The Increasing Sophistication of Mobile Media Sharing in Lower-Middle-Class Bangalore

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ABSTRACT
During the first decade of the 21st century, the rise of mobile feature phones in India saw the development of both an economy of informal media exchange and a culture of active media sharing for entertainment. Mobile phone owners paid for pirated movies and music on the grey market, and they traded them with one another, even using poorly designed mechanisms such as Bluetooth file exchange.

In this paper, we update what is known about the dynamic mobile media sharing culture through qualitative interviews conducted with low- and lower-middle-class participants in and around Bangalore. We find that with the increasing penetration of smartphones and data packs, media sharing has not only continued, but has blossomed into a rich and varied range of activity in which mobile owners display sophisticated knowledge and behaviors. Our participants deftly juggle multiple media devices, mobile handsets, SIM cards, storage devices, mobile applications, and cloud services as a way to navigate issues of cost, file size, data bandwidth, physical proximity, and social engagement styles. We consider our findings in the context of domestication and amplification theories of technology.

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1. INTRODUCTION
The last two decades have seen rapid changes in mobile phone technologies. Handset hardware, software, wireless technologies, and mobile services have all undergone radical transformation. What's more, the transformation has been experienced around the world, at least as much in the developing world as in the developed.

In a 2010 paper, Smyth et al. described how the mobile feature phone enabled a vibrant culture of mobile media sharing in urban Bangalore [26]. Feature phones are mid-range mobile phones that occupy a space between basic phones (that permit only voice and text) and smartphones (which have full computing capability) in terms of cost and function. Though feature phones do not match the computing power of smartphones, they are nevertheless able to play music and video, the latter at a sufficiently high resolution that it is not entirely uncomfortable to watch video clips and even movies on them.

Smyth et al. found that feature phones filled a gap in entertainment alternatives for lower-income groups. Some of those interviewed either could not afford television sets and DVD players, or did not have anywhere to put large electronics due to the temporary or cramped nature of their housing. The feature phone served as an inexpensive, personal, entertainment device.

Indeed, by the time that study was conducted, the researchers found a thriving underground economy in which small shops that otherwise provided mobile sales or repair services also sold pirated entertainment media typically by downloading content to the microSD cards that most feature phones accept as supplemental memory. From these media dealers, customers could receive a few gigabytes of digital media – easily several full-length movies and hundreds of songs – for 50 or 100 Indian rupees (US$1-2).

In addition, some feature phone users actively shared media content with friends and acquaintances, going so far as to navigate the decidedly unfriendly user interfaces for performing Bluetooth file exchange. The authors titled their paper "Where There's a

Will There's a Way," to highlight the fact that even bad UIs did not frustrate the strong desire for sharing entertainment [26].

In the six years since, India has continued to grow economically while technological advances have continued worldwide. Smartphones in particular are rapidly penetrating lower-income communities, particularly in urban areas. In 2015, estimates for Indian mobile Internet use were approximately 250 million users in a country of 1.2 billion people, of whom some estimates counted no more than 70-140 million people in the middle and upper classes [2], [19][20]. This suggests that well over a hundred million people from lower-income Indian communities are mobile Internet users.

In this paper, we outline the findings a qualitative interview study of media content users which aimed to understand what, if anything, has changed since the study by Smyth et al. The interviews were conducted in Bangalore and its surrounding areas in 2015. We find that mobile media sharing has blossomed into a rich and varied range of activities among lower-income individuals. Almost all our participants had smartphones with some form of internet access. Just as with Smyth et al. in 2009, mobile usage is dominated by routine communication, media consumption, and media sharing. However, we found a dramatic increase in the diversity and sophistication of technology use and media sharing behavior. Not only do users juggle multiple SIM cards and handsets, they also use a wide range of apps and techniques to download, store, share, and exchange media, often making fine-grained decisions that depend on file size, bandwidth, cost, distance (e.g. whether collocated or not), and so forth. These findings resonate with themes from domestication theory and amplification theory, and demonstrate that while the technology has evolved, the key insights from Smyth et al. still hold.

2. METHODOLOGY

Our research was instigated by an interventionist aim: to see whether we could intentionally introduce videos containing public service messages into the informal video sharing market in the hopes that they would go viral and cause positive shifts in behavior, particularly among lower-income groups that are the least influenced by knowledge propagated via mass media [27]. To undertake such an intervention, however, we needed to reconfirm whether people still engage in mobile media sharing, and if so, just how media sharing occurs among the groups we intend to affect.

Our approach follows the traditions of socio-technical systems and ethnographic design, in which close attention is paid not just to the technology, but also its human users, and the interaction between them [4], [5], [7]. These approaches are established practice in the field of human-computer interaction, which often begins with a qualitative investigation prior to the design of technology [28]. The objective is to understand people's existing use of technology, their preferences, needs and desires so as to inform design.

In June and July of 2015, we interviewed 31 people from in and around Bangalore. 27 participants were from central Bangalore (Commercial Street, Shivajinagar, Ulsoor) and two Bangalore suburbs (Ganganagar, Yelahanka) and 4 people were from Hassan, a small city about 200km from Bangalore. We interviewed two kinds of participants: (1) 24 lower-middle class mobile phone users, selected because they had media on their phone; and (2) 7 people who worked in or owned mobile phone shops or complexes. These latter were interviewed to understand the media sharing ecosystem from the perspective of those who had provided media for sharing in bulk in Smyth et al's study. We intentionally selected participants whose demographics approximate those in Smyth et al.'s previous work [26] so as to allow for comparison. Our participants were mainly in blue-collar and service industry jobs including drivers, beauticians, shop workers, a cook, an electrician, a furniture manufacturer, and a caretaker. Two of our interviewees were students. In comparison, Smyth et al.'s study involved 25 participant interviews (21 male) from the streets of Shivajinagar and Yeshwanthpur neighborhoods of Bangalore. They interviewed 16 mostly blue collar workers, 6 mobile content providers, and 3 participants in the media sharing ecosystem. The average income of their participants was Rs 8,300 ($166), which is consistent with the majority of our mobile-phone user participants: 7 interviewees earned below 9,000 Indian Rupees per month ($132); 11 earned Rs. 10,000-19,000 ($132-$278) and 6 earned more than Rs. 20,000 ($293), including an auto-driver bringing passengers to a craft shop and a cab driver who both earned the maximum income in our sample, 35,000 Rupees ($513).

