The Mobile Media Actor-Network in Urban India

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ABSTRACT

Building on a growing body of human-computer interaction (HCI) literature on information and communication technology (ICT) use in the developing world, this paper describes the vast, growing mobile media consumption culture in India, which relies on the ubiquity of informal socioeconomic practices for reproducing, sharing, and distributing pirated digital media. Using an Actor-Network Theory (ANT) based approach, we show how the practice of piracy not only fuels media consumption, but also drives further technology adoption and promotes digital literacy. To do this, we first uncover the role of piracy as a legitimate actor that brings ICT capability to underserved communities and reveal the heterogeneous character of the pirated mobile media distribution and consumption infrastructure in India. We then emphasize the benefits of an ANT-based theory-driven analysis to HCI's efforts in this arena. In particular, ANT enables us to one, draw attention to the ties in the pirate media network that facilitate the increased *decentralization* of piracy in India; two, highlight the progressive transition from the *outsourcing* to the *self-sourcing* of users' media needs as this network evolves; and three, recognize the agency of human *and non-human* entities in this inherently sociotechnical ecosystem.

Author Keywords

Actor-Network Theory; Mobile; Media; Piracy; Entertainment; ICTD; HCI4D

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

Human Factors

INTRODUCTION

As information and communication technologies (ICTs) rapidly penetrate underserved, resource-constrained communities of the developing world, new sociotechnical

systems emerge, introducing new patterns of technology access, interface, and use. This change also creates a need for the HCI community to develop new, evolved approaches to study and design for these sociotechnical systems. Our larger objective, through this paper, is to inform the process of design for a growing population of marginal users who are newly learning to own ICTs and adapt them to fulfill their needs.

We examine the mobile media culture of accessing, sharing, and distributing pirated digital media via mobile chip downloads – a widespread culture that relies significantly on illegal socioeconomic practices. We aim to be agnostic towards the legality of these practices, adopting a neutral stance towards the term "piracy" to refer to the regular procurement and consumption of media in violation of copyright laws (sans the negative connotation it otherwise carries). This allows us to uncover innovative means of media procurement and dissemination, increasingly becoming ubiquitous in socioeconomic settings where original media remains largely inaccessible and unaffordable. Thus we highlight technology practices of users in underserved communities of the developing world – a research area rapidly gaining ground within HCI. Our contributions in this paper are twofold. First, we analyze the heterogeneous character of pirated mobile media production, distribution, and consumption infrastructures in India. Second, we emphasize the benefits of a theory-driven analysis to HCI's efforts that examine technology adoption in the developing world.

The increasingly ubiquitous mobile phone draws upon a rich infrastructure of piracy to bring significant media access to the low-income consumer historically excluded from accessing the more expensive, original versions of this media. By studying infrastructures of piracy in metropolitan India, the down markets of New Delhi, Bangalore, and Hyderabad, we focus on mechanisms for media access and distribution in a resource-constrained environment and the growing consumption of this media among low-income users via multimedia- and Internet-enabled mobile phones. We also highlight how these entertainment-driven practices serve to promote digital literacy and expand technology adoption.

To study these dynamics, we employ Actor-Network Theory (ANT), an approach that was developed to analyze the interplay between technology and society by balancing the approaches of technological determinism and social

determinism [8]. ANT treats everything in the social and natural worlds as "a continuously generated effect of the webs of relations within which they are located [13]", allowing us to generate narratives that trace the paths of these webs. In our study of the pirate media actor-network in urban India, ANT highlights the interactions between consumers and distributors of pirate media and how these cause the network to form, grow, and evolve.

In particular, our use of ANT enables us to one, draw attention to the ties in the pirate media network that facilitate the increased *decentralization* of piracy in India; two, highlight the progressive transition from the *outsourcing* to the *self-sourcing* of users' media needs as this network evolves; and three, recognize the agency of human *and non-human* entities in this inherently sociotechnical ecosystem, thereby also ascribing legitimacy to the pirate infrastructures largely overlooked by mainstream academic research. A significant contribution of this paper is the use of ethnographic data from in-person narratives to situate the pirate media actor-network and its evolution. Hence, we attempt to facilitate a discussion between ANT, ethnographic methods, and HCI.

This paper is structured as follows: the next section provides a review of relevant literature on ANT in HCI, piracy and the informal economy, and technology adoption in developing regions. We then describe our research methodology, before reporting our findings in an ANT framework. Finally, we discuss our findings and conclude.

BACKGROUND AND RELATED WORK
The Actor-Network Theory framework has made occasional appearances in HCI literature in the contexts of participatory design [16][17], as a rhetorical device to gauge the disciplinary turn in HCI [18], and in the realm of information systems [19]. The concept of agency, intimately linked with ANT, is also popular with the design community, and recent work explores the performative role of design materials in the unfolding of design activity [15][31]. These contributions are part of a larger body of literature that aims to better understand sociotechnical systems, also offering alternative versions of the ANT framework to argue for a broader adoption of this approach [22]. We aim to view and capture technology, with its diverse material properties, as it comes into being through engagement with the human world. In particular, we are inspired by the view that technology "… may be materialized by users (and other actors) who define novel ways of relating it to the other entities in their life world…" [14][1]. This view specifically demands an *in situ* analysis to research technology as it unfolds in the hands of the user. By using ethnographic methods, we uncover the processes of technology adoption within infrastructural constraints.

