

ViralVCD: Tracing Information-Diffusion Paths with Low Cost Media in Developing Communities

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ABSTRACT

We describe ViralVCD: a low cost method for tracing paths of information diffusion in developing communities using physical media. We instituted a participatory video framework for creation and dissemination of developmental videos in seven urban slums and peri-urban communities of Bangalore, India. By combining a call-in contest with Video CDs, we were able to measure developmental impact as well as elicit data on social networks and technology usage practices. In particular, our technique was able to extract data from multiple layers—social, technological, and developmental. ViralVCD allowed us to identify key actors and map information diffusion, as well as technology ownership and access. These findings have implications for HCI initiatives targeting low income locales and populations.

Author Keywords

HCI4D, diffusion, tracking, low-cost media, methods.

ACM Classification Keywords

H5.m. Information interfaces and presentation (*e.g.*, HCI): Miscellaneous.

General Terms

Human Factors

INTRODUCTION

Western world HCI techniques are not always applicable to developing communities, due to profound differences in users, needs, contexts, practices, and goals of projects. In particular, HCI for “Development” (HCI4D) research opens a conversation not just about technology design, but also about the methods employed in user research and evaluation [1, 2]. HCI4D projects are often community-centred and require an assessment of need, relevance, and scope for development in the local setting. Assessments often require an understanding of technology penetration and the underlying social structures of the community. HCI4D projects can benefit immensely from (i) identifying

gatekeepers or critical agents interested in development, and the dynamics of information diffusion in a community, and (ii) piloting content to gauge relevance and interest in the community to avoid expensive technology mismatches.

We developed *ViralVCD*—a low cost, rapid data elicitation technique for low income contexts. Our method combines approaches from participatory design and ethnography, such as probes and snowball sampling. The technique leverages local practices and existing infrastructure to elicit contextual data. It employs physical media and mobile phone questionnaires to gain access to data on multiple levels: *social* networks underpinning information diffusion; *technological* ownership, access, and usage; and *developmental* impact assessment of HCI4D projects. We also identify the social dynamics of communities which could help development organizations, in particular, to assess community-centred projects which may depend upon social relations. While anthropology has explored these approaches for decades, we contribute to the application in technological environments of resource-poor settings.

We report on our deployment from seven urban slums and peri-urban communities of Bangalore. We first created a participatory video framework by involving the local communities. Our ethnographic data suggested that Video Compact Discs (VCDs—a low-cost/low-quality alternative to DVDs) might be an excellent means of distributing videos due to the high prevalence of VCD players, the richness of television screens, heavy television watching, and the low cost of disc media. We screened the videos and distributed the VCDs to a few members of the communities. We then conducted a call-in contest for the viewers, providing suitable incentives. Callers were encouraged to pass the VCD to others, within an allotted time frame. By combining the video extension program with the call-in contest, we obtained insights into the impact, distribution, and viewership of the videos, as well as underlying social mechanisms and technological infrastructures. ViralVCD helped us to disperse news about the project, track and recruit users, and assess enthusiasm in the sites.

Despite the increased interest in addressing development, there is a scarcity of HCI methods for the developing world. ViralVCD is an example of a larger class of possibilities that can be seen as a methodological contribution to researchers working in resource-challenged contexts. It

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blends locally available technologies, existing practices and social structures, and relevant content, to gauge the complexities of development and provide inspiration for design in low-income communities. The technique may also be applicable to non-developmental contexts to trace key actors and social networks, and may broadly be useful to CHI, in addition to HCI4D. It is not a replacement for ethnographic or longitudinal studies. It compliments in-depth studies; however, it is envisioned as a tool for rapidly understanding community settings in a short time span.

APPROACH

We began our study with the goal of understanding information diffusion in low income communities. All of our informants were women. In co-operation with a nongovernmental organization, Stree Jagruti Samiti, we identified three urban slums in the heart of Bangalore, India—Nakalbandi, Ragigudda, and Byssandra (where informants were primarily domestic workers) [5]. With the help of a computer clubhouse, CLT India, we also identified three peri-urban neighbourhoods—Jakkur, Sampigehalli, and Chocanahalli (informants were primarily farm hands and seamstresses). The two sets of communities were chosen for their geographical location, community ties (strong ties within the communities; weak ties with other communities), and income differences (informants in the peri-urban communities were slightly economically better off, with better-paid spouses than the urban slums).