All participants were between 18 and 31 years of age, and of the 31 participants, 24 were men and 7 were women (similar to Smyth et al). Interviewees were recruited on the streets and from the transport department of a Microsoft office. Since there were more men than women in these locations, we also targeted locations where we were likely to encounter more women, such as beauty salon employees. In addition, in an attempt to find more female participants, we informally interviewed a number of women in the Bangalore slums. However, none of these women had media on their phones – the phones were used only for calls – so we did not interview them formally. Incidentally, these women all had feature phones, not smartphones, suggesting that another strata of mobile-phone use exists. It is beyond the scope of our study to determine whether this is because of income, social status or lack of interest in the consumption of mobile media, but it would be interesting to probe this further.

The interviews were conducted by authors 4 and 5 – both female – one of whom is a fluent Hindi speaker. To negotiate the various local South Indian languages spoken in Bangalore, the researchers were sometimes accompanied by a translator (male) or a professional fieldworker (female). Each interview took between 30 to 60 minutes, and the interviews were conducted in locations chosen by the participant typically close to the site where they were recruited. The interviews were semi-structured, following a protocol containing questions focused on the participant's background, digital device ownership, mobile usage patterns, and patronage of mobile shops (or, in the case of mobile shop workers, about their interactions with their clientele). We also asked interviewees to show us the content on their phones, e.g. what was the last file you shared, show me the apps you use to share media, and to demonstrate behaviors such as file transfer.

Data collection began in central Bangalore. However, as we discovered that interviewees no longer used the media dealers encountered by Smyth et al., we were curious about whether this was a function of their metropolitan location. We therefore conducted nine interviews in the Bangalore suburbs and Hassan. We stopped interviewing when we were not getting any substantially new information on media sharing.

All interviews were audio-recorded, transcribed, and coded. Two authors read all the transcripts several times and assigned descriptive codes [18] that fell into six thematic categories: technology (e.g., Dubsmash, WhatsApp, WiFi); mobile logistics (e.g., data plan, file transfer); content types (e.g., comedy videos, movies, pornography); behaviors (e.g., watch and delete, Bluetooth sharing, Google download); people (e.g., media dealer,

friends, family); and miscellaneous in-vivo comments (e.g., "phone is important," "battery issues"). A total of 1490 utterings were coded across 31 transcripts. Coded statements were organized and hierarchically clustered, and themes prominently occurring in the data were pulled out, with special attention to those focused on understanding media consumption, sharing, and purchasing behaviors on mobile phones. Furthermore, themes were explicitly sought out for comparison where they related to those found by Smyth et al. (e.g., use of Bluetooth, or interaction with media dealers).

In the rest of the paper, we describe the main themes that came out of the analysis, illustrating them with quotations from the interviews. For the most part, we chose quotations which are representative of the themes we are describing. Where a quotation represents an outlying opinion, these are explicitly indicated.

3. FINDINGS

The increasing affordability of smartphones and more cost-effective data packs has opened up Internet access to a whole new segment of users. Being able to afford 1GB of data enables watching YouTube online and downloading moderate-size files (i.e., hundreds of MB) directly to the phone.

But cost is not the only factor; many of our participants spent considerable amounts of their income on data. In addition, as we will return to later, popular social media such as WhatsApp have provided additional reasons for people to desire the Internet. These factors in combination have driven Internet uptake.

This point is particularly striking when compared with the work of Smyth et al. only six years before. Whereas they found no users using the Internet on their feature phones, our participant sample is overwhelmingly dominated by mobile Internet and smartphone users. Against the backdrop of this shifting technology landscape, we describe the increasingly sophisticated patterns of use in terms of technology, media acquisition, sharing, and management. Where Smyth et al. framed their findings around the dramatic tension between obstacles and motivations surrounding mobile phone use, we describe our findings in terms of the complex tradeoffs that users navigate and the ongoing evolution of digital media practices.

3.1 Technology Ecosystem

A decade ago, digital media consumption was restricted to a small minority, and those who partook of it consumed media on low-end phones, televisions, and PCs. Today, digital media consumption appears to be a widespread phenomenon and for lower-middle-class groups, the smartphone has taken a central role by extending and serving as a hub for the capabilities of a diverse media ecosystem.

3.1.1 Mobile Phones

In contrast to Smyth et al.'s 2009 study in which respondents had either feature phones or low-end phones, all but one of the participants in our study had a smartphone. Android devices were the most popular phone, but Windows, iPhone, and a Blackberry also featured.

Eight participants had more than one phone, two had three phones. Participants with two phones typically needed to be available for calls from customers, such as shop-owners and so were concerned to maintain availability for calls. Of those who had more than one phone, most used a smartphone for Internet access and a feature phone for making calls, because of the superior battery life of feature phones. As P293 explains,

That one is for Internet. It doesn't have good battery life. This one does. This phone runs for a week. That one runs out of battery in a day.

Just as with Smyth et al., participants were often paying a month's salary for a phone. However, with the declining price of handsets, in 2015 they were able to acquire a smartphone for this price. Our participants smartphones ranged from lower-end price-conscious brands to iPhones (two of the higher income participants).