The link between piracy and media practices, especially in the context of emerging markets, is relatively new to HCI, although media piracy has long been present in contemporary global contexts of digital media consumption[2]. Sundaram's monumental research on Delhi markets sheds light on the generation and consolidation of pirate networks of electronic product distribution that 'bleed' into other parts of the city "which is a coordinate of media markets, small software and hardware factories, and local shops that interact with customers [3]". Ilahiane and Sherry's focus on the 'articulate entrepreneur' [11] as the 'processing conduit' for global markets draws attention to the rise of informal actors in emerging markets and the nature of their complex business relationships. Our paper is particularly inspired by the notions of 'bleeding networking culture' [2] and the 'articulate entrepreneur' [9]. Building on the strengths of this existing literature, we cast a specific theoretical lens on media piracy for two reasons. First, we lend rigor to the understanding of the generation and consolidation of pirate media networks. Second, we identify key actors and their relations in the formation and evolution of these networks.

A growing body of ethnographic research in developing countries examines the adoption and use of ICTs, including the mobile phone [21][22][23], emphasizing the interpretive flexibility of technology. We extend this work with our study of entertainment-driven adoption of mobile technologies. We use a similar methodological approach and additionally draw upon ANT to permit a view of media infrastructure and mobile media adoption. Kolko and Putnam [24] draw attention to the non-instrumental uses of technology that promote digital literacy. In the infrastructure-challenged and low-income contexts of use that we study, mobile phone adoption and use has become primarily entertainment-driven. Rangaswamy and Cutrell [25] present an anthropological perspective on the mobile Internet practices of low-income youth in India. Smyth et al. [26] and Kumar et al. [27] examine mobile adoption for consumption and sharing of entertainment media. We confirm their findings but significantly redirect them to disclose a ground-up view and deconstruct the processes of actors and their social networks that incubate and nurture a sociotechnical system. We believe this rich and grounded view of technology infusion and transmission offers potential for expanding nuanced sensibilities towards thriving ecosystems on the margins of HCI.

RESEARCH METHODOLOGY
To achieve an in-depth understanding of mobile media consumption and distribution, we conducted open-ended and semi-structured interviews, observations of mobile

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[1] For the reader new to ANT, Kraal et al. provide a helpful description of the framework and offer suggestions for its use.

[2] Larkin [6] studies media piracy in Nigeria, viewing pirate infrastructure as the totality of technical and cultural systems that create institutionalized structures for circulation of different kinds of goods. Karaganis et al. [4] provide an overview of pirate practices in various developing countries.

phone businesses and their operations, and baseline surveys of existing mobile use trends. Our IRB-approved study took place in the Indian metropolises of New Delhi, Bangalore, and Hyderabad, all of which boast an active culture of mobile media piracy. In preliminary investigations, we observed and interacted with mobile businesses to understand their business practices, clientele, and media management practices for the content procured and distributed. These provided a contextual basis for identifying suitable respondents – shop-owners, assistants, media consumers, and law-enforcers – for our next round of in-depth and focused interviews, each lasting approximately 1-3 hours. Some of these respondents emerged as key informants and field guides, providing valuable insights into pirate media business practices. Having obtained a broad understanding of the mobile business ecology, we narrowed our focus to understand the primary players and operative processes of procuring and distributing pirate media. We paid special attention to practices aimed at acquiring skills for media procurement and transfer[3].

At each of our sites, we sought two kinds of respondents: youth who actively consume mobile media, and mobile shop-owners, assistants, or other individuals engaged in the sale or distribution of mobile media. Our respondents – who were explicitly and openly informed of our research objectives and backgrounds – came from diverse backgrounds, but from low-income earning families, earning on average INR 10,000 (USD 200) per month. Many had migrated from rural parts of the country – with or without their families – in search of improved livelihoods. While some of our respondents were migrant workers – electricians, carpenters, or laborers, others were students who had moved to the city for a better education – and lived with relatives who were migrant workers. A majority of the shop-owners we interviewed had also migrated from their villages in search of business opportunities. All the consumers we interviewed were male and in the 18-25 age group, as were the shop assistants. The shop-owners we spoke to spanned a wider age group (18-40), and were also all male. The lack of women in our sample was not by design, but may be attributed to the use of snowball sampling via male respondents, in addition to being indicative of an existing gender bias in the participation in the exchange and/or circulation of pirated media.

In Bangalore, we visited 18 mobile shops across Gandhi Bazaar, Commercial Street, and Whitefield markets, where we engaged in extensive conversation with the shop-owners and assistants, and observed their shop-keeping practices. We also interviewed 10 mobile media consumers in these locations who, as mentioned above, were migrant workers.

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[3] Participant/shop names have been anonymized to ensure that they do not come to harm for sharing their narratives. Hindi, the language in which we conducted a significant portion of our study, has no direct translation for the word "pirate", but our participants were unhesitant to concede that they were transacting in pirated content.

