"Only if you use English you will get to more things": Using Smartphones to Navigate Multilingualism

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ABSTRACT
We contribute to the intersection of multilingualism and human-computer interaction (HCI) with our investigation of language preferences in the context of the interface design of interactive systems. Through interview data collected from avid smartphone users located across distinct user groups in India, none of whom were native English speakers, we examine the factors that shape language choice and use on their mobile devices. Our findings indicate that these users frequently engage in English communication proactively and enthusiastically, despite their lack of English fluency, and we detail their motivations for doing so. We then discuss how language in technology use can be a way of putting forth mobility as an aspect of one's identity, making the case for an intersectional approach to studying language in HCI.

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HCI4D; ICTD; Multilingualism; Interface Design

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H.5.m. Information Interfaces and Presentation (e.g. HCI): Miscellaneous

INTRODUCTION
User-centered design and its aligned paradigms in the field of human-computer interaction (HCI) assign the user to a place of paramount importance. An important consideration in user-centered design, then, is the language technologies use to communicate with the user. However, ascertaining the language to use may pose a dilemma in multilingual settings, of which there are many in our fast globalizing world. For example, the multiple official languages of countries such as India, Switzerland, and Canada already have implications for how the public sector disseminates information online [48]. In India specifically, where 12 % of the population is English-literate [25], penetration of smartphones (predominantly designed in English) has reached 22 % and is growing [1, 2], indicating a definite overlap between non-native English speakers and smartphone users. This brings us to question how new smartphone users who lack fluency in English become accustomed to using an English interface. English also takes on additional meaning in light of India's colonial past, with prior research pointing out how English has come to represent a foothold in today's global economy [68].

Within HCI, researchers have explored language in particular contexts. Examples include Gao et al.'s line of work on multilingual collaboration in the workplace (*e.g.,* [23, 19]), the testing of Indic text input methods (*e.g.,* [33]), and localization of digital content (*e.g.,* [24]). Research in the domain of HCI for Development (HCI4D) has additionally focused on target users' literacy levels. Medhi's seminal work in this regard looked at minimizing text dependence in interfaces for low-literate users [41, 42, 43]. More recent research has looked at circumventing text via interactive voice-response systems [32, 46, 51, 70] and unpacking the growing use of visuals such as emoji in mobile communication [79]. The focus of these works on particular contexts prompted us to explore how multilingualism naturally plays out in the use of technology by diverse user groups. This comprises a broader understanding of language in diverse online activities by users with different English fluencies, allowing us to inform the design of interactive systems for multilingual contexts.

We conducted a qualitative investigation of non-native English speakers' smartphone use across rural, urban, and suburban India. We provide a perspective of language in a place where more and more users who are not fluent in English are using English-based devices and apps nevertheless. Thus, our research delves into how our participants become accustomed to English, the thought processes underlying their decision to use different languages, and the user experience in using each language. Our findings lead us to think about how language, in India and more generally, is deeply tied to identity and mobility, a notion that we use to make a case for an intersectional approach to language in designing interactive systems.

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In this paper, we begin by describing HCI research on language and localization and theoretical work on multilingualism. We then describe the diverse sites we chose and our approach to collecting and analyzing data. Our findings highlight the factors that shaped our participants' language choices in their smartphone use: the nature of their adoption of smartphones, their attitudes towards language, their social contexts, usability challenges faced, and their engagement with alternate modalities such as audio. We then describe how language in technology use connects with identity and mobility, offering takeaways based on an intersectional approach for designers of interactive systems in multilingual contexts.

RELATED WORK

Going Beyond Translation of User Interfaces

One focus of HCI research on language has been internationalization and localization. Very early work largely revolved around the idea that to reach an global audience, interfaces should be internationalized (easily configurable to enable use in other countries) and localized (actually adapted to a specific context or culture) [16]. The focus since then has been on moving past translation of text to also thinking about other aspects of an interface, such as culturally relevant and accepted images, colors, functions etc. and working and testing with international users [16, 62]. Gasparini et al., Marcus and Gould, and Smith et al. have all made arguments for actually tailoring interfaces, usability testing, and forms of interaction to local culture, in addition to localizing language [24, 39, 65, 30]. While this work advocates for a greater focus on culture instead of translation, we take a step back to look at how language itself is tied to users' attitudes and beliefs.