Out of the six communities, we paid special attention to Ragigudda and Nakalbandi. We built a good rapport with them in the process of observing 22 women in three months. We began our study by employing ethnographic techniques, such as participant observation, household surveys, and semi-structured interviews, to understand the socio-economic, developmental, and cultural aspects of our informants. By triangulating our data with inputs from the communities and the NGOs, we determined two key developmental areas that were of interest and relevance to the community—education and health care. Baseline surveys and budget exercises were employed to record current practices in education and health. In parallel, our findings reflected the relative pervasiveness of certain household technologies, in particular VCD players, in these communities (30 out of 64 households owned one).

PARTICIPATORY VIDEO FRAMEWORK

The videos: A participatory framework was used to facilitate observation of a particular subset of the network primarily interested in development issues. By employing a framework catering to local issues, we hoped to create content that was useful and interesting, but one that could ultimately serve as a lens to study its own diffusion.

Episode 1—Nutritive cooking: Our informants attributed their poor nutrition to lack of resources. In order to extract local content and showcase budget cooking in an engaging fashion, we hosted a “cooking contest” in the slums. Judging criteria of taste and nutritional value motivated healthy cooking. Snippets of the contest were embedded

into the final video. This was followed a segment on balanced diet, as explained and prescribed by a doctor.

Episode 2—Childhood education: Parental lack of literacy was attributed to poor academic performance of children and high incidence of dropouts. We scripted a role play involving two non-literate women, featuring local best practices. Techniques to ensure good academic performance that overcame the non-literacy barrier were demonstrated, e.g. making children read aloud, looking for ticks and crosses, and building a good relationship with children. An education expert provided actionable steps.

The participatory element helped gain more momentum in the communities. Inspired by the participatory format in Digital Green [3], where videos featured local members, our hypothesis was that people may want to view the videos more because their peers from similar communities feature in them. We chose not to show videos from a community to its own members to avoid distraction through familiarity. Six videos were shot in total: two in Nakalbandi and Ragigudda each, and two in Jakkur. Images and voice-over narration were employed to hold attention (figure 1, left). Menus were avoided to keep interactions simple.

Dissemination and call-in contest: A screening session was held in each community, where we screened videos on a local television or on our laptop (figure 1, right). Group sizes varied from 6-14 members. Videos were paused for recall and retention exercises. At the end of each session, VCDs containing the videos were distributed to attendees (1-3 VCDs each, chosen at random).



Figure 1: (Left) a screen shot from the cooking video and (right) a screening session in Jakkur.

A contest was initiated to encourage video viewing. At the end of each video, the voice-over provided instructions to “flash” (calling a number and hanging up before the call begins) a number that appeared on the screen (to cut costs for the caller). After receiving a flash, the researcher would immediately call the number back to ask the caller a few questions. Upon answering correctly, an inexpensive, utilitarian prize (utensil or blanket) was provided. In order to gauge the influence of the incentives on call response, we modified experimental conditions: the researcher displayed the prizes to Byssandra and Ragigudda during the screening sessions, whereas Jakkur, Sampigehalli, Chocanahalli were only told that there would be a prize, without explaining what it was. Nakalbandi was not informed about the prize at all until after the contest. Callers were encouraged to pass the VCD to others who may benefit. The contest was limited to a week, after which, calls were no longer accepted. Two screening sessions were held in Ragigudda. The deployment

cost us \$200 in total (VCDs - \$70, phone calls - \$10, and incentives - \$120).

Each VCD was tagged with a unique 6-digit numeric identifier and a phone number. The VCD sleeve contained a photograph of a celebrity—a film star or politician, with the unique number imprinted (figure 2). We kept the videos short (13 minutes at most) and packaged them in an entertaining idiom, so they could be watched at leisure. During the phone call, the researcher determined the unique identifier, photo, and the source of VCD (i.e. person collected from), asked a video-related question, and gathered some baseline data, including the creation of a socio-economic profile. The video-related questions were different for each participant to discourage prior discussion of answers. If callers provided incorrect answers, they were advised to view the video again and call back. Average call length was 3 minutes. Participants were informed about the identification exercise beforehand for transparency.

In summary, physical media featuring development content were created, a mobile call-in contest with a questionnaire was arranged, a clear incentive was marked off for each person in the chain, and an initial meeting was conducted to describe the contest and disseminate the media.