In Hafeezpet, a slum near the affluent IT parks of Hyderabad, we interviewed 7 users of the mobile Internet, some of who had morphed into expert users of pirate web sites. These informants were identified from a larger ethnographic project on urban slums and ICT adoption. In Delhi, we visited Sewa Nagar and Meharchand markets, both of which cater largely to the migrant population nearby, before exploring the pirate hubs of Ghaffar Market and Palika Bazar in addition. We visited more than 20 mobile shops in these markets, and interviewed 20-25 consumers of mobile media. Our snowball sampling in Delhi commenced from the shop assistants and led us to other college-going youth who were active consumers of mobile media.

Our interviews were audio-recorded and transcribed. We coded our data and organized it thematically to identify emerging patterns relevant to media procurement and distribution. This exercise helped us select our primary actors and their inter-relations in the pirate media actor-network, drawing our analytical focus to the networks that service the media needs of underserved communities. We then conducted another iteration of coding, focusing on the formation, evolution, and dissolution of these networks.

AN ANT FRAMEWORK

The Actor-Network Theory framework was developed to examine the alignment of interests of the social and the technical to see how they impose worlds upon each other, and to describe the dynamics and internal structures of actor-worlds [1]. Over the years, slightly different ANT approaches have evolved to address sociotechnical configurations in varied domains [13]. In this paper, we draw upon Callon's *sociology of translation*, because this suitably highlights, in the case of our pirate media network, how the consumers and suppliers of mobile media and the mobile phone interact to result in a thriving actor-network. In this section, we describe the key aspects that motivate our ANT analysis.

Each actor of an actor-network may be expanded into a new actor-network, and likewise – actor-networks may be collapsed into a single actor. ANT thus offers a uniform framework "regardless of the unit of analysis [11]". This becomes particularly relevant to our study of piracy as we accord equal strength of analysis to a plethora of actors in pirate networks. The mobile phone kindles an actor-network in itself, packaging hardware, software, plans and pricing into its affordances. The mobile shop, in turn, generates an actor-network that includes a business element for the shop to remain in existence and a technological element that determines the extent of services it is able to provide to its customers.

Although ANT ascribes symmetry and equal agency to humans and non-humans, for which it is frequently criticized [29], it does differentiate between them from the perspective of intentionality. Objects may not be

empowered with intentionality or have the desire to effect a particular outcome, but they have the agency to modify a state of affairs through their availability and use, e.g. Latour's door-opener [7]. We do not ascribe intentionality to the technology we study, but we do draw upon the agency of this technology as it acts on the users to afford particular media storage, consumption, and sharing practices.

By eliminating the histories underlying interactions among actors and ignoring intentionality, ANT allows for a neutral analysis of this actor-network, in that it ascribes due worth to the roles fulfilled – if illegally – by the pirate actors we study. In eliminating the afore-mentioned histories, however, ANT has been criticized for its "austerity to the depicted social worlds by circumventing historical sensibilities and eschewing actor intentionality" [21][30][31]. This paper attempts to redress some of this critique with the use of grounded first person narratives. Ethnographically informed actor-networks allow us to capture the richness of a historically informed social world and contextually informed actor motivations to offset the theoretical symmetries imposed otherwise by ANT.

While we considered alternative theoretical frameworks, we found them unsuitable for our analysis. For example, a materiality framework fails to capture the web of social links that ANT highlights, or affect theory, which focuses on the passion that drives technology adoption but sidelines the technology itself. Admittedly ANT has its limitations. It precludes a historical perspective and obscures the role of cultural values in driving the ubiquitous nature of media piracy. These, however, have previously been addressed by Sundaram [2] and Manuel [3].

FINDINGS

Our actor-network is built on the links that dictate media procurement, disbursement and consumption practices. To examine this actor-network, we follow our actors as they engage in pirated acquisition, sale, consumption, and redistribution of media. We first describe our actors and then the relations between them that result in the formation of our pirate media actor-network, also outlining the moments of translation [1].

The Actors

Actors are human or non-human entities that "can be endowed with interests, projects, desires, strategies, reflexes, afterthoughts, with the ability to enroll other relevant actors [10]". The two main categories of human actors that emerged from our ethnography are of *media suppliers* and *media consumers*. We label actors as consumers or suppliers based on their dominant roles in the network. However, these labels are by no means permanent and, as our actor-network evolves, may overlap or change altogether. The media supplier meets the entertainment needs of the consumer. This is enabled, in turn, by our third category of actors – the *technology*, and most notably the

mobile phone, in the absence of corrective action by our fourth category of actors – *law enforcement authorities*. We now describe these actors and how they originate from, are empowered by, and further perpetuate our actor-network.

The Media Supplier
Our first category of actors includes *media distributors*, who provide media to consumers for financial profit, and *media entrepreneurs,* who do not sell media but proactively engage in procuring and supplying media, driven by social recognition instead.