A number of interviewees had multiple SIMs. At least three reasons were cited for this practice. Some mentioned having one SIM for work and another for non-work communication. One person mentioned separating voice and data usage:

P241: *I have two SIMs – one for Internet and the other for making calls.*

And, others used multiple SIMs to manage costs. One interviewee had one SIM for incoming calls and Internet but used another SIM for outgoing calls at a cheap rate. Or another who kept his 2G Idea SIM, which was relatively slow, as a back-up for when he had consumed all the data in his post-paid pack.

3.1.2 Data Plans

In conjunction with the migration to smartphones is the uptake of data packs. Twenty-seven out of our 31 participants had data packs and of the remaining four, two connected to the Internet in other ways (one through the office Wi-Fi and the other through friends sharing their networks), leaving just two without mobile Internet use altogether.

The relationship between income and data package purchased does not appear to be a simple one, at least in our sample. Taking the 24 mobile phone users (excluding workers in mobile phone shops), only the two highest earners had post-paid packages, the rest had various pre-paid packages. However, equal with one of the postpaid users in spending, was one of the beauticians, who despite earning only Rs. 10,000, spent Rs. 1,000 a month on data. The majority of participants however spent around Rs. 250 a month on data (for a 1GB package), whatever their income. For example, three participants spent around Rs. 170 a month: two beauticians earning Rs. 5,000 and Rs. 20,000 and a driver earning Rs. 15,000. The highest spending low earner was a shop keeper earning Rs. 5,000 who spent Rs. 455 a month and the lowest spending high earner was an ironer earning Rs. 25,000 who spent Rs. 58 a month.

The beautician who spent 10% of her earnings mainly consumed that data to watch online movies in her native language. She hailed from the north of India and content in her local language would be almost impossible to find in Bangalore on traditional broadcast media. Hence her data consumption was about consuming media in her local language, and through this staying in touch with home. In comparison, a number of participants, from across the income range, just used WhatsApp, and sometimes Facebook, they therefore consumed little data and had no need to spend much on their data packages. The value that users put on media consumption varies across individuals and has an impact on the amount they are willing to spend relative to their earnings.

At the same time, data is, of course, just one of the expenditures any user has to juggle relative to their income and almost all of our participants were cost-conscious about data, including those on postpaid packages: as P164 (earning Rs. 35,000) said of his

call and data bill of just under Rs. 1,000 *'it's very problematic*'. However, those most conscious were those on the smallest packages that offered data in megabytes (MB) per month. For example, P291, who had 500MB a month of data free for recharging phones, says,

Sometimes I need extra data, but since I don't want to pay for it, I don't use it.

Only a few participants found themselves regularly needing to top up their plan, the majority had a data plan that fit their needs. For example, P175 (1GB of 3G connectivity) says:

I don't use the Internet that much, so it doesn't really exceed that much.

However, when we look closer, we found that having a data plan that fits your needs is achieved through a set of sophisticated data management practices. This involves juggling applications and available data sources to ensure their media consumption and communication habits do not exceed their data limits. For example, a common practice for those with limited data expenditure was to just use WhatsApp and Facebook for communication when on mobile data packages and then to get content from others or, where available, use Wi-Fi connections for other content. We outline these practices in greater detail in section 3.3 on Media Acquisition and Sharing.

3.1.3 Other Devices

For most of our participants, the mobile phone is just one device in a wider media ecosystem. When discussing media consumption for example, it was clear that televisions play a central role for our participants – particularly as a device to watch movies with the family. Some drivers had media systems installed in their cars and preferred to watch movies on those, and shop workers listened to music on the in-shop stereo system. However, while the strengths of laptops, television sets, and stereos are their bigger entertainment experience – bigger screen, bigger sound – their lack of portability was cited frequently as a disadvantage. Only one interviewee with access to a computer preferred it to the phone. Most preferred the phone, as P234 sums up:

P234: *I prefer my phone because it is always with me. With the computer I have to go to it, but with the phone if I have Internet on it, I can send emails, I can download music and videos from google, I can do anything. With a computer, I have to go looking for a cyber café or have to go home to use it*.

Furthermore, the phone combines communication with entertainment functionality. P233 says he uses his mobile phone more than is laptop because:

My friends will be calling me on my phone; my friends will be texting me on WhatsApp. Also, they share videos and we share photos as well. In groups, we share a lot of things.

Participants adapted their practice (whether that be downloading, watching or sharing) according to available devices (phone, TV, Laptop, stereo) and data (mobile Internet, Wi-Fi). As a result, the device used depends both on the content (short skits, songs vs. whole films), the activity (downloading vs. watching) and the location (on the go, at home, at work).

Desktop computers and laptops, for example, play a key role in allowing some of our participants to download content onto their phones. While few participants had their own computer, the majority did have access to one either at home (14 participants), at work (7), or at a friend's home (3). In total 21 participants had access to a computer (some having access in multiple places). How much interviewees used a computer varied quite a lot, from regular users such as P175, our only interviewee preferring the computer to the phone:

Yeah, the phone isn't that important to me. I prefer the computer - it is fast and easy,

to others who used their sibling's computer for an hour on a Sunday evening, to still others who had access at home but did not use it (3 participants), and one participant who got rid of his computer because nobody used it.

Overall the phone is the device most used for media consumption in our sample. A couple of interviewees pointed out the inconvenience of watching movies on the phone – they might be shared by mobile phone – but then transferred to the computer or an in-car entertainment system for consumption. P233 notes the dual use of a laptop, not just as a device for media downloading, but for media consumption:

P233: *I don't watch movies much on phone. I download the movie, then transfer it to my laptop and then watch on my laptop. Mobile has very small screen. If I put the movie on the laptop, entire family can watch.*

3.2 Mobile Usage Patterns

Applications such as WhatsApp and Facebook were the primary drivers of mobile Internet use in our study. These applications blur the lines between communication and entertainment. Augmentations to messaging (e.g., online status, message delivery notification, and groups) and integration of media content (e.g., sending images, videos, and voicemail) make the smartphone a more holistic, rich, and textured platform for communication and entertainment. It is not easy to disentangle the communication and entertainment usage of phones.

