

CoLRN - A Community-Based Vision for Local Resilient Networks

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ABSTRACT

In this research, we share our findings from a series of design workshops with community wireless network members and their users in India and Africa to develop a community-based vision for resilient local networks. We simultaneously leveraged existing projects in India and South Africa around network management interfaces and local content creation to evaluate our design strategies to foster resilience and effectiveness in empowering community networks. Through this work, we identified the challenges and opportunities for innovative approaches to leveraging networked technologies to bring communities together to learn from each other on how they manage and use their community network. We highlight key opportunities to explore a) infrastructural resilience through community-centred design of network management tools, and b) novel approaches to support content creation tapping community desires to capture local knowledge, through annotation of digital stories and production of radio content.

CCS CONCEPTS

• **Community-Based Vision for Local Resilient Networks, Network technologies, Participatory Design;**

KEYWORDS

Community Networks, Network Management, Content Creation, Speculative Design, Co-design

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1 INTRODUCTION AND BACKGROUND

The COVID-19 pandemic has foregrounded the role of digital technologies in widening the gap between the rich and the poor [1]. Many propose that universal broadband is the answer; indeed, lower mobile data costs in South Asia have resulted in tremendous growth in networked participation [5]. People at the edge of the Internet still experience unequal access, in terms of relevant local content, costs, device and infrastructure constraints[2]. Our research also shows that communication in these communities is often with users within the same locality. Thus, messages destined for neighbors across the street must first travel across the world over expensive data links. We propose to rethink our approaches to network infrastructure. Community networks offer a means for high-quality communications infrastructure growth. However, we want to look beyond community networks as a means of access to the Internet – and towards community local infrastructures that effectively leverage digital technologies to bring community members together through active participation [3, 4]. For us, to "build back better" is to actively work with communities to co-design and co-deploy their networks: empowering easy deployment of engaging and relevant digital content and services, and to make network management tools that lower the barrier to sustainable maintenance and operation of community networks.

Community Networks (CNs) are organizations or movements formed to provide free, subsidized, or low-cost access to the Internet via wireless means by and for the communities [5, 6]. CNs are recognized as an enabler of sustainable development as they deliver explicit socio-economic benefits by connecting people locally and globally, providing employment and business opportunities and educational and healthcare support [2].

Two networks that have made local content and services the centre of their goals is FOCUS (South Africa) and Janastu (India).

For this research, we worked with current and prospective members of the networks – both operators and users – to reimagine directions for CNs and to evaluate our current trajectories. With our participants, we have sought to understand how CWN members understand resilience and envision possibilities for how CWNs can contribute to community resilience; both in a broad sense and more specifically with respect to content creation, infrastructure building, ownership and maintenance.

The studies were conducted in rural and semi-urban areas of India and South Africa. We reached these areas with the help of our local collaborators operating community wireless networks, FOCUS in South Africa and Janastu in India. FOCUS is the community wireless network offering of Black Equations – a company with the objective of supporting community development in Ocean View, a historically disadvantaged township in Cape Town, South Africa. Their infrastructure leverages the iNethi platform, which supports local content and services specifically designed in partnership with community members to support their community wireless networks. Janastu provides free and open-source software solutions and support to the community and small non-profits organizations.

2 METHODS

2.1 Interviews and Co-Design Workshops

The study followed a participatory design approach to collect data. The authors engaged with 14 participants (4 prospective CN's operators, 4 CN's operators, 6 CN's managers) through an interview study to understand the context of use and everyday challenges with community networks in semi-urban (6-Ocean View, 2-Soweto, 2-Khayalitsha) and rural (1- Mamaila) areas of South Africa and rural areas (3-Devraynadurga) of India. Each interview started with an introduction of the study and informed consent was given, was conducted in English and lasted for about 33 min in average. The interviews explored the background of the participants in relation to network management, training activities, existing network management interfaces they use, and redesigning network management interfaces [7].

We also engaged with four community network users from Ocean View, South Africa and seven prospective users of community networks in India (1 field coordinator and 6 frontline health workers called Health Navigators). Interviews were conducted in English in South Africa and Kannada (3) and Hindi (4) in India and lasted for about 30-45 minutes each. During these interviews, we sought to understand how the users perceived community wireless networks, both from a structural point of view (how they are run, and what structures were required to support it) and a services point of view (what services they might use through a community wireless network). We asked about wishes for the community network; what they would like to be able to do within a CN. Finally, we asked about resilience of the community and of community networks more broadly. These interviews helped to inform the refinement of the workshop protocols for network management co-design workshops, speculative design workshops and content creation co-design workshops the next phases of research [8].