Raju is a media distributor. He is a 20-year-old male and works as a technical assistant at Lakshmi Communications – a mobile shop[4] in Sewa Nagar Market (New Delhi). He learned to use a computer in a six-month training course and is adept at operating the shop's PC for media and software use. He transfers content from CDs, DVDs, and USB drives to the PC, organizes it into folders, and assorts it into 1GB/2GB collections that he can transfer onto the mobile phones of customers. For this he earns INR 6,000 (USD 100) per month. He is an avid consumer of media himself and plays song audios and videos in the background while he works. By virtue of his employment at the shop, he has free access to both regional and Bollywood content, which he enjoys. He is fond of Bhojpuri films and music, which originate from his native state of Bihar where he migrated from 2-3 years ago for an improved livelihood.

Lakshmi Communications is run by Shankar – a 25-year-old small businessman who dropped out of school after 8th grade – who makes decisions regarding whether to engage in the sale of pirated media or not. Shankar also hires a mobile repair assistant, who sits at a small desk in a corner with his tools, is familiar with different brands and models of mobile phones and their parts, and seemingly adept at trouble-shooting. As multiple shopkeepers in Sewa Nagar informed us – low-income earning users typically purchase Chinese-manufactured unbranded phones that (they know will) break down often. When this happens, the users bring back their phones for repairs to the shops where they had bought them in the first place, providing a steady and profitable source of revenue to these shops. This also helps to maintain an ongoing relationship between the shop and its customers and media is frequently part of their transaction. In addition to providing media and repair facilities, Shankar sells mobile accessories including covers, headsets, and portable speakers. He also deals in SIM cards, providing new mobile connections and recharging prepaid SIMs. By providing a host of mobile-

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[4] The mobile shop, as mentioned earlier, is an actor-network in itself, comprising mobile phones and accessories, a technical assistant, repair assistant, a business manager and possibly others, though their roles may be combined in some cases, such as when the shop-owners have the technical expertise to generate and circulate media libraries on their own. With minor differences, the structure of this mobile shop remains the same in the cities we study – New Delhi, Bangalore, and Hyderabad.

related services, Shankar aims to provide high quality customer service and ensure that the customer *"does not leave [his] shop disappointed."* Thus he addresses the stiff competition from the slew of mobile shops that have flooded the Sewa Nagar Market in the last 1-2 years.

Yousuf, on the other hand, is a *media entrepreneur* who shares various audio-visual content with friends and family and loves the social recognition he gets as a result. Yousuf, now 20, dropped out after eighth grade to manage his family's newly converted mobile shop in Hafeezpet (Hyderabad). He is passionate about all things mobile, and shows off his knowledge of various mobile parts – cameras, keyboards, speakers, etc. Like Raju, Yousuf works at a mobile shop as well, but chooses not to engage in the sale of media downloads. His response to pirate practice is shaped by a fear of having to deal with the police (and potentially shelling out hefty bribes to them) and a clouded grasp of copyright infringement laws in general. He explains:

"The Government has made rules. If you have a system [PC], you must have a license… like a driving license… for downloading. … The police will come and check your system. They will see if you have downloaded. There was a shop in the neighborhood. They had no license. They were downloading videos for Rs. 200. The police came and asked for videos and took away their system. Now the shop doesn't exist. This is why I don't sell any media content."

Yousuf routinely downloads new releases onto his 2G Nokia phone. He starts the process at 1.30 a.m. when he can simultaneously download 4 movies. Each download takes 1.5-2 hours in the night, he says, while in the daytime *"it is divided,"* each movie taking 3-4 hours. Yousuf regularly scans pirate movie sites and downloads these movies as soon as they become available, then sharing them (via Bluetooth) with his friends. Movies are more his thing than music, he says:

"People come and ask me for songs. They say which songs they want. If I keep downloading songs for them from their lists, it will be evening. I can't spend so much time."

Yousuf proudly shares his technical knowledge with us, making evident his enthusiasm for media procurement and sharing. He and other media entrepreneurs we encountered indulge in piracy not for financial gain, but to have their technical expertise contribute to an elevated social status (in addition to serving their and their friends' entertainment needs). Sanjay, a 23-year-old media entrepreneur in Delhi who regularly downloads songs and movies for his friends and family, also mentions:

"The smile on their faces when I give them what they're looking for… that is what drives me to do this."

In this actor-network, the role that Raju plays is different from that played by Yousuf and Sanjay. The former acts as an *intermediary*, who according to Latour conveys "meaning or force without transformation: defining its inputs is enough to define its outputs [8]." In contrast, Yousuf and Sanjay are *mediators* who "transform, translate, distort, and modify the meaning of the elements they are supposed to carry [8]." Intermediaries transfer media from one device (mobile phone or PC) to another without augmenting the user's skills or technical knowledge, while the mediators transfer media to others' devices and aid them with various tasks and/or services. Raju silently conducts media transfers to address the customers' needs. His motivation is not to enable them to procure the media themselves, since his earnings depend on their dependence on him. Yousuf and Sanjay, however, have different motivations. They pride themselves on keeping the most up-to-date mobile-related information. They are familiar with the latest mobile Internet plans (which change frequently), recognize phones by their make and model as well as software and hardware, and have memorized a list of websites from where one can download movies. They selectively share this knowledge with friends and family, teaching them where from and how to download Bollywood songs, for instance. Because of the widespread demand for entertainment media, this helps them maintain an elevated status in their social circles, simultaneously enabling the transfer of skills from experts to novices.

