



Investigating the Use and Appropriation of Digital Technology in Contexts of Infrastructural Limitations

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Abstract

Infrastructural limitation in different forms such as in technological, social, and political aspects affect the adoption and use of technology. Thus, it is important to understand how digital technology is appropriated for current and future use in such contexts. This research investigates how digital technologies are used and appropriated in environments characterized by infrastructural limitations, focusing on grassroots efforts in Bangladesh and the United States. Using qualitative methods and participatory approaches, the research aims to characterize existing socio-technical strategies employed by users to navigate infrastructural limitations, and to co-design future directions for interactive technology to leverage existing practices to overcome the limitations of infrastructure and power dynamics.

CCS Concepts

• Human-centered computing → Empirical studies in HCI.

Keywords

infrastructuring, digital access, informality, environmental justice, social media

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1 Introduction

The use and appropriation of digital technology in contexts with infrastructural limitations have been a significant area of interest for Human-Computer Interaction (HCI) researchers (e.g., [1, 4, 5]). Building on earlier work on how people experience and respond to infrastructural inequities, especially in Low- and Middle-Income Countries (LMICs) [2, 10], my PhD research explores how individuals and communities adapt digital technologies to overcome infrastructural challenges, focusing on informal practices and the role of social media in advancing social justice causes. In doing so, we use the lens of infrastructuring which is defined as "creating

socio-technical resources that intentionally enable adoption and appropriation beyond the initial scope of the design" [3, 6] to develop an understanding of grassroots practices to overcome limitations.

1.1 Research question

Overall, in my research, I propose to investigate the following overarching research question: What are existing and future informal practices on social media for overcoming limitations of infrastructure and unequal power dynamics in the context of advancing social justice causes?

This question can be broken down into the following research questions that build upon the insights gained from the two completed preliminary studies and one ongoing study.

- (1) What are the existing informal practices on the social media platforms to overcome limitations of infrastructure and unequal power dynamics in the context of advancing social justice causes?
- (2) How can we co-design interactive technology solutions with EJ advocates to support their existing informal practices on social media platforms for including and amplifying under-represented community voices?

By answering these questions, this research aims to contribute to a deeper understanding of how interactive technologies can be leveraged to empower marginalized communities and promote social justice. This research will contribute to the broader field of HCI by providing insights into the role of informal practices and infrastructuring in shaping the design and use of technology and its implication in practice and policy.

2 Completed works

The research comprises several qualitative studies that investigate the adaptation and utilization of digital technology in environments with significant infrastructural constraints.

2.1 Study 1: Infrastructuring for Access to Online Subscription-Based Services in Bangladesh

This study examines the shift towards online subscription-based services in Bangladesh, driven by factors like the COVID-19 pandemic and challenges with international payment barriers [9]. Through interviews with 22 participants, it explores informal market practices such as account sharing, reliance on intermediaries, and the use of social media to access services. These practices reflect broader patterns of informality in technology use in the Global South, shaped

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by infrastructural constraints and power dynamics. Key findings are presented in Table 1.

2.2 Study 2: Participatory Design of Interactive Bicycling Advocacy Tools in Baltimore

The study focuses on co-designing interactive bicycling advocacy tools with bicycling event organizers in Baltimore[7]. We worked with nine participants from five cycling groups in Baltimore with whom we conducted individual interviews first and then three participatory design sessions in future workshop [11] format. The goal was to explore practical motivations for urban cycling, cyclist identity within a car-centric infrastructure, the role of interactive technology in cycling advocacy, and to identify directions for future change to promote safe and sustainable bicycle use in the city. Summary of the key findings of this study is presented in table 2.

3 Ongoing study

The ongoing study focuses on the environmental justice advocacy ecosystem in Bangladesh. The first phase of the study aims to understand the perspectives of environmental justice (EJ) activists in Bangladesh regarding justice and technology [8], which is already completed. The second phase would adopt participatory design approaches to co-design future directions for interactive technology to leverage existing practices to overcome the limitations of infrastructure and power dynamics with the EJ advocates of Bangladesh.

In the first phase, we interviewed five environmental justice advocates from Bangladesh. The findings reveal that the motivations for engaging in climate and environmental justice activism are deeply personal, often stemming from direct experiences with the impacts of climate change and a recognition of systemic injustices. Activists view technology as both a tool and a challenge in their work. On one hand, technology facilitates communication, organization, and advocacy efforts, enabling activists to reach wider audiences and mobilize support. On the other hand, there are concerns about the potential for technology to reinforce existing power dynamics and inequalities [8].

In the second phase, I would conduct two activities as part of research method with environmental justice advocates of Bangladesh and the community members they work with. Table 3 indicates methods for each research question.