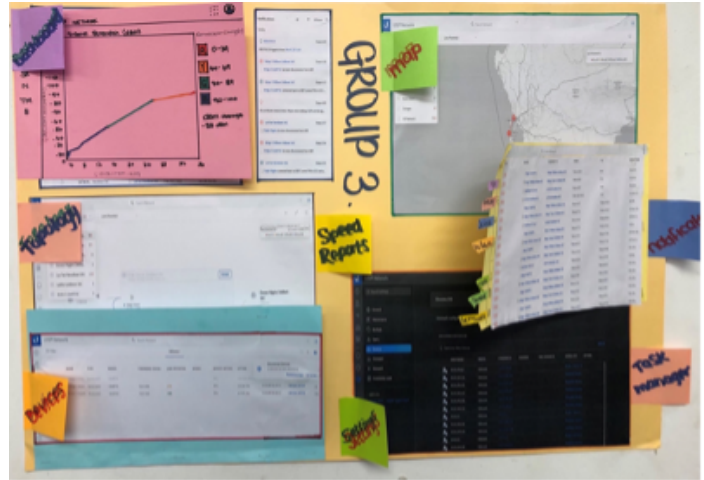


Figure 1: Network Management interface co-designed by participants

2.2 Data Analysis

The data collected from interviews and workshops was thematically analyzed by the authors [9]. As a team, we met up in Bangalore, India to conduct the analysis together, which started with grouping similar themes from the interview scripts and the workshop recordings. During the workshops, participants co-produced a number of visual drawings that we used to support the analysis. All the transcripts from the interviews and co-designed materials were thematically analyzed. We started the analysis by first reading the transcripts from the interviews and highlighting the themes as they emerged, after grouping all the similar themes together we then compared them to the visual drawings. Some of the themes that we focused on include the background of our participants, their current roles in their community network management, forms of training or education level, how they currently manage the network, the current network management interfaces that they are using, and the resources that they consult when troubleshooting their community wireless network.

3 LESSONS LEARNED

3.1 Network Management

Local community network operators and managers experienced challenges while developing and sustaining community networks. The sustainability and management of a community network often requires local network operators to seek technical knowledge, repair and troubleshoot breakdowns. Local network operators are often responsible for re-designing and purchasing the recommended equipment to further expand and develop the network, but often they are not able to purchase the intended network equipment. This is because most of the equipment that they have good experience with using is often not available in South Africa and India.

3.2 Speculative Design

Physical infrastructure is important to improve the network. The physical infrastructure can prevent vandalism. Having high-quality



Figure 2: Participatory co-design workshops to identify both strengths and challenges within the network in the community.

devices to improve signal strength and coverage. Back-up generators and solar panels to keep the network up during load shedding. Strategies to make a self-sustainable network. Network for the community, by the community, where the network will be managed and maintained by the community. Activities and workshops were conducted by the Focus network to train community members. Helpline and chatgroup on the network for the community members are also helpful.

3.3 Content Creation

The discussions taking place amongst the participants demonstrated that content creation is not just for entertainment purposes, but should be used as a tool to build and grow the people of the community. Participants from Ocean View community, wish to use their content to find and communicate with like-minded people through forming and strengthening their own forums and communities. Content creation is also a means to represent those who cannot speak for themselves, especially on taboo issues (same sex relationships, changing religion or beliefs, drug addictions, mental health issues, and etc.). In addition, positive content that is pushed into the community will help the people to build self-confidence and a better state of mind. The feeling of acceptance and approval by the community was also discussed as being important for the development of its people.

4 DISCUSSIONS

Our findings firstly show that there is significant variation in how community networks are structured, and used. Likewise, what is a community network varies and depends on factors, such as state of implementation, community use and engagement, and a collective vision about community infrastructure. The Ocean View community network is ahead in its implementation, with a range of community members actively participating in maintaining it as well as users engaging with the Internet services offered. In contrast, the Janastu network came about only during the COVID-19 pandemic induced lock-down driven by Janastu and their ambition of setting up alternative infrastructure for equitable Internet access



Figure 3: Participants using the PAPAD software as an artifact for content creation and archiving knowledge

in the surrounding villages. However, they are gradually getting the community members, particularly the younger populations to engage with the network and think of potential services together. Meanwhile in Channapatna, the network is a conceptual idea, still being realized, yet being driven by the community health workers with a desire to collect, curate and make use of locally relevant health content.

Many of the challenges to the resilience of community network infrastructure are already well-known: power outages, availability of local expertise, and cost of equipment [5]. Programs such as APC's Community Network School are directly intended to address the issue of expertise. However, this approach underscores the technical gap – systems that should be easily learned by a community are simply not usable, necessitating significant training. This training forms not only a barrier to entry, but also introduces risk, as trained individuals become more employable and are able to seek other opportunities elsewhere. Prior studies have highlighted how challenging it is to engage with community participants especially from low-income communities in rural areas of the Global South [10, 11]. On the one hand, a potential limitation might relate to the fact that our participants were recruited from particular community networks in South Africa and India in smaller communities that might raise the concern that our results might be limited to a narrow set of community perspectives and resilience practices [12]. However, on the other hand, our analysis of resilience practices of community networks suggests the opposite and the richness of involving not only two geographically distinct regions in the Global South, but also how the community familiarity was helpful not only to identify challenges but also to co-design potential user interfaces and solutions for different realities. Grounding the different speculative scenarios to the existing practices of CN's participants was helpful when engaging in the co-design activities [13].

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