The Media Consumer
Our second category of actors is the *media consumer* who seeks pirated media for listening and viewing. We break this category down further to distinguish between two kinds of consumers. The first is the *consumer* (to keep things simple) who through his/her demand for cheap, pirated media, brings business to the supplier, while the second has evolved into an *alpha consumer,* proactively procuring his/her content from illegal websites using the mobile Internet. The first kind of consumers generally comes from a community of technically unskilled users, seeking the mobile shop for various kinds of assistance. The mobile phone is the first and primary personal technological device they own. Be it for the recharge of prepaid mobile SIM cards, upgrading to a new mobile phone, or purchasing mobile accessories, they routinely visit mobile shops, frequently procuring a few GB of mobile downloads as a part of their transaction. This entertainment media is then consumed alone or with friends. Ravi – a 22-year-old electrician in Bangalore – is a migrant worker from Assam. Since he lives alone in Bangalore (with his family in Assam), he meets his friends in mornings and evenings when they collectively partake of Bengali music and films online on his friend Sunny's mobile phone. This daily activity makes him feel closer to home, he says. Ravi has learned about Internet downloads from Sunny, and recently spent INR 5,699 (USD 110) to buy a GPRS-enabled Chinese unbranded mobile phone to access the Internet: *"I*

wanted to be able to download the latest Salman Khan[5] film and watch it on my mobile." He is unable to do so, however, because he claims his mobile service provider said it was impossible. He is now stuck with this phone, continuing to obtain his media from Sunny via Bluetooth. Most low-income users we interviewed came from migrant labor communities or families who had moved to the cities in search of employment. There is thus a strong demand for regional content – movies and music – that they can consume and share with friends and relatives. These users rely entirely on pirate sources for their entertainment.

The second set of consumers, the *alpha consumers,* includes those who have evolved into savvy mobile Internet users, quickly mastering tricks along the way that help them satisfy their hunger for the latest audio visual content. Kulbhushan, an 18-year-old male from Hafeezpet (Hyderabad) has grown into a sophisticated mobile Internet user after he bought his first prepaid Internet voucher[6] two years ago. He says: *"… I need my fix of Salman Khan songs and trailers… the Internet gives me quick and ready access to these…."* Since then, Kulbhushan has moved on to identify the UC Browser [25] as the one that works best for him, enabling him to use gaming applications of his choice. Not only is he now an expert at browsing his mobile web, he also gives crash courses to his friends regarding *" ...the correct AV player from the correct web site ..."* and *"what buttons on the phone to press for what functions…. "* For these consumers, the pirate web not only fulfills their daily entertainment needs but also transforms them into savvy Internet users able to fuel media consumption in their social network of friends.

The Technology

An integral part of the exchange between the media consumer and supplier is our third category of actors – *the technology*. We include in this category devices that enable the distribution and consumption of media, such as mobile phones, PCs, Bluetooth technology, the media clips, and the Internet and/or CDs from where this media is procured.

The agency of the mobile phone – the artifact, along with the hardware and software it encompasses – is represented by its affordances. Equipped with the ability to provide audio-visual entertainment to its user, and to render accessible (or not, as with Ravi) all the content that exists on the Internet through 2G and 3G connections, the mobile phone is an enabler of many things – especially (as mentioned above) among those for whom it is the first and only ICT device owned. Media entrepreneurs use this

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[5] At the time of this fieldwork, Salman Khan was the most popular Bollywood actor for the Indian masses.

[6] For our group of respondents, postpaid Internet plans are scarce. The mobile Internet is most commonly accessed using low-cost prepaid vouchers. The cost of these today, although carrier dependent, may be as little as USD 0.30 for 3 days.

phone to download media from the Internet (as Yousuf and Sanjay do) and transfer it (using Bluetooth) to users like Kulbhushan, who is quickly mastering the tricks of the pirate trade. The inexpensive prepaid mobile Internet vouchers they use signal a distinct shift in the processes of media piracy, reshaping practices of media consumption and distribution.

For the media distributors who conduct mobile chip downloads for financial gain, the PC is a critical component as well. It allows faster transfers than the mobile phone, and also affords considerably more storage to cater to various customers from diverse backgrounds. Indeed the Sewa Nagar Market would not be a pirate hub were it not for the PC enabling the media business. Also critical to our network are the regional CD shops that supply the content that isn't yet available on the Internet, but caters to the demand of the local unskilled migrant labor. Of course, whether sourced from CDs or the Internet, the media clips (e.g. MP3, MP4, 3GP files) play an indispensable role in our network, since they represent the commodity that is bought, sold, exchanged, or shared.

Thus we see that the technology forms an integral component of our pirate media infrastructure, enabling the practices we examine. The increased affordability of multimedia- and Internet-enabled mobile phones and the near-zero cost of reproducing (and storing) media clips further propagate our actor-network, pushing the demand for low-cost entertainment and resulting in piracy that is more widespread than ever before.