Much of the communication between friends is what is called "timepass" in the Indian vernacular, involving sharing of comedy clips, personal and other photos, good morning greetings, and pornographic imagery [11]. While these may not be accompanied by any additional voice and text annotation, they appear mainly to serve as a casual means to keep in touch. This is illustrated in the extreme by P132, a driver and regular WhatsApp user, who simply passes on content which is doing the rounds, without adding any messages himself, but by doing so is able to participate in various WhatsApp groups. This use is reminiscent of Rangaswamy and Arora's work, in which the authors found that youth in Bangalore slums shared similar sorts of pictures on Facebook, often with English messages on them (so-called "memes") as a lightweight way of "sharing sentiments" as well as projecting a particular self-image [18].

As for entertainment media, our participants preferred short content. While it was not unheard of to watch whole movies on the phone or to watch Indian Premier League cricket games live during power cuts, the majority of participants used the phone to watch short content or to listen to songs, often on the go or at work. Very popular are short video clips, including adult content, which was explicitly mentioned by two of our participants.

The phone is also often used for playing games and even participants who did not download other content often downloaded their own games from Google Play Store and similar sites.

While mainly used for timepass and entertainment, group communication also served other purposes, from religious discussion to disseminating information to help community members. P109 says,

There is serious concern [about] something... those cases we will share those things. Someone needs blood or something, we can share those things.

3.2.1 Content Creation

Among our participants, content creation was largely limited to taking photos – of family members, outings and so on. There was little mention of participants creating videos, recording their own songs, blogging, writing extensive posts on Facebook. For some participants, even personal photography was extremely limited, except for the occasional selfie, as they typically worked long hours, sometimes getting only two days off a month. As P273 explains:

P273: *I am a driver. What do I have to take a photo of?*

Nevertheless, content creation is not completely absent. For example, a couple of participants used Dubsmash, which allows users to select short audio clips and turn them into the audio track for personally created video clips. Others reported their friends creating memes – the popular annotation of images with humorous text.

P241: *Some of my friends create memes and comedy photos. Those I share in other groups. Good morning and Good night, people send once but photos like memes, they send to many people, even share on Facebook. Their friends like it and they send it to their friends.*

Still another reported using MP3 "cutters" to cut songs into fragments. One participant, a beautician, says,

Sometimes I record videos of facials so that we can learn better.

A couple recorded videos of outings and messing about at home – these were typically shared only within the group of participants or not shared at all.

3.3 Media Acquisition and Sharing

Increased access to the Internet has radically changed the media acquisition landscape in this demographic in recent years. Smyth et al.'s 2009 study suggested that almost all content was initially acquired from media dealers and then shared amongst networks of friends, family, and acquaintances [26]. In the current ecosystem, sharing is still prevalent, but it takes a different form. Most of our participants still get content from multiple sources, but downloading directly from the Internet has largely replaced purchasing content from media dealers. In terms of people's primary source of content, the biggest category was someone else downloading for them (9 participants); downloading on their phone (8); downloading on a computer themselves (5); purchased from media store/cyber café (4); downloading on computer and phone equally (1); media store and friends equally (1).

Today, a whole new category which spans media acquisition and consumption has emerged: watching content online. YouTube videos and other short content are the most popular, even amongst interviewees with limited data packages. Interviewees with access to Wi-Fi or good data packages, even mentioned occasionally watching live cricket matches or films, although this was much rarer. As P190 said,

Like I said, for timepass, if we have data pack, we keep watching something.

As we mentioned, the beautician who spent the most relative to her wage on her data package, consumed that much largely because of streaming video, rather than downloading as this enabled her to stay in touch with her home:

When I am bored, I like watching Manipuri videos on Youtube which is where I am from.

Manipuri media from Manipur, a Himalayan state in North India, is unlikely to be broadcast in the South Indian state of Karnataka. In contrast with Smyth et al., the vast majority of our participants did not go to media dealers for content. Some noted that they used to do so, however. P164 says,

Before the Internet, I used to go to a media dealer near my house. Not anymore, now I have the Internet and I download everything I need. I only go to them to fix my phone.

Similarly from P241:

After I got the new Windows smartphone, I haven't been going to the media dealer much. I have most of the songs I need and if I don't, I get it from my friends via WhatsApp or ShareIt.

None of our interviewees in central Bangalore still visited media dealers, and this was confirmed by the mobile shop owners. However seven interviewees, from the suburbs and Hassan said they still used media dealers or visited Internet cafes for content. These included an older woman without Internet access on her phone, another participant who downloaded apps from the Internet café, but got other content from her friends because her data package was too small to download herself and a third who listened to music or watched videos in an Internet cafe but did not download. While mobile shops in central Bangalore reported they no longer dealt in media, those outside, had adapted to this new ecosystem – where their customers now often had access to mobile Internet by simplifying, lowering the cost, or saving the time required for downloading large amounts of content at once:

P230: *I don't download at all – it is a waste of time. It takes 3-4 hours to download at home. So we go to the media dealer opposite to my house. He will have all the latest movies downloaded already. We'll give him the pen drive and tell him to add movies that we want. We'll come home and watch it on the TV.*

P221 (a media dealer): *I can download unlimited amount of movies and songs and they get to buy it for Rs. 10. At home if they download, they have to pay Rs. 255 for the extra bandwidth they'll end up using.*

Media dealers have also found other ways to offer value to their customers by serving as a knowledge repository, helping customers download apps or learn how to search and download themselves. P230 says,

Media dealers will help us with any questions that we have – regarding downloading or apps or how to do something. He doesn't take money from us.