The body of HCI research that engages deeply with language has focused on how the use of technologies affects communication as well as how users of different backgrounds engage with language. Over multiple studies, Gao et al. examined how the presence of machine translations, highlighted transcripts, and dictionaries might aid communication among native and non-native English speakers or in multilingual conversations [20, 21, 22, 23]. Gao and Fussell have also examined code-switching by non-native English speakers in collaborative workplace settings, finding in part that their conversations on instant message platforms often took place in their native language, which made it more difficult to integrate the conversation into the rest of the workplace [19]. Other studies have looked at the implications of word choice among specific sets of people such as research subjects [9] or blind individuals providing navigation directions [64]. In our work, we also examine language choice in light of users' backgrounds and language skills but in a broader context of communication and with the recognition of the dominance of English globally. Thus, we are able to glean insights into how multilingual systems might be built for a large user base with diverse language skills.

Localization in HCI4D Contexts

In HCI4D research, language often comes up in terms of localization of systems for users with varying language skills and literacy levels. Medhi's research shows that semi-literate and non-literate users prefer text-free user interfaces that are designed with graphics and voice [40, 41, 42], informing the design of social media, email, and assistive technology for this user group [43, 59, 75]. Researchers have also studied mobile content creation for visual and audio storytelling in India, Kenya, and South Africa [7, 17, 61], the use of locally-produced video to disseminate agricultural [18] and health information [37, 67, 72], and the use of interactive voice-response systems to provide information and services without written text [32, 34, 45, 51, 58, 70, 78]. Some of this work has been done specifically with a focus on localization of different aspects of the information, including language [52, 57, 67, 73]. Our study informs instances of localization where it is not entirely obvious which language the system should be in—we uncover the reasons language preferences might vary among different users in an Indian context and how designers could study language localization in light of such complexity.

HCI4D researchers have also looked at language-related interactions with mobile phones, providing initial insight into how users with limited English skills use English-based devices. Vashistha et al. and Wyche et al. have come across usability issues with typing on mobile phones in India and Kenya, respectively [74, 76, 77]. Vashistha et al. found that even literate participants felt typing on a phone was more challenging than speaking, and even well-educated participants found it difficult to type in a local language [74]. Wyche et al. found that the rural farmers they studied had trouble typing in local languages with an English keyboard due to the frequency of long words and having to learn how to input a variety of symbols [76]. Studies on Indic text input on mobiles have explored how users transliterate Indic languages and [12] the usability of alternate Indic text input methods [14, 33]. Considering these usability issues that have been uncovered, we aim to understand why they occur and to what extent they affect users' smartphone activities.

English: An Easy and Difficult Choice

While we have looked at work that relates language and technology, HCI has been largely quarantined from work that discusses how language is implicated in social behaviors and power. Prior work has shown how a user's experience of the internet changes when English (or other dominant language) is not their native language. For example, public policy requiring the use of official languages in government workings, can make certain information that is supposed to be public inaccessible to those who do not speak said languages [48]. Even democratized forms of content creation and sharing, such as Wikipedia and Google Search results, have a heavy English bias, making information from high-income, English-dominated countries more self-representative [5, 28]. Offline and in Indian contexts, the use of English, including through code-switching, has been shown to have more associations with education, mobility, and respect [3, 6, 44, 47] than with the *"the hearth and home"* [3], placing undue importance on English in individuals' lives.

While we highlight these views of English in our findings, we also engage with the suggestion of scholars such as Pennycook and Canagarajah that we view the use of English as an on-going negotiation between the global and the local, so that we can understand English in more than just

economic terms [10, 54]. Instead, English can be adapted to local languages and social dynamics as needed, focusing on the communicability and usefulness of English in diverse contexts, rather than proper grammar [10, 56]. As a result, we view users' language choices in online interactions as shaped by a diverse set of factors. This includes the ability to engage, but also the value ascribed to English, the ability of *others* to engage in English, and the affordances of the technology being used. Our research aims for a deeper understanding of these choices among diverse users to inform interface design of interactive systems in multilingual contexts.

METHODOLOGY

The goal of our research was to understand how new technology users who are non-native English speakers engaged with and responded to language in their interactions with their mobile devices. We next describe our approach to collecting and analyzing data.

In summer 2016, the first author conducted usability testing of a localized Android mobile app with seven participants in Kogda, a village in the state of Jharkhand. This work uncovered participants' preference for English navigational words and apps despite not speaking English, which we wanted to explore in more depth and breadth in order to inform localization practices for mobile apps. The usability challenges we came across inspired the design of this study and a set of questions that we could ask.