Figure 2: Example VCD and sleeve

RESULTS

We distributed 132 VCDs to 65 attendees (many were given 2 or 3 VCDs). For these attendees, the call response rate was 31.25%, with 20 callers. In total, 50 unique callers were registered and 31 VCDs were transferred (1st level - 20, 2nd level - 14, 3rd level - 7, 4th level - 7, and 5th level - 2, as shown in table 1. Dash indicates no transmission. Refer to Table 1 and figure 3). Each level is an order of diffusion. 1 represents original recipients, 2 shows second order recipients (received from the original), and so on.

Table 1: VCD diffusion. #VCDs=No. of VCDs distributed, #A=No. of attendees & #R=Total no. of respondents

	Community	#VCD	#A	#R	1	2	3	4	5
1	Nakalbandi	30	10	17	5	9	2	1	-
2	Ragigudda	27	9	3	3	-	-	-	-
3	Jakkur	8	8	7	2	1	1	3	-
4	Byssandara	16	8	13	4	3	3	2	1
5	Sampigehalli	24	12	1	1	-	-	-	-
6	Chocanahalli	18	9	6	2	1	1	1	1
7	Ragigudda2	9	9	3	3	-	-	-	-

Social insights: ViralVCD helped us in tracing paths of information and technology diffusion, and the social

processes that drove the diffusion. At a micro level, two forms of diffusion emerged—the prominent, peer-to-peer propagation (A→B→C) and actor-driven diffusion (A→ (B and C)). Peer-to-peer propagation was seen in communities where multiple key (active) actors existed, and actor-driven diffusion was visible where there was a strong actor with a strong social network—like in Jakkur (box 3 in figure 3), where a school janitor was also a Self Help Group founder and had ties with both organizations. Active callers were also active members within the NGO and the community identified through pre-intervention ethnography. In other words, the VCD diffusion process mirrored the already existing information diffusion processes in the community. Across families, the ones with older children and close-knit relatives registered more calls (more callers, more calls) than those with younger children. We found that VCDs tended to be relayed to persons of the same socio-economic profile, such as domestic workers, even though the callers borrowed VCD players and mobile phones from their employers. No difference in diffusion was found across communities with and without strong researcher rapport.

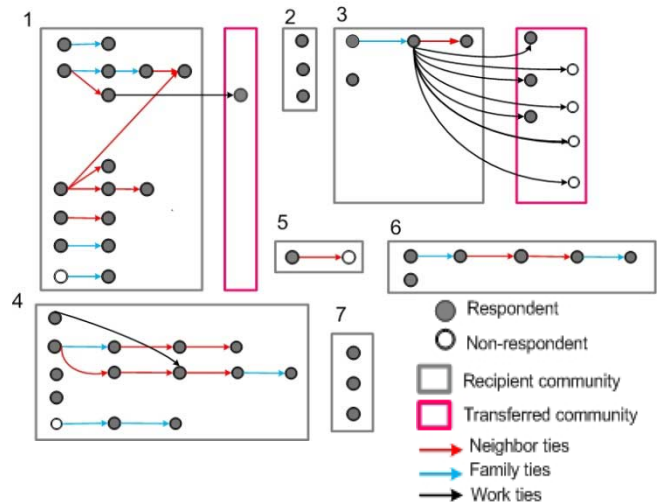


Figure 3: Paths of VCD transfer.

At a macro level, the diffusion reflected the social solidarity of the community—neighbourhoods splintered by heavy internal politics showed fewer proclivities towards diffusion activity, as evidenced in Ragigudda (boxes 2, 7 in figure 3). Tightly knit communities, such as Byssandara (box 4) and Nakalbandi (box 1), exhibited quick and widespread responses. The technique also helped us assess relationships with employers (2 callers used their employer's telephone and VCD player). Family, neighbour, and work ties guided transfers—15 neighbours, 13 family members, and 3 colleagues comprised recipients.

Adjacent pink boxes represent neighbourhoods to which VCDs were transferred through diffusion. The pink box in box 1 represents another slum community reached through a Nakalbandi caller's employer's neighbour's domestic worker. The school that received VCDs through the janitor is seen in box 3. This person even arranged for a screening for the boys of Class VI (none of whom called, hence non-

respondents), with help from the headmistress. Each column of nodes in a box represents a level (first column=attendees, second column=second order recipients, etc.), and each arrow represents a VCD transfer, colour coded by relationship. Non-respondents did not call, but watched the videos (N=3, in addition to the school boys).