This movement out of the metropolis, suggests that media dealing is a phenomenon that may fade as peri-urban trends catch up with the city. Even outside of the city, media dealers confirmed that the business of selling content downloads was declining and that the clientele who request media are mostly the lowest-income workers: *construction workers, auto drivers, domestic house maids, housewives, and unemployed people* (P297).

3.3.1 Media Sharing and Storage

But if the rise of the Internet has decreased commerce with media dealers, it does not appear to have affected the degree to which people share data amongst friends. We found a vibrant media sharing ecosystem that has expanded due to lower costs, greater convenience, and what could be considered a new social culture of casual media exchange.

Smyth et al. report that in 2009, it was common for one person to go to a media dealer, pay for content, and then share it amongst their networks of relatives. In 2015, widespread sharing among friends and family, post-download is still common. Those who do not download themselves often get someone else to download for them. As foreshadowed by the increased self-sourcing of media content reported by Kumar et al. in 2013 [15], what has changed is that more people are likely to engage in direct downloading of content themselves. There may also be a gender difference. Our small sample of female participants did not download themselves; rather they consumed the content that family members, typically siblings, downloaded for them.

While some people, typically those with limited data packages, do not download at all, many others will download or watch songs and short videos directly from the Internet – often YouTube – but will acquire larger file-size content such as movies from friends and relatives who either own computers or who download directly to their phone.

Enabling this new sharing pattern are a range of tools – many of which do not use mobile data bandwidth.

Wi-Fi tools: ShareIt and Zapya establish a Wi-Fi connection between phones, allowing file transfers without consuming data plans. Users are aware of this advantage. For example, P241 says,

The movie Bahubali was released recently. My friend downloaded it this morning. The file is about 400MB… He downloaded directly to his phone. Then we shared it using ShareIt.

These tools – ShareIt in particular – are by far the most popular app for sharing larger files. A small number of interviewees were using a newer app, Zapya, which enables fast sharing to multiple people at once.

Bluetooth: A number of our participants still used Bluetooth for close proximity file exchange. However, Bluetooth seems to have become a secondary medium of sharing – to be used where other more convenient methods such as ShareIt were not working, or by users sharing between particular combinations of handsets which did not work well with ShareIt. Exchanging files through Bluetooth on a smartphone is less complicated than on a feature phone, which can require up to 19 steps [26], but it has the disadvantage of being as much as 40 times slower compared to ShareIt.

Other sharing techniques: Other methods of sharing were mentioned by one or two people each – memory cards, data cables, Android Beam, Dailygram, Hike, and Skype.

The versatility of sharing methods also extends to management of data storage. Many of our participants reported deleting media files regularly according to their needs and preferences. Participants delete the content on their phones frequently to manage their media libraries or to allow space for new content. Low memory is an important indicator for many of them to go through content and delete. As P201 described,

I downloaded too many videos till my phone was full. At first, there was no problem. Soon as I opened the media player to watch videos, the phone would hang. When I took the phone for service, I came to know the problem was low storage space.

Furthermore, participants used combinations of storage mechanisms to manage their priorities. P190 says,

When the memory card is full, I will transfer the content to a pen drive and memory will be free again.

For two of our participants this facility with storage management extended to the cloud as a backup device. One participant commented on transferring content to Facebook to keep it permanently. Another participant, P109, reported using Microsoft's Skydrive,

Everything that I [have], it's saved in the SkyDrive. So if I log onto any other system or smartphone also it will all be there.

3.3.2 WhatsApp

By far the most common method of file sharing among our participants was WhatsApp. Twenty-six out of the 28 interviewees with Internet access on their phones described WhatsApp as their main use of the Internet to the point of being the driving factor for data and smartphone use. As P132 put it,

Now that WhatsApp has come, I use the Internet regularly.

Meanwhile, those who use neither Internet nor WhatsApp aspire to it. Of our two participants who did not use Internet on their phones, one had just started earning and aspired to get a new phone for the sake of WhatsApp and Facebook. She explained the reason why she did not have Internet was,

My phone does not support it. I want to buy a new phone which will support Internet so that I can download songs and photos.

This woman's feature phone had Internet capability, but she did not seem aware of it. Feature phones lack the ease of use and convenience of a smartphone, and available apps and services are extremely limited. WhatsApp, for example, only works on a few feature phones.

So what makes WhatsApp so compelling? One of WhatsApp's most important features is that it consumes very little bandwidth –

whether texting, sending media files, or voice messages. Even people with limited, low cost, data packages can use WhatsApp to communicate and share content. Among our smartphone-owning participants who neither downloaded media themselves nor watched YouTube videos, all nevertheless used WhatsApp. P297 says,

Yeah. I don't use much data anyway. I use WhatsApp more.

While voice mail, as provided by mobile operators, is rarely turned on by Indian users, voice messaging on WhatsApp, has taken off. Given the numerous local languages in India and the difficulties of typing on Indian character keyboards, WhatsApp voice messaging seems to be used as a replacement to traditional text-based messaging:

P251: *We do text but when it is hard to text and we need to talk in local language, we use recordings.*

They also can be a neat way to bypass work constraints:

P241: *When at work, I can't text. Then, I send voice messages.*

On the other hand, while there is a calling facility on WhatsApp none of our participants used it, probably because mobile calling provides better quality for a competitive price. In comparison, sending voice messages keeps the advantages of the asynchronicity of text messaging, while reducing the burden of typing and keeping costs low.

Only a three participants mentioned using Internet calling apps such as Skype and Viber.

Groups: Participants typically belonged to multiple WhatsApp groups: family, work (including with boss and without boss), religious groups, college friends and so on, enabling them to contact whole groups of people with one message. Similar to Facebook, this makes WhatsApp useful for maintaining weak ties (and indeed making new contacts) as well as sustaining friendships independent of physical proximity [9][21]. P190, an auto-rickshaw driver, discussing a driver WhatsApp group says,

We share in groups… Whatever content anyone puts there, we all get it.