To expand the data collected in Jharkhand, we conducted 20 semi-structured interviews between June and August 2017 with individuals who were active smartphone users with data plans but whose native language was not English. These interviews were conducted by three authors in four other locations across India: Bangalore, Karnataka; Mumbai, Maharashtra; Chennai, Tamil Nadu; and Greater Noida, Uttar Pradesh. We wanted data from multiple locales in order to target regions with different predominant languages/dialects and find participants from diverse backgrounds. Participants were recruited using a combination of snowball and purposive sampling [27, 31], as is common in such studies where the researcher has limited access to the community of participants and must tread carefully in line with existing social values and norms.

In interviews, we asked participants general questions, such as how they had begun to use technology like computers and smartphones, what kind of apps they used regularly, and how long they had used them. We then asked more focused questions around language preferences and how these influenced mobile content generation, consumption, and sharing. All interviews were audio-recorded, but because some were conducted at short notice or were in noisier settings, we also took extensive notes. All interviews where 30 to 40 minutes long and took place in the interviewees' native language (Hindi or Tamil) except for four interviews where the interviewer did not speak the interviewee's native language. These interviews were conducted in English instead after ensuring participants were still comfortable with it. We then anonymized participant names for use in this paper.

As we gathered data, we aimed for a balanced sample, ensuring diversity of gender, age, and educational background (see Table 1). Participants also had varying fluency in reading, writing, and speaking English, which had implications for the activities they performed on smartphones. Additionally, the occupations and lifestyle of participants varied across locations. The five participants in Bangalore were all visually impaired and were part of a training program to learn computer skills. Participants in both Mumbai and Chennai were students and teachers. Meanwhile, Kogda was our only rural setting and had participants who were the least comfortable with English and had less exposure to English overall compared to urban areas. Greater Noida was suburban, located outside of New Delhi, the capital of India. The various lifestyles of our participants gave us insights into how people with varying levels of English fluency use language in different smartphone activities.

Participant	Gender	Age Range	Location	Education	English Fluency	Years Using Smartphone
Rakesh	M	20 - 25	Bangalore	College	B	1
Aarav	M	20 - 25	Bangalore	High school	B	< 1
Neha	F	20 - 25	Bangalore	College	B	< 1
Bhavin	M	26 - 30	Bangalore	College	I	1
Hari	M	41 - 45	Bangalore	High school	I	1-2
Devansh	M	18 - 20	Mumbai	High school	I	2
Madhu	F	18 - 20	Mumbai	College	I	1
Ishan	M	18 - 20	Mumbai	College	B	2
Suraj	M	18 - 20	Mumbai	High school	B	3
Navya	F	18 - 20	Mumbai	High school	I	1
Samir	M	20 - 25	Mumbai	College	I	2
Raja	M	51 - 55	Chennai	College	B	1
Yaj	M	40 - 45	Chennai	High school	B	1
Aditya	M	21 - 25	Greater Noida	Trade school	B	1
Abhijit	M	21 - 25	Greater Noida	Trade school	I	2
Sudhir	M	21 - 25	Greater Noida	College	I	4
Deepak	M	26 - 30	Greater Noida	High school	I	3
Jagan	M	26 - 30	Greater Noida	College	I	2
Kiran	F	61 - 65	Greater Noida	College	I	2
Preeti	F	61 - 65	Greater Noida	College	I	2
Shyam	M	18 - 20	Kogda	High school	N/A	1
Bipin	M	18 - 20	Kogda	High school	N/A	1
Devesh	M	18 - 20	Kogda	College	N/A	1
Bijoy	M	21 - 25	Kogda	Unknown	N/A	2
Prabir	M	21 - 25	Kogda	Unknown	N/A	1
Pranjal	M	21 - 25	Kogda	High school	N/A	2
Tanay	M	26 - 30	Kogda	College	N/A	2

Table 1. Participant Demographics; B = Basic, I = Intermediate

Our data analysis was iterative, starting in the interviewing stage, which involved regular check-ins among authors to discuss findings, compare notes, and iterate on our interview protocol. Interview transcripts were translated to English and analyzed in conjunction with our notes. We subjected our interview data to thematic analysis as outlined in [8]. This process was primarily driven by the first author, but all authors participated and iterated upon codes until consensus was reached on their appropriateness. We began with manually

conducting open coding. First-level codes were carefully linked to our data, such as *"doesn't feel nice to translate English to Hindi"*, *"Hindi keyboard is slow"*, and *"English helps with economic prospects"*. After multiple rounds of coding, we condensed the codes into larger, overarching themes such as *"attitudes towards different languages"* and *"usability issues"* around which we structured our findings.