Technological insights: Our preliminary surveys and interviews extracted ownership and usage data, but did not reflect in-situ usage. ViralVCD helped us understand the communal usage of technologies: the place, time, and the nature and composition of the group in which the shared activity transpired; the working order of VCD players, televisions, and mobile phones; and the correlation between technology ownership and communal participation. This complemented our ethnography by offering contextual understanding of shared technology use and co-located users. Our findings show that there was a strong correlation between owning mobile phones and VCD players (25/26 phone owners were player owners). Fifty percent of our callers had proximate access, i.e., borrowed players and phones from others (N=25). All phones were mobile phones. Four public pay phones were used.

Developmental insights: In addition to creating opportunities for information gathering, our technique created development extensions for education and health. Because we placed contest details at the end of the video and asked unique questions, viewers needed to watch the entire video to answer correctly. The technique created a direct interview session to assess the impact of the videos. We queried on the understanding and usefulness of the content in health practices and child rearing. By logging the number, we made further calls to gather more data. No perceivable difference in diffusion was found across the income levels in the urban and peri-urban communities.

The role of incentives: Informing VCD recipients about the incentives had neutral effects—Byssandra showed good response whereas Ragigudda showed poor response. Nakalbandi, which was not informed about the prize, nevertheless, showed a good response. The key actor in Jakkur ensured a good response. Sampigehalli called more after the first winner collected the prize, and Chocanahalli showed poor response due to scarcity of DVD players. Incentives were valuable rewards for the effort involved in watching the videos, but people who would call but not pass VCDs were not uncommon. Overriding the incentives, interest in community welfare alone was strong enough to invoke responses in Jakkur and Nakalbandi. Motivations for passing a VCD included welfare—creating awareness among other members; economic—taking maximum advantage of the prize scheme by including family members as recipients; and social—including close friends and colleagues in the scheme.

OPPORTUNITIES

We summarize our main findings from ViralVCD as:

(i) Key actors (active callers and VCD diffusers) were the same as active members within the community itself.

Opportunity: *ViralVCD could be used to identify critical agents in communities*, where informants are unwilling to disclose critical agents, or rapid elicitation is needed.

(ii) VCD diffusion was generally reflective of the state of social ties and technology penetration in the community. Two kinds of diffusion were seen: peer-to-peer and actor-driven diffusion. Opportunity: *ViralVCD could be used to assess the socio-technical makeup of the setting*.

(iii) No perceivable difference in call response was found across income levels or incentives. Opportunity: *ViralVCD could be used across income levels, with appropriate incentive*. Although incentives may entice some callers, interest in community welfare could also motivate.

(iv) Fifty percent had proximate access to VCD players and mobile phones. Opportunity: *Medium technological penetration may be sufficient for the technique*. Sharing may be strong enough to overcome gaps.

(v) Finally, ViralVCD created a snowballing effect—starting with the first-order attendees, the VCDs traversed to fifth-order recipients. By transcending communities, VCDs reached a new slum and school setting, helping us gain access to them. VCD transmission was limited to people of the same socio-economic stratum, agreeing that diffusion of innovations works better with homophilic situations (high degree of similar beliefs, attitudes, and values, and in this case, profiles) [4]. Opportunity: *the technique could be used to identify and recruit peers of the same stratum, possibly across communities*.

ViralVCD avoided additional infrastructure in understanding community capital, technological ownership and access, and developmental baselines. ViralVCD complemented our ethnography by not being limited to the duration of presence of the researcher, providing understandings of organic use, users, and contexts of use, which could be applied to the design of HCI projects.

Beyond ViralVCD: Several modifications could be made as relevant: the physical media could be chosen to be any pervasive technology, such as cassettes or notebooks. Any locally relevant content could be used, and baseline impact could be used to ascertain its value. Material incentives are governed by budget and social relevance.

REFERENCES

- Chetty, M. & Grinter, RE. (2007). HCI4D: HCI Challenges in the Global South. *CHI EA*
- Dearden, A., Light A., Dray S., Thomas, J.C., Best, M., Greenblatt, D., Krishnan G., Pittman C. and Sambasivan, N. (2007). User-Centered Design and International Development. *CHI EA*
- Gandhi, R. Veeraraghavan, R., Toyama, K. & Ramprasad, V. (2007). Digital Green: Participatory Video for Agricultural Extension. *Proc of ACM/IEEE ICTD*.
- Rogers, E. M. (1995). *Diffusion of innovations* (4th ed.). New York: The Free Press
- Sambasivan, N., Rangaswamy, N., Cutrell, E. & Nardi, B. (2009). Ubicomp4D: Interaction and Infrastructure for International Development. *Proc of UbiComp*. pp. 155-164