Integration of communication with media sharing: WhatsApp enables the easy sharing and distribution of media content within the communication stream of text and audio messages. Furthermore it is simple to pass on content you have received from one contact or group to others, as P255 says

I receive from my friends and then I share it with other friends.

For example, one regularly cited practice is for people to send good morning and good night greetings in the form of stored stock images (often memes). Almost all of our participants mentioned doing this.

The easy integration of content within the communication stream also makes WhatsApp useful for "productive" use apart from entertainment. Participants who had relationships with customers used WhatsApp as a tool for interaction with them. One common practice is the sending of photographs – of some product, or model of phone, or part – which somebody needs to another person to procure for them. P175 who works in a mobile store said,

Sometimes, customers will request phone covers with certain designs and I won't have it. So I'll ask them to send a pic and then send it to my wholesalers, asking if they have it and requesting them to send it to me.

In another case, a mother would send her son shopping and he would take pictures of the garments to check that his mother liked them and she would then send back bargaining prices for him. Compared with SMS text messaging, WhatsApp makes it much easier to send multimodal messages, which in turn facilitates a wide range of communication acts.

The proliferation of file-sharing techniques has created a new class of mainstream mobile user who is versatile with many tools. Most of our participants fluently juggled different methods for sharing content, and they were strategic about how and why they did so. The deftly took into account file size, cost, proximity, battery power, technical ability, and phone capabilities. For example, P251 says,

If my friends are nearby, we share videos via ShareIt. If they are far and there are photos of outing or trip, we share using WhatsApp.

And, despite the wide popularity of WhatsApp, our participants recognized that it used data bandwidth. So, it was typically only used for transferring short clips and videos. One participant demonstrated transferring a 14-minute video via WhatsApp without difficulty – but most shared content is typically shorter than that, with clips no more than a few minutes long.

Facebook, while it also enabled remote content sharing with large groups of people, was used to a much lesser extent. Its use was generally limited to downloading photos.

3.4 Privacy, Security, and Adult Content

While not the focus of our study, we found several allusions to the privacy and security challenges faced by our participants, but almost entirely in the context of adult content. Multiple participants had locks on their phones, and specific locks for pictures and apps. One participant said that he clears search history frequently and demonstrated this process on both on Google and Facebook. This is especially so because he only searches for adult content. He has also taught others to search for and then clear their search history. The same participant mentioned a "watch and delete" approach to avoid his spouse discovering his activities:

P164: *Friends share dirty videos with me. I watch and delete immediately – because my wife checks my phone every day.*

Other participants immediately deleted adult content to avoid bosses from coming across inappropriate content on their phones, or for religious reasons. We note that because most of our participants are male and our interviewers were female, our findings regarding adult content are potentially muted.

Most participants continue to be oblivious or naïve about the illegality of piracy, but are aware of and take measures against viruses. Unlike recent work by Chen et al. on security and privacy perceptions and practices in urban Ghana that found confused notions of how Internet technologies operate [6], our participants

appeared to have some understanding of the how viruses work. Furthermore, given the option to use mobile data, our participants can make media acquisition decisions based on this risk assessment.

P190: *I used to go to a media dealer ages ago. If we get movies there, then our phones will get viruses. It's because they transfer content to thousands of phones.*

Another interesting phenomenon we observed was a surprisingly nonchalant attitude toward losing phones and media content, but strong attachment to their phone numbers. In response to losing their phones, our respondents responded:

P109: *I will buy another one. […] I know how to download everything. What's the problem?*

4. DISCUSSION AND RELATED WORK

Our work builds on a small but growing literature on mobile media usage practices in the low- and lower-middle income developing world.

4.1 Evolution of Mobile Media Sharing

4.1.1 Commonalities

The most prominent comparison is with Smyth et al. [26]. Our work can be viewed as an update to that work six years later. Keeping in mind that both studies were undertaken in an urban South Indian context (Bangalore) that is one of the fastest growing frontiers of technology use in developing regions, we find several thematic commonalities between 2009 and 2015 including: the dominance of phone use, an active culture and economy of media driven by entertainment, sophistication of use, and limited content creation.

As with Smyth et al., we find that the dominant use of phones is for communication followed by, and overlapping with, entertainment. Entertainment takes the form of chatting with friends and consumption of music and video. Rangaswamy and Arora also find that entertainment usage is prevalent in urban Hyderabad and Chennai [22].

Furthermore, we find again that there is an active culture and economy of downloading and sharing of media, driven by an enduring desire for entertainment as well as frequent if fleeting communication acts with friends and family. This includes a rich assortment of music, video, and images – mainstream media, locally produced media, adult content, and memes. While feature-length movies continue to be occasionally consumed on phones, users traffic heavily in short clips. Most users continue to be oblivious about the illegality of piracy [15].

We also find that users continue to be sophisticated about the options they have with respect to hardware, software, affordances, cost, and bandwidth, and they are willing to juggle SIM cards, handsets, and apps as a way to achieve their goals. In particular, cost continues to be a dominant theme, though it is one of several competing factors, including ease of use and convenience as evidenced by the different hardware options considered for the various media-related activities. Kumar et al. found this in other urban Indian contexts [15].

Finally, neither set of participants (in 2009 or 2015) engaged in significant media production. There does not seem to be a widespread practice of individuals in urban lower-income communities generating original text, music, or videos. (*cf.*, Kumar et al. [13]).