FINDINGS

We now present how participants developed language preferences in their use of smartphones. We describe how these preferences were shaped during smartphone adoption, by attitudes towards the languages they used, by social behavioral dynamics, by usability challenges such as keyboard sizes that participants were forced to contend with, and their interactions with other modalities (such as audio).

Onboarding and Prior Technical Literacies

Participants' initial engagements with technologies were driven by diverse motivations and shaped the way they subsequently used language on their smartphones. In several cases, particularly among middle class participants, acquiring a smartphone was a matter of convenience, but other participants felt they *needed* a smartphone:

> *"When I turned 40, I decided that I am going to turn my life. I had struggled a lot earlier. On my birthday, after a lot of contemplation and waiting, I decided to buy a smartphone and asked my mentor to teach me how to use it." (Hari)*

Hari's comment reflects how smartphones uniquely offered participants greater utility. For some participants, the utility of a smartphone could sometimes elicit a sense of *"charisma"* [4] as well, as in the case of internet access on the go: *"And now there was this phone that you could take potentially anywhere! It felt too good to be able to do that…" (Madhu).* Taking advantage of smartphones' utility and mobility, most participants' devices were used for social exchanges (through Facebook and WhatsApp), ridesharing and other travel, or leisure-driven activities such as games or videos. These phenomena have been uncovered in earlier HCI4D research [35, 49, 60, 66, 71] and drove our participants' content consumption, generation, and dissemination activities, also shaping their media literacies [35]. Their interactions with language on their phones, then, were primarily related to typing messages or posts, navigating apps in English (*e.g.,* WhatsApp, Uber), or consuming content on social media.

Once participants got a smartphone, they generally said there was a quick learning curve, and they all appeared accustomed to using English language settings and preferences. In the case of older participants who had been introduced to their smartphones by their children, their interactions were limited to the apps (and settings) their children had set up for them: *"My daughter downloaded the apps and they were in English only" (Kiran)*. Our participants in Kogda in particular seemed to hear about new phones, apps, and ways of sharing content through friends and family. Such an intermediated learning process (as studied earlier [63, 36]) and acceptance of English as the default language meant that participants were sometimes ill-informed about what their devices and apps could afford. For example, many participants were unaware that they could translate posts on Facebook, that some apps like Uber could be localized, or that Indic keyboards were integrated with their operating system.

Participants' prior exposure to technology and language encountered online also affected language practices on their new phones. For participants that had used computers before, especially our visually impaired participants who found prior computer training invaluable in learning how to use a smartphone, English-based practices carried over to smartphones: *"We have been using the English keyboard even on the PCs and we now know where the letters are located so it is very easy to use this" (Devansh).* In addition to digital literacies, prior language literacies naturally shaped participants' smartphone engagement. The extent to which they generated, consumed, and shared content depended on their command of the English language, since this was the language that most content was in. However, even when participants were not fluent in English, like our rural participants, they were used to English on their phones through rote learning. As a result, they appeared to be much more comfortable using certain keywords in English and not Hindi, their native language:

> *"Certain keywords, like* Share*,* Receive*,* Cancel*, and* Delete *should be in English, while longer instructions like* "Please select a recording to share" *should be in Hindi." (Bijoy)*

Rakesh concurred with this sentiment when asked about translations, remarking that because most people use smartphones in English already, few people would understand direct translations like *"Settings"* in English to *"Amarikalu"* in Telugu. Devansh shared that he did not want all Android phone settings and navigation to be in Hindi, also sharing challenges he faced with his grandfather's phone:

> *"I think my grandfather had a feature phone with everything in Hindi. When I use his mobile, if he asks me to change brightness of the phone, I know that in an English phone, I would have to go to Settings, then Display, then 'Brightness', and then adjust brightness. But now in his phone, everything is in Hindi—and I have no idea what 'Settings' translates to in Hindi?! […] What does 'Brightness' translate to in Hindi?* Ujaala? *There are five other words that mean 'Brightness' […] There is no standard for these key terms like there is in English across all phones." (Devansh)*

Younger participants from socioeconomically disadvantaged backgrounds showed affinity towards English because it used *"standard"* terms. This leads us to our next set of findings around attitudes towards language as evinced by participants.