The Law Enforcement Authorities

To enable the sale of pirated goods, it is essential that the *law enforcement authorities* ill-perform their duties. These authorities thus make up the final actors in our analysis of this actor-network. We saw in the case of Yousuf that the fear of legal action – even in light of limited awareness regarding piracy and copyright infringement – holds him back from dealing in the sale of movie and song downloads. This also gives Yousuf the freedom, however, to share technical knowledge with customers who ask him for movies, without conflict of interest.

In Sewa Nagar, on the other hand, we found that the police and anti-piracy organizations (e.g. Indian Music Industry or IMI) are dormant actors, allowing the network to function by not interfering in its processes, even though it is their lawful charge to do so. Interviews with the police and IMI officials indicated that there is a combination of factors that leads to their non-interference. The problem lies both in the administrative structure of these public sector organizations and in the reportedly corrupt practices at the beat constable level. The end result is that the pirate businesses are able to operate confidently, without concern of legal disruptions. The beat constable obtains his daily 'perks' from these shops by threatening to otherwise report their illegal activity. These perks feed upwards into the police

hierarchy, reducing incentives to be duty-bound. Although the IMI's charter appears to be uncompromised, they must act through the police force, but have no control over the police, and cannot ensure that appropriate action is taken, given the corrupt practices of the police.

Thus, we have highlighted the primary actors in the pirate media actor-network of urban India. The entertainment needs of the consumer are met by the media supplier, enabled by the availability of the ubiquitous and affordable mobile phone, in the absence of corrective action by the law enforcement authorities. We now focus on the ties that link these actors in the subsection below to enable the formation and evolution of our pirate media actor-network.

The Actor-Network
An actor-network is a set of heterogeneous actors who come together to form a network based on ties that afford them mutual gain. The origins of our actor-network spring from the availability of (previously inaccessible) pirated mobile media for consumption. For low-income users, original forms of media are too expensive for regular consumption, as seen in [26][27]. This limited market potential found respite when digital reproduction made media cheaper and accessible to the masses [2][3]. As the mobile phone became ubiquitous, it also facilitated greater consumption of this media. Our actor-network represents the flow of media via a diverse set of disbursement channels, across the actors presented above. These distribution links form the surface of a set of deeper, less visible social ties. We categorize these ties as *strong* and *weak*, depending on the nature of media disbursement taking place – for commercial or non-commercial purposes, the permanence of relations, and the stakes involved for various actors[7].

Strong Ties
In Sewa Nagar (Delhi), there exist CD/VCD/DVD shops alongside the mobile shops, providing the consumers with regional music and movies that they take to the mobile shops. Here, the media is ripped off the CD and converted to formats that can be downloaded onto the mobile phone. Indeed, regional content is key, because the clientele consists primarily of migrant workers who desire content from their native regions. The customers also act as carriers of media, as Shankar (the shop-owner of Lakshmi Communications in Sewa Nagar Market) explained:

"If someone comes and asks for music we don't have, we tell them to go to Himachal Music [across the street] and buy the CD, which we will download onto their mobile."

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[7] The notion of "weak" and "strong" ties was incorporated into our actor-network to differentiate between ties that perpetuate the network and those that slowly bring it to disintegrate. The weak ties we discuss here are not related to Granovetter's conception of *weak ties* in social networks [28].

Himachal Music – in turn – sends customers requesting mobile downloads to Lakshmi Communications. CDs at Himachal Music – on average – cost INR 35 (USD 0.70). Customers buy these CDs, take them to Lakshmi Communications, and have them converted to mobile format. As part of that transaction, Lakshmi Communications keeps the digital reproduction of the CD (returning the physical CD to the customer) and charges INR 30-40 for their service. Shankar spoke of his clients and their (mostly Chinese, unbranded) mobile phones:

"China mobiles have everything – camera, memory card, speakers…. 60 percent of our customers use the phone to listen to songs alone. This is true for those who don't have any other medium of entertainment at home. Like migrant laborers – they don't have any [television] sets. They have nothing else [but the mobile]. They figure out everything. They know they can copy from CDs. No one takes songs from the Internet. There are a lot of people who do Internet downloads, but you can't do that on China mobiles. So we copy from CDs, convert to 3GP format, and then download onto their phones. ... In music, we have Hindi, Bhojpuri, Punjabi – we have everything."

The ties in this network are relatively less volatile, due to the investment involved in setting up the CD/DVD shops that supply content, and the mobile shops that convert this content to mobile formats, maintain libraries of it, conduct downloads, and provide other mobile assistance to their clients. Here too, we see two kinds of relationships. Those between the CD suppliers and the mobile shops are supply-side relationships. By continuing to play their roles as actors in this pirate network, they are able to maintain a mutually beneficial bond. In contrast to this is the client-facing relationship between the shops and their customers. The shops aim to lock their clientele into a relationship by providing them superior customer service and fulfilling their mobile needs. While the customers are not obligated to return to the same shop, it is often in their financial interest to do so. Due to the absence of a rigid pricing structure, they are able to obtain lower rates by becoming regular customers. Although contributing to the informal economy, these ties are more formal and permanent, *stronger* than the *weak* ties based on non-commercial links we describe below.