4.1.2 Differences

Some things, however, have changed since 2009. Rather than the tedious practices of media sharing described by Smyth et al., we found instead a rich ecosystem of devices, technologies and practices which people combine in sophisticated ways to enable the sharing of media for communication and entertainment. Instead of having to visit a media dealer and then negotiate cumbersome exchange by Bluetooth over feature phones, interviewees had a wealth of options for file acquisition and exchange, which they juggled according to criteria such as file size, data package, ease of use, physical proximity and so on. This has all been enabled by access to smartphones and the Internet. While individual apps and tools have become easier to use, the overall media ecosystem is increasingly complex. The ingenuity necessary to circumvent obstacles to entertainment in 2009 appears now to be applied toward optimizing across the diversity of available technology options.

Users, at least those who consume media on their phones, have kept pace with the technology. In 2009, mobile media dealers were the main gateway to online content, and microSD cards and Bluetooth were the main avenues for sharing. In 2015, these methods have been overtaken by new methods. ShareIt, for example, allows file-sharing between smartphones via the Wi-Fi connection, and it has largely supplanted Bluetooth. Many more people have data plans and download and share on the Internet via WhatsApp and Facebook. MicroSD cards and Bluetooth are still used, but less and less so. While our population of interviewees have a broad range of incomes we found a remarkable similarity across practice. The main trends relating to demographics being that (1) users within central Bangalore no longer visited media dealers, whereas those in peri-urban areas and beyond did so despite having Internet access on their phones; (2) the relationship between income and data package purchased (and consequently media consumption and sharing practices) is more complex than price alone; (3) although the women in our study often consumed content online themselves, they rarely downloaded content, relying instead on the content shared by siblings and friends.

Today, the grey market for entertainment media that mobile shops previously trafficked in via microSD cards has moved almost entirely online. Mobile shop owners see less of this business except in cases of dramatic improvements to cost or convenience due to the still (relatively) high data costs and low bandwidth of mobiles. However, those who are able to afford both the smartphone and the data are free to watch streamed video through Youtube rather than through tedious downloads and transfers.

Additionally, WhatsApp features prominently in our interviews. It is difficult to decouple communication from entertainment, but this merging of functionality onto a single streamlined platform is undoubtedly a driver of its success, with users citing ease of use, voice messaging, easy sharing, ability to form groups, and efficient use of bandwidth as key reasons for its popularity. Like Smyth, we found that sharing is a deeply social practice, with siblings and friends. Whereas sharing may be widespread, larger items were often downloaded by specific people – often, but not always, those with access to a PC, or at least Wi-Fi - choosing content in bulk to download and share with others. Alternatively one person might download a whole movie on his mobile phone to share with friends and colleagues. The downloading and sharing of smaller items, individual songs, skits, images and so on was undertaken by a wider range of interviewees, as was watching online.

Overall, our findings are consistent with Smyth et al. with respect to user motivations for engaging with their phones (driven by communication and entertainment); user willingness to handle technical hurdles for their interests; and a dynamic culture – increasingly supported by formal tools – for media sharing. The differences between 2009 and 2015 reemphasize that users, even those who claim less ability to use technology, adapt quickly to changes in technology.

4.1.3 Beyond Smyth Et Al.

Beyond Smyth et al., there is other work on mobile media sharing that interacts with our work. In a 2013 paper, Kumar et al. [15] use actor-network theory [16] to analyze the evolving informal economy of mobile media piracy in urban India. They find a growing mobile media consumption culture motivated variously by entertainment, profit, and prestige, which occasionally lends itself to increased sophistication of ICT capabilities. Furthermore, Kumar et al. find that the early adopters who gain increased media acquisition self-sufficiency eventually support the diffusion of media beyond conventional distribution channels.

In rural Indian communities, Kumar et al. find people's interaction with folk music affected by mobile penetration [13]. That work contrasts in two prominent ways with our findings. First, some rural communities appear to have a vibrant culture of music production and recording, mostly undertaken by local musicians (who previously used cassette tapes and CDs to record their work [17]). In contrast, our participants did not mention recording their own music or sharing locally produced music. However, we did not seek out musicians or artists and our findings would perhaps have been different if we had. Second, Kumar et al. found that media is often consumed in groups using a single device, as opposed to the more individualistic consumption of media among our urban participants. While we could speculate on the reasons for these differences (rich history of local entertainment; lower penetration of devices), practices around the creation and consumption of content in different communities (rural vs. urban; amongst musicians and other artistic communities, and so on) seems like a rich vein for further inquiry.

The dominant narrative that emerges from a comparison with other work on mobile media sharing is one of dynamically evolving user sophistication that tracks closely with technology availability and accessibility. Though there are undoubtedly differences in how this evolution occurs due to location and local culture, a common trajectory does seem to emerge.

Much of the existing literature on mobile usage patterns in lower-income communities occurs at times and places in which the Internet is largely unavailable or where it was just beginning to be accessible in terms of handset hardware, app software, and bandwidth, as well as in terms of cost. In place-times where the Internet is mostly unavailable, such as in rural Kenya in 2011 there is predictably little media consumption or sharing of any kind; usage is dominated by voice calls and strategic text-messaging [31]. Then in the early days of Internet availability, such as in South African townships circa 2008 or urban India in 2009, early adopters begin to actively consume and share entertainment, but still through relatively limited channels: mobile shops are the source of content because downloading direct to mobile is bandwidth- or cost-prohibitive, and sharing is limited to exchange via Bluetooth and microSD cards [12], [26].

In this paper, we report on what is likely to be one of the most technologically advanced settings in the developing world circa 2015 – urban and peri-urban India. Here we find that previously observed trends are further extended: mobile usage is dominated by entertainment and timepass activities; users are prolific sharers of content; and users – no longer restricted to an expert class of early adopters – are versatile managers of multiple handsets, apps, and techniques for sharing media.