Attitudes Towards Language

The use of English held different meanings for different participants. For some, it was the language they were used to because their initial engagement with computing technologies (mobile or otherwise) had been in English. For others, the possibility of learning English was laden with aspirations. Some participants felt partial towards English for *"technical"* kinds of communication. Even those who

felt equally favorably towards all languages they knew felt compelled to engage more in English.

English as a Learning Opportunity

Many participants chose to use English over their native language so they could improve their English skills. Neha, for example, shared that this was why she preferred to use WhatsApp in English:

> *"English I want to learn so I can apply for jobs at companies [. . .] I never tried using WhatsApp in Hindi. I downloaded it in English because I wanted to learn English. My Hindi is already perfect. It would not be useful." (Neha)*

The desire to improve English skills in Neha's case came from a desire for greater mobility. She acquired English-speaking skills rapidly—in a span of six months, when she felt the need to move around in public on her own. Being visually impaired, she often needed to ask for directions but had a difficult time finding Hindi speakers since Bangalore's native language is Kannada. Moreover, she was interested in applying for jobs and felt the need to improve her English for the same. Some other visually impaired participants also saw the use of screen reader software in English as related to better employability. Hari noted the advantage of using screen reader software in English rather than his native languages:

> *"I use only English on my phone and computer. I don't think there is any scope for local language. English is like a national language. It is easy to learn. Anywhere I will go, English is better, nobody will ask for my Marathi or Konkani." (Hari)*

Another participant Bhavin mentioned that there are some WhatsApp groups in which he only uses English because the group as a whole wants to learn English. This desire to learn English also led participants to value translation apps because they could use them to translate English to a local or native language in order to improve their English vocabulary. Jagan described how he navigates apps that are mostly in English:

> *"Mostly apps are in English which is the language those apps are available in. I also use language apps DuoHindi and Google Translate for translating English to Hindi and Hindi to English and to improve my language skills." (Jagan)*

This desire to improve English skills because English is the *"national language"* or because it afforded mobility hints at participants' aspirations. Multiple HCI4D studies have shown that aspiration plays a role in language, with participants recognizing the social value-add of learning English or mainstream dialects of Hindi as opposed to local languages [35, 50, 73]. In our study, participants' aspirations for English fluency resulted in using English on their phones as a learning opportunity, instead of relying on temporary workarounds or *"jugaad"* [35]. We focus on this affinity for English next.

English, Above All Else

Many participants said they would continue to prefer English equally or more than any other language in their technological interactions, even when participants were not fluent in English. Reasons for this mindset varied widely. One participant explained why English was his preferred choice:

> *"Even if I were to make my own app, I would choose to keep the language English. English is a 'worldwide' language and I think it makes logical sense to keep [the app] in that language. Just as we adapted to this, I'm sure others who do not speak English too well will be able to adjust easily. Today, it is very simple for me. I don't even remember having any struggle to learn to use these English apps." (Devansh)*

Participants across rural, urban, and suburban areas agreed that there is no real need to create or fully translate apps to local languages now. Preeti, an older female participant from Greater Noida, said that switching to Hindi (her native language) on her phone might actually slow her down. Prabir, from Kogda, shared that, at the very least, apps should be made in both English and Hindi so people could use them as per choice. There was certainly no desire expressed in favor of eliminating English from smartphones, even in Hindi and Tamil heartlands.

Participants also considered English on a smartphone to be different from speaking English, so whether or not they could speak English fluently did not appear to impact how they felt about using English for reading/writing on phones. Part of the reason for this was mobile translation apps (as discussed above). Suraj also reasoned why typing in English felt more comfortable than speaking it:

> *"It's because I have the time to type slowly! There is no body language, facial cues, intonations, and pauses to make when I type in English. So I can take some more time to think and type slowly and so I have no issues at all typing in English. I can barely speak in English however to someone. This is why I think people mistakenly believe that they should also make apps in Hindi—we just can't speak in English, but we can read and type really well because we have more time to do those activities!" (Suraj)*

This speaks to the eagerness to use what English skills one has and how the affordances of smartphones result in users experiencing language differently than in spoken conversation. In addition, the preference for English was not shaped just by what users got from using English, but also the opportunity costs of not using it. The fact that English dominates online content also made participants worry that they would be missing out if they did not choose English:

