireframes.

Provide Support for Offline Access

In the interviews, a few of the participants remarked that the assessment was challenging for members of their team to complete because it required a good internet connection to access. The very act of moving the assessment online created tensions around the value of universal

usability and inclusion. On the one hand, moving the tool online utilized the convenience of the internet, improving the ability of community team members to collaborate and accomplish the work that needed to be done. On the other hand, the communities most likely to be using the tool are also those located in areas with poor broadband access. For some communities, this might lead to effectively limiting the contributions to those who have sufficient internet access to participate.

While we would certainly prefer that users complete the assessment online because this helps with data aggregation, we feel that making a downloadable version of the assessment (.doc, fillable .pdf, or .txt files) would be beneficial for some teams. Providing a downloadable version of the assessment is technically straightforward and should be easy to implement. This might add extra work for the team leader when consolidating responses or when working on creating the final report, but the cost of the work is offset by the value added by the knowledge and input of those that otherwise would have been excluded.

Ideally, it would be nice to have a way to upload the participants' responses, but this feature can be developed at a later date.

Encourage Data-driven Work

Several of the participants remarked that the data provided by the FCC did not match their lived experiences. In some cases, there were errors in the data. In other cases, the FCC's model for the data (e.g. by census block or tract) was not a useful or accurate unit of measurement that corresponded to the participants' goals.

To solve this challenge, we have two recommendations. The first is to provide contact information for the FCC or for other government entities so participants can communicate to them why the data is not accurate/helpful.

Second, it is worth encouraging communities gather their own data. We have provided prompts for this in some of the modules of the assessment. Helping communities gather data is empowering and is an excellent way to provide quantitative evidence they can later use when applying for funding etc.

Shorten the Final Report

The team leaders we interviewed felt that the final report created at the end of the project was too long and repetitive. While Karen Perry did excellent consultative work to distill the final report into a shorter list of insights, this work may not be sustainable on a larger scale.

The team leaders need assistance in creating an executive summary of the findings. As a further step, it would be nice to automate some of the final report generation (e.g. automatically calculate statistical averages), but this can be done at a later date.

Shorten the Entire Assessment

Many participants felt that the assessment was too long and repetitive, but at the same time, provided the feedback that they appreciated the comprehensiveness of the assessment. Some of the issues of the length of the assessment were related to how the questions were displayed, with the threefold scale-scope-and narrative questions being split into different pages. Our recommended design for this is straightforward: related questions should be grouped together on a single page.

Next, some of the feedback was related to the repetitiveness of questions and to the overall length of the assessment. We worked to eliminate or consolidate these questions to shorten the assessment. The exact wording of all questions is available in Appendix G.

Finally, it is important to offer multiple completion paths. Not all participants will want to answer every question, nor should they be expected to. Allowing them to only focus on the sections they care about or have expertise in will enable them to not feel like they need to complete the entirety of a lengthy questionnaire.

Enable Team Leads to Assign Sections to Participants

Following our recommendation above, we feel that team administrators (team leads) should have a way to choose from multiple completion path options and should have the ability to assign modules to participants.

We've chosen to break up the assessment into two paths: a pathway that focuses on Broadband Adoption & Digital Inclusion, and a pathway that focuses on Infrastructure & Availability. Ideally, a team leader will select one pathway and assign the modules within that pathway to the members of the team.

Ensure Reading Level is Appropriate & Simplify Answer Choices

We received a lot of feedback about the length of the assessment, as discussed above. This feedback was often intertwined with remarks about the difficulty of the assessment. While no participant explicitly stated that the reading level of the assessment was too high, we discovered through a comprehensive reading level analysis that some of the modules of the

assessment were written at a 14th grade (college) reading level. To make the questions easier for participants to answer, we've worked to decrease the reading level of all modules to be below an 12th grade reading level, with an ideal target of closer to a 9th or 10th grade reading level. By re-wording the questions, we've been able to reduce the reading level of each module by at least two grade levels. This should help participants be able to easily understand the questions. Decreasing the reading level also makes the assessment feel shorter because participants can read faster.

The reading level improvements and consolidated questions are available in Appendix G.

In addition to decreasing the reading level of all of the modules, we considered the target audience for the questions. We revamped the beginning of the assessment into a single module covering community engagement, which we expect most participants to complete. In contrast, the module about provider engagement might only be completed by participants who hold an interest in that area.