4.2 Comparison with Developed World

Our participants showed striking differences with the common patterns of mobile phone use among developed-world users. What most stands out, perhaps, is the habitual juggling of technologies to achieve usage objectives while meeting strident constraints with respect to cost, battery power, and bandwidth. And, this practice is "habitual" both in the sense of it being constant and frequent, but also in that users are practiced and versatile. In most of the developed world, it is rare for users to have more than one SIM card or one handset; but many of our users had at least two of each, and made fluent calculations about how they were used particularly with respect to costs and conservation of battery power.

Another noticeable difference was the near absence of mobile use for things like online shopping and navigation, both widespread activities among developed-world users. Given the dominance of cash, especially in everyday transactions it seems unlikely that this will change any time soon.

4.3 WhatsApp

Given the prevalence of WhatsApp in our transcripts, it would be remiss not to situate our findings with what is known elsewhere about this popular social media app. Our findings of WhatsApp reflect recent findings comparing SMS to WhatsApp messaging in Spain [8]. Church and Oliveira found that WhatsApp messages are exchanged more often, are more conversational in nature, are used to communicate within closer social circles, and are used more often for group-based communication. The general feeling that their participants expressed was that WhatsApp is more immediate compared to SMS. They found that the underlying intents of WhatsApp messages are in line with past work on traditional text message practices, but WhatsApp is perceived to support more social, natural interactions thus leading to more chatting, planning/coordination, and group messaging when compared to SMS. Similar to our results, Church and Oliveira posit that while it is likely that WhatsApp has grown in popularity due to economic reasons, the motivation and perceived value of WhatsApp may change due to factors beyond cost after prolonged use.

Other recent work by O'Hara et al. investigated the relationships "doings" in WhatsApp in the UK, and its role in maintaining a continuous sense of narrative, tellings, thoughts, and shared images [21]. As with Church and Oliveira's study, O'Hara et al. compare the perceptions and use of WhatsApp with SMS in an effort to understand why, given the lack of conceptual novelty, WhatsApp has been adopted beyond what appears warranted by the reduced cost. O'Hara et al. found that the additional cues provided by WhatsApp (online status, message delivery notification, "typing" status) provide a more nuanced and immediate experience. In addition, the ability to form groups and share media within the same app form a cohesive platform for interaction. Our study further confirms this, showing that such a cohesive experience can even drive internet adoption.

4.4 Evidence for Relevant Theories

Our findings resonate with a number of theories of information systems and technology and society, but here we highlight two of the more relevant that have not been explored previously in similar contexts [14], [15][22], [23].

The first is domestication theory, in which technologies experience a cycle of adaptation: First, they are adopted and adapted by users into everyday life; then, users themselves adapt to the new capabilities, often exhibiting new tech-related behaviors; next, technology creators see the new uses and develop further innovations to address them; and the cycle continues [3], [10], [25].

When low-cost feature phones first appeared on the market, users were quick to adopt them and make them their primary entertainment devices, which in turn led to changes in the media ecosystem (media dealers) and user behavior (media sharing via Bluetooth) [26]. These trends were noticed by technology companies, which have since responded with a range of technologies specifically designed for mobile sharing, whether it is ShareIt or Zapya. Among the shrewdest of the firms is WhatsApp, which is widely recognized in the industry for having a single-minded focus on customer satisfaction with its products, as well as for its genuinely global focus [24]. WhatsApp's founder and CEO, Jan Koum says, "we focus on the utility of the app, its simplicity, the quality of the service," and as our study finds, this focus has found fertile ground in India's urban users, who have taken in WhatsApp as they might a beloved pet in the latest cycle of technology domestication. Parallel domestication cycles can be seen with regard to handsets, mobile plans, and the nature of the entertainment content being shared. Each of these mobile facets has seen ongoing technological progress proceed together with intimate user adoption and adaptation.

What is perhaps surprising is just how quickly the cycle of adoption and adaptation has occurred. In 2009, feature phones were common but not yet standard among the lower-middle-class users observed by Smyth et al., and file exchange was limited to BlueTooth and microSD card transfers. In 2015, just six years later, people of the same city within roughly the same income range are predominantly smartphone users, with almost no users of BlueTooth or microSD cards, and the cottage industry of digital media downloading has all but vanished.

The second theory that our work provides evidence for is amplification theory, which posits that digital technology amplifies underlying human forces [1], [29]. As with Smyth et al., we found that people using their phones for explicitly "productive" ends were in the minority (and even then, their use reflected professional priorities, whether it was customer engagement or learning about facials). Communication – much of it for timepass – and entertainment continues to dominate consumer usage, and users perform digital acrobatics to squeeze the most entertainment out of their phones for limited budget and bandwidth. As Smyth et al. noted, where there's a will, there's a way. And, this is true even though 2015 users have an even richer array of content and services for education and productivity compared with 2009. In other words, the new educational offerings and business opportunities enabled by more advanced technology do not of themselves increase the appetite for these activities. If anything, the technology further amplifies the human desire for entertainment – what people want to do with their private phones in their private time is at least as likely to be driven by a desire for diversions as by socio-economic self-improvement.

5. CONCLUSION

This paper presents a qualitative investigation into mobile phone and media sharing practices in lower-income urban and peri-urban Bangalore. We find that, consistent with the work of Smyth et al. from 2009, there is a dynamic, ongoing ecosystem of devices and media that is supported by new technologies and integrated into individual user habits with considerable sophistication. New technologies – from low-cost smartphones and cheap data plans to software such as WhatsApp – have also led to significant shifts in sharing culture and the media economy, with some practices, such as grey-market sales of downloaded media by media dealers vanishing in urban centers in only six years.

Our ultimate aim is to see whether we can hitch onto the well-established and well-supported trend to share entertainment media and use it to propagate public service messaging. The work presented in this paper confirms first of all that media sharing is alive and well. But in addition, it shows in relation to Smyth et al. that it is likely to be an ongoing phenomenon. Even as technologies evolve, we can expect to rely on the trend of informal, person-to-person media sharing to continue for the foreseeable future.

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