> *"I'm sure there is more information available in English than in any other language, especially for doing projects as students. I feel like we'll lose out on information if we use apps in any other language." (Navya)*

Other participants were agnostic about what language to use as long as the original meaning and feel of the content was properly retained. This often meant that participants wanted content originally created in English to stay in English since transliteration or translation would feel strange:

> *"I think for 'technical' usage and communication, the content is best if it is in English and not in Hindi or any*

other language. By technical usage, I mean words like 'Facebook' or 'WhatsApp'. Imagine what they would look like if you literally tried to write those two words in Hindi? It would be 'Ph' with the 'ey' maatra and so on and see how weird that would be to read! Even the pronunciation changes [. . .] I think the things that should be in English should stay in English, and only the original Hindi content should be in Hindi. It doesn't feel nice to translate these English technical words to Hindi!" (Devansh)

Devansh's point indicates how language was as much about *"feel"* as it was about aspirations or practicality. In fact, auto-translated content was sometimes not preferred because words lost their original *"feel"*, *"comfort"*, or *"friendliness"* after being translated to a local language.

We see above a host of reasons that made English the favorite choice among participants. The ubiquitous nature of English, promises of social and economic mobility, availability of translation apps, the relatively forgiving exercise of typing in English, and a fear of missing out on content available in English—all these factors together appear to be responsible for creating an English-loving smartphone user base. This phenomenon has been described in detail in prior research on multilingualism in India, but in the offline world [44]. Mobile technologies appear to have made it more pervasive.

A Matter of Convenience

Despite English being the language of choice, participants were quite comfortable using it in combination with their local languages and showed a willingness to consume content in any language that was known to them.

"When I read/watch/see content on Facebook, I consume Hindi, English, and Marathi content depending on the language it is written in. Hindi content is usually written in Hindi in the Hindi script, but sometimes I also see Hindi content written in the English script and I like reading that as well. This content is image content or text content. It doesn't really matter what language the video is in—usually, I'm able to follow videos easily regardless of Hindi or English." (Devansh)

Even when participants did/could not speak English in their daily lives, English seemed to creep into their mobile communication, either through typing in the Latin script or through intermittent use of English words. As Devansh explained further: *"When I type or input content—like when I chat on WhatsApp—similar to reading, I prefer typing in Hindi in the English script. This is very easy. I think I can do this in my sleep now!"* The widespread use of the Latin script to write in local languages, however, did not mean that there were standard spellings, resulting in an ongoing negotiation, according to one participant:

"Everyone has a unique way of typing Hindi or Marathi words and we often know that Rohit will spell 'paratha' with an 'n' but Muskan will not [. . .] but we're often able to understand nevertheless. We'll sometimes have arguments around how a word should correctly be spelled but they're quite funny—everyone knows that all spellings are wrong because these aren't even English words to begin with!" (Navya)

These findings corroborate the idea that though many consider form a necessary part of communication, the ability to understand what is being said is still most important [10], though the social context might change this priority (as we describe in the next section). Another way participants mixed languages was by peppering conversations in local languages with English, often to increase the effectiveness of one's communication. As one participant noted, sometimes English words were deemed necessary to convey meaning:

"Sometimes we use a mix of Hindi and English (both in the English script though) when we talk. [. . .] When I'm chatting with someone, I may type a sentence like 'iske upar kya *information* jaante ho?' *(Do you have any information on this?) Notice that I did not choose to translate 'information'—usually we do this, we keep some English words as they are because we generally know what they mean and a Hindi translation for them will be a bit weird. We talk a lot in 'Hinglish'!" (Madhu)*

The use of Hinglish, or a mix of Hindi and English, indicates how participants utilized English in ways that added value to their communication, but that held on to the notion of *"keeping"* a word in its origin language. Mixing languages, then, becomes not just a way of bringing in new words, but of bringing in the new or unique concepts behind them.

Language in Social Situations

Who a communication exchange was with mattered greatly to the language preferences of our participants. Depending on the relationship between sender and receiver, as well as the comfort levels of both, participants would use the appropriate language and script. Users also chose what language to use based on the content they needed to interact with or task they had to accomplish.