Weak Ties
When Yousuf downloads pirated content off the Internet, media is transferred over the Internet, which he then shares with friends and acquaintances. Social ties also govern the transfer of media in the case of Ravi, who obtains media from Sunny, sharing it with his Bengali friends – all migrant workers. We call these ties, based on social gain, weak ties. They are less permanent, with media transfers taking place in a more impromptu and volatile fashion, mostly via Bluetooth connections. Financial investments, such as in the case of setting up and maintaining a business, do not factor into these social networks. When the ties are

weak*,* none of the actors have a measurable stake in perpetuating the exchange of pirate media. However, the weakness of the ties also encourages the actors to perform greater mediation, so as to establish greater peer-to-peer connections. For instance, Ravi's friend Sunny is the technology expert in their social group. By proactively downloading Bengali media off the Internet or streaming YouTube videos, Sunny demonstrates his expertise before his friends, augmenting their digital literacy, such that they slowly graduate towards conducting these downloads themselves, as Ravi did. Yousuf and Sunny play the role of a mediator, transmitting technical know-how by being consumers themselves. The effect of their mediation is visible in the resulting acquisition of more advanced mobile phones by users in their social circles, expressly motivated by the desire to conduct their own downloads.

The ties that determine media disbursement, together with the human and non-human actors presented above, comprise our actor-network. The sustenance of this actor-network relies on the perpetuation of several links: the mobile shop and media entrepreneurs must have a steady source of pirated content to draw their media libraries from, and the consumers must desire this media, which must, in turn, reach them via the existing media disbursement channels discussed above. Our actor-network may be considered a success or failure based on the alliances between its human and non-human actors, and the longevity of these alliances. If the alliances are long lasting, that is, if a demand for pirated media continues to exist and engage the skills of the suppliers, the network will not fail. Sustenance will be a challenge, however, if the dependence on these actors falls, and they are no longer considered useful in addressing the needs of the consumer. This is when the growth of the actor-network slows down or stops.

The Moments of Translation
Having described the formation of our actor-network and the actors themselves, we now embark on a discussion of the moments of translation [1] to trace the formation and evolution of this network. Translation – by which the actor-network comes into existence once the actors' interests are aligned – occurs in four stages, which we discuss below. Through an analysis of these stages, we are able to arrive at a better understanding of the stability (or lack thereof) of our actor-network.

In the *problematization* stage, media suppliers introduce media and technology to novice mobile users, showing them what they can accomplish with their mobiles. As providers of media that was otherwise unavailable to the users we examine, these actors establish themselves as an *obligatory passage point* (OPP) in the network of relationships they build with the media consumers [1]. They acquire the technical know-how necessary for procuring and transferring media, as well as for addressing other mobile-related problems. This is done with the objective of promoting long-lasting ties with the consumers who seek

their assistance. They offer downloadable media for the mobile phones of the consumers, catering to the different formats of different makes of mobile phones, doing what is necessary to stay out of the law-enforcers' way or keep them placated (through routine bribes).

Interessement, here, is the group of actions by which the primary actors – the media suppliers in our case – try to impose and stabilize the identity of the other actors in the actor-network. In the problematization stage, we find that these actors are aligned with the consumers, the mobile technology, and the law enforcers, in order for them to attain their objective of distributing mobile media. In the interessement stage, they try to interest the consumers into seeking their service for acquiring media. Both the mobile shops and the media entrepreneurs try to build their technological expertise (by taking training courses, learning from friends, etc.) so as to increase the repertoire of services they provide. They also pay special attention to the media demands of their clients. They adopt different approaches, however, for addressing these demands. The distributors build up large libraries of media with old and new Bollywood content, in addition to regional content acquired from neighboring CD shops. The entrepreneurs, on the other hand, acquire media as and when requested by their select (and smaller) group of clients.

In the *enrolment* stage, a group of actors emerges, with well-defined roles and relationships. As Callon says, "to describe enrolment is thus to describe the group of multilateral negotiations, trials of strength and tricks that accompany the interessements and enable them to succeed [1]." For the media suppliers to successfully enroll the other actors (consumers, technology, law-enforcers), the latter must accept the roles imposed by the former. Enrolment is achieved by a series of measures taken by the primary actors to secure their practice. The distributors offer their consumers a range of media services, as discussed previously. They expand their technical expertise to cover specific requirements of different kinds of phones, to enroll the technology. As for the law-enforcers who use their influence over mobile shops, they are negotiated too – as mentioned above.

In our actor-network, *mobilization* (or propagation of the network) is not fully achieved for the same reason that the network does not break down. That is, the network spawns numerous smaller networks as more and more alpha consumers begin to evolve into media entrepreneurs, albeit at varying skill levels and circles of influence. This is their act of "*treason*" [1] that causes the initial actor-network to change. We turn to the impact of this treason next.

DISCUSSION
We organized our findings on the pirate media infrastructure in urban India using an ANT framework, identifying its actors and the ties that run between them, to understand the evolution of media practices within

underserved resource-constrained communities. These findings highlight two ongoing processes that we discuss below, first from the perspective of the actor, then from the perspective of the actor-network.