- (1) **Focus Group with Stakeholders:** A focus group will be conducted to gather insights from various stakeholders, including community members, activists, and representatives from environmental justice oriented organizations with whom we have established connection in the first phase. This will provide a holistic understanding of existing informal practices and identify key areas for intervention
- (2) **Participatory Design Workshop:** Following the focus group, one or more participatory design sessions, will be organized in the future workshop [11] format. Stakeholders and community members will collaborate to co-design interactive technology solutions that align with the identified needs and goals. This participatory approach will ensure that the solutions developed are contextually relevant and address the aspirations of the community.

I am currently developing the protocol and prompts for the focus group and participatory design sessions. The data collection would likely to begin towards the end of Fall semester, 2024 and continue throughout Spring 2025.

4 Participation in the GROUP Doctoral Consortium

Attending the GROUP Doctoral Consortium will provide an invaluable opportunity to gain feedback on my research from leading experts in the field of HCI and CSCW. I am looking for guidance on how I can present my research to better align with the GROUP audience and in future, for academic job market. I also hope to engage in discussions that will refine my research questions and methods, and to network with fellow doctoral students and researchers who share similar interests. The consortium will also offer a platform to present my work, receive constructive criticism, and explore potential collaborations that could enhance the impact of my research.

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Table 1: Findings of Study 1, presented as themes and subthemes

Themes	Subthemes
The Shift Towards Online Subscription-based Services in Bangladesh	<ul style="list-style-type: none"> Platforms used/popular among users, and why Previous practices – using physical media and torrents Factors leading to the shift towards online subscription-based services – Online platforms becoming popular during COVID, Internet availability and affordability
Obstacles for accessing international subscription-based services	<ul style="list-style-type: none"> Payment difficulties – having to pay in USD instead of local currency Procedural difficulties – process for enabling international payment gateway, the dollar endorsement process
Strategies to Overcome Obstacles to Accessing Online Subscription-based Services	<ul style="list-style-type: none"> Accessing subscriptions and online media through local social media pages and groups, and streaming services Accessing subscriptions and online media through friends, family, and social groups who have access to international payment
Social Motivations and Dynamics Among Subscription-based Services Account Sharees	<ul style="list-style-type: none"> Social motivations Sharing dynamics: sharing with unknown people vs known acquaintances Concerns while sharing with others Coordination and collaboration among sharers
Perspectives on Informally Using Online Subscription-based Accounts	<ul style="list-style-type: none"> Concern about using informal methods Need for convenient payment procedures in local currency
Perspectives on Future Equitable Platform Practices	<ul style="list-style-type: none"> Revisiting sharing policies Expanding content availability

Table 2: Summary of Key Findings of Study 2

Themes	Subthemes	Details
Practical Motivations for Urban Cycling	Cycling as an Alternative to Inadequate Public Transport	Participants cycle as a response to inadequate public transport, using cycling as a more reliable and accessible mode of transit.
	Advocating for Robust and Equitable Cycling Infrastructure	Cyclists organize group rides and advocate for equitable infrastructure across all city areas.
	Cycling to Promote Health and Fitness	Participants highlight the physical and mental health benefits of cycling, promoting it within their communities.
	Community Relationship Building	Cycling fosters community ties, engages youth, and builds an inclusive cycling culture that challenges stereotypes.
Cycling as Activism and Identity Expression	Cycling While Black	African-American participants discuss racial profiling and stereotyping, emphasizing the need for inclusivity in cycling.
	Experiencing the City Differently	Participants use cycling to explore and connect with parts of the city less accessible by other forms of transportation.
	Cyclist Identity in a Car-centric Infrastructure	Cycling forms a community identity that challenges the dominant car-centric culture and related stereotypes.
Use of Interactive Technology in Urban Cycling Advocacy	Social Networks for Advocacy	Participants use Facebook and other social networks to connect, organize rides, share information, and engage in advocacy efforts.
Future Visions for Urban Cycling	Envisioning Imaginary Spaces	Participants envisioned secure bike storage, protected bike paths, car-free zones, inclusive public spaces, and clean environments for urban cycling communities.
	Ancillary Bicycle Infrastructure and Supporting DIY Repair Practices	Expanded bike infrastructure including secure bike parking, showers, BMX parks, and affordable DIY repair hubs for bikes and mobility devices.
	Changing Perceptions through Community Engagement	Advocacy to shift negative narratives about cycling, promoting it as a positive, community-centered practice with vibrant street culture.
	Using Technology to Support Community Awareness and Inclusion	Participants proposed interactive tools for route finding, cycling feedback, and community engagement to foster inclusive and participatory urban cycling planning.

Table 3: Methods for Answering Research Questions

Research Question	Corresponding Methods
RQ1: What are the existing informal practices on the social media platforms to overcome limitations of infrastructure and unequal power dynamics in the context of advancing social justice causes?	Focus group discussion
RQ2: How can we co-design interactive technology solutions with EJ advocates to support their existing informal practices on social media platforms for including and amplifying underrepresented community voices?	Participatory design workshop in future workshop format.

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