Going Back and Forth Based on Audience

In general, participants noted that they used English in formal conversations with elders, teachers, and colleagues. Meanwhile, conversations with friends were often in local languages:

"When I chat, the language I use depends on who I am chatting with and which group I am on. If there is a teacher in school or elder person I am talking to, I will talk to them in English. But if it is a friend or anyone else of my age, I will just type in Hindi (English script). I just feel comfortable doing that, I really don't know why. If the friend doesn't understand Hindi or is more comfortable with English [. . .] then I will talk to them in English on WhatsApp. Even with groups, it depends on who is in the group." (Devansh)

This was not a hard and fast rule. More than anything, language and script choices were about understanding which languages the other person would be receptive towards. While participants said they used Latin script with family and close friends in general, Navya stated that this was not always the case: *"...when I think about this more, my father says he's more comfortable reading in the Hindi script—so I sometimes type like that when I talk to him."* Meanwhile, Samir did not

always feel the need to switch over to Hindi script: *"My uncle types in the Hindi script and I can read that, but I reply in Hindi in the English script only and he is able to understand that as well."* For others, language preferences were shaped by recipients' goals. For example, Bhavin noted that his friends in a small town wanted to learn English, so they created a WhatsApp group to chat in English.

Situations came up where negotiation of language was not so easy. When sharing pre-existing content, it was not possible to choose the language it was in. As a result, participants needed to think about who they could forward different types of content to, say on WhatsApp. Rakesh mentioned that in his network, he could usually forward English content to most people without a problem, but would have to think about which groups could understand local language content. Negotiation was also more restricted when the sender and receiver did not overlap in their language skills. One participant who talked to her grandchildren through WhatsApp mentioned that it would be nice if messages that she sends them in Hindi (the language she was more comfortable with) were translated automatically to English since they do not speak Hindi. While language in multilingual contexts seems negotiable, language literacy barriers need more effort to overcome.

Going Back and Forth Based on Content

The way participants wished to interact with content shaped their language preferences. They appeared to find it easier to consume content in many languages, but more challenging to create content in languages they were not fluent in. The preferred language also varied depending on the desired reach of the content or how quick a response was desired. With respect to content creation, Rakesh said that he wrote his group messages in English because a larger subset of his multilingual group members would know English. Meanwhile, Aarav mentioned that though he might get more comments on local language Facebook posts, he still used English because his friends are also starting to learn English, so they would be able to interact with his posts anyway.

Language preferences for consumption came about based on the type of content. Once again, time taken for comprehension played a role:

> *"For the most part, I consume English content, but I sometimes prefer Hindi content—like jokes, news, and Wikipedia. When I am searching for teaching content, I am very fast with reading Hindi, so I would prefer seeing it in Hindi." (Samir)*

In this case, searching, likely because it requires scanning and filtering large batches of information quickly, seemed to prompt the desire to search in the language one finds most comfortable. In other scenarios, participants thought more about the *"feel"* of content. Some content was simply better conveyed or more impressive when in a certain language:

> *"...people who are fluent in more than one language often easily move between the languages when they chat or talk. I think people do that (or at least I do that) because they feel like there are some things that can be conveyed better or sound more impressive in one language over another, so they will flip mid-sentence or speech and then flip back. " (Navya)*

In a multilingual context, different languages are used in different scenarios because they appear to have specific affordances, such as reach or comfort. This in turn reifies the meaning of each language, such as English being a *lingua franca* for content dissemination.

Challenges with Usability

There were scenarios in which participants may have preferred to use their native language or quickly switch between languages, but usability challenges made this cumbersome or impossible. Overall, these challenges could be categorized into issues with keyboards, translation, accommodating multiple languages, and spelling/auto-correct.

Challenges with Keyboards

An overwhelming number of participants, even when they were generally amenable to typing in a local language script, found it time-consuming or difficult to use a local language keyboard, especially relative to an English keyboard. Devansh noted the usability issues in a Hindi keyboard:

> *"The keyboard will take too much time to figure out where the keys are located and how I can use all the vowels. You know, I tried the keyboard once. Hindi has more letters than English, so all letters do not fit in the keyboard. We have to use the shift key to see the second set of letters that are not on the keyboard. It is very painful and slow to use the Hindi keyboard." (Devansh)*

Other usability issues included the trickiness of pressing multiple keys at the same time (often resulting in spelling errors) or the fact that some languages required users to open another app for typing. The drastic effects of usability issues with keyboards can be seen especially with Tamil. Raja shared in