Actor-Agents: Centralizing the Actor

ANT draws our attention to the mobile phone, the unique technologic and economic affordances of it, and how it sustains the pirate media actor-network by becoming an agent for procuring, storing, and playing back media to the consumer at low-cost. Increasingly affordable storage options (a 4GB micro-SD card roughly costs USD 6) conveniently host large numbers of audio and video files. These features are certainly agreeable to the functioning of our network.

Intermediaries such as Raju, financially motivated, try to engage their customers with varieties of media or improved customer service. Mediators such as Yousuf and Sanjay, on the other hand, keep themselves skilled and knowledgeable to cater to the media needs of their friends and family and thus gain a better social reputation. While the intermediaries are keen to sustain the network, the mediators are increasingly spawning an additional set of mediators through a gradual transfer of skills and knowledge. Their contribution is two-fold. First, they pull consumers away from the profit-oriented media distributor by offering them media services free of cost. Second, they gradually teach these consumers their newfound skills (*pro bono* or for favors in kind) to source their own (pirated) media through online downloads. This process is more easily attained due to the wider adoption of Internet-enabled phones and a supporting telecommunications infrastructure. Highlighting here the morphing of the alpha consumer into a media entrepreneur, that is, the graduation from *outsourcing* to *self-sourcing*, is a key contribution of ANT.

Actor-Networks: De-Centralizing the Network

The question that naturally arises is of the stability of our actor-network. No doubt the distributors, by their acquisition and disbursement of cheap and accessible media that is in high demand, are able to create and sustain a market for themselves. While there is still a supply and a demand to keep this market going, there is a change in the network resulting from the transfer of skills mentioned above. With new (more convenient and less expensive) means of goal satisfaction now available, the consumer is less likely to keep the network going. The sustenance of our network is disrupted by the emergence of consumers who now have sufficient technical expertise to acquire their own media and share it with friends. Their motivation to acquire this skill-set is in part so they may self-source their media needs, but it also originates from a desire to be seen by their friends as a 'go-to' person for their technological needs. The links in our network are thus redefined. In ANT's vocabulary, while the intermediaries promote the sustenance of the actor-network, the mediators cause it to break down by spawning many more, smaller networks.

The result is a *decentralization* of piracy, as the digital nature of media no longer imposes traditional channels of physical media acquisition and distribution.

ANT's unique contribution to facilitate an understanding of the pirate media actor-network is in its definition of actors – not just because it ascribes agency to mobile technology, but also because it legitimizes the role of piracy in altering media consumption by equalizing the role of media suppliers and consumers. We see, through an ANT lens, how piracy, by fulfilling non-instrumental needs of mobile users, promotes digital literacy – even among the most resource-constrained communities. This perspective is especially critical for the HCI community studying the applications of mobile technology in the context of developing regions, as it highlights one major actor that drives mobile adoption and diffusion.

CONCLUSION

The field of HCI is increasingly pushing its traditional boundaries as it engages with technologically motivated developmental efforts in underserved, resource-constrained regions. For the success of these efforts, it is critical to understand how users in these regions interact with and adopt technology, and the factors – both social and technical – that play a role in this adoption. Our paper contributes to these efforts by examining a vast, growing mobile media consumption culture in an infrastructure-challenged, urban Indian context. By combining an Actor-Network Theory (ANT) approach with ethnographic methods to analyze this culture, we aim to provide a deeper understanding of the agency of mobile technologies, media suppliers and consumers, which sustain widespread informal socioeconomic practices for reproducing, sharing, and distributing digital media.

The lens of piracy offers greater insight into technology practices by allowing us to uncover, via ANT, the progressive transition from the outsourcing to the self-sourcing of media, as the transfer of knowledge and skills from experts to novices (motivated purely by social recognition) makes mobile users sufficiently digitally literate to browse for, download, consume, and share their own media. The emerging media entrepreneurs slowly gain mastery over today's devices and become autonomous with their technological needs. They break away from their dependence on the media suppliers, bringing other consumers to do so as well, fulfilling Latour's definition of *mediation* [8]. They are also the forces of treason that result in the fragmentation of our actor-network into smaller networks, operated on the basis of social and not commercially motivated ties, progressing steadily towards a decentralized pirate media infrastructure. The motivating forces, as uncovered by our ethnographic findings, are of increased self-reliance, availability of a more suitably tailored assortment of media, and of course the zero cost. Thus we emphasize the role of piracy in bringing basic, or

occasionally more sophisticated, ICT capability to underserved communities. This finding highlights the long-term constructive impact of media consumption in particular and non-instrumental uses of technology overall.

In a world where the social and technical are increasingly becoming intertwined, our aim through this paper is also to introduce ANT to the HCI community in a cohesive, digestible format that will aid future efforts. Additionally, we demonstrate how ANT can inform future ethnographic explorations in HCI research. The unique contributions of ANT enabled us to shed light on key aspects of the pirate media network and its practices, allowing for a superior understanding of the emerging mobile culture in urban India in particular.

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