Additionally, we have chosen to reformat questions from a 7-point likert scale to a 5-point likert scale and have added and answer choice for "I don't know" or "N/A" to nearly all questions. This will enable us to collect more accurate data and reduces the cognitive load on participants.

Encourage Participation & Celebrate Success

One of the challenges of the assessment was that team leaders sometimes had difficulty getting participants to answer the questions. While our work to make the assessment easier and more enjoyable for participants will go a long way toward helping them successfully complete it, the tool could also benefit from more ways to encourage participants to take part. We suggest that the next version of the tool have a way for team leaders to send reminders to participants, or to automatically remind participants at set intervals. The tool should also have a way for participants to clearly see their progress and what they need to do next. Additionally, displaying a brief congratulatory message after the completion of each module will help participants remain motivated.

Encourage Collaboration

As mentioned above, the BCAT beta project had a limitation of fifteen members per team and did not have an easy way for teams to receive information from other community members who were not part of the main team. Because this is a community-focused assessment, we

believe it is important for teams to be able to gather information from any sources they deem relevant and from any individuals. As such, the team leader should be able to determine the team size and add additional participants beyond fifteen people. Ideally, the leader should be able to send questions via email or should be able to automatically invite people via email and assign questions/modules to those users. Finally, it would be nice to create a way for team members to upload documents to a shared drive/portal so that other team members can see the information. This feature is not critically important but would help teams work together to consider multiple sources of information.

Recognize that Urban and Rural Communities Have Different Needs

Throughout the course of the interviews, we noticed that teams from urban and rural environments tended to have different priorities. Providing a choice of module pathways (a pathway that focuses on Broadband Adoption & Digital Inclusion and a pathway that focuses on Infrastructure & Availability) should help them tailor the project to the topics they would like to focus on. In addition to these two choices of pathways, teams should also have the ability to work on any modules they would like to complete (regardless of pathway).

Support Work Across Communities

Several team members who held strong beliefs in the importance of data expressed a desire to see how their community compared to others. In any area where data is presented, it would be nice to provide additional columns for comparison, e.g. “your community” vs.” your state” vs. “other similar communities.” We recognize that this would be challenging to implement but want to note that it was a requested feature.

In addition to being able to compare data to other communities, team members expressed a desire to work with other communities. One benefit of the beta project was that teams participated in regular conference calls and were able to lean on each other for support. This cohort-based model was critical to the success of the teams because it enabled them to ask for help and to feel connected to others who were going through the same experience. Retaining the cohort model is one of our recommendations that should be given the highest priority.

In addition to the cohort model, providing some examples or case studies for new teams would be a good idea. If possible, the work of past teams should be shared with new teams so the news teams can have an example to guide their work.

Improve Interface Aesthetics & Technical Functionality

Last but not least, participants did not love the aesthetics of the user interface, nor did they find it particularly easy to use. The next version of this tool should be developed using the *U.S. Web Design System Style Guide* [2], a digital framework that was developed by the General Services Administration for use of all government websites. This style includes a Bootstrap template and the designs should be easy for a front-end web developer to implement.

We have created some initial wireframes of how the tool should function and what it should look like. A developer can use these to guide their work, but if there are any questions about the designs, the *U.S. Web Design System Style Guide* [2] should be followed as opposed to building pixel-perfect recreations of the designs we've included in this report.

Further information about the specifics of these designs and their implementation is available in Appendices C, D, E, F, and G.

Conclusion

In sum, the BCAT beta project was successful but some revisions should be made to help ensure that future participants are successful.

Beta project participants stated that the tool helped communities build broadband teams, was comprehensive, and revealed gaps in their knowledge. The tool created a starting benchmark to help them gauge future progress and provided information that could be shared with policymakers. All of the participants we interviewed think this work is important and would be happy to participate again.

The changes we have suggested above will help future teams successfully complete the assessment. The power of this tool is that it prepares communities for self-advocacy and empowers them to work on projects that can best serve their communities. To improve broadband access across the country, it is important for us to work together for the betterment of the world around us. Supporting these communities and preparing them for self-advocacy is one of the most important steps we can take.

Finally, we would like to thank Karen Perry and Will Saunders for their belief in and encouragement of our work. They have been excellent mentors and role models. This project would not have been possible if it were not for their support.

References

1. BroadbandUSA: Community Connectivity Assessment (2017). Retrieved from https://www2.ntia.doc.gov/files/bbusa_assessment_fact sheet_6_21_17.pdf.
2. US Web Design System. (2018). US General Services Administration. Retrieved from https://designsystem.digital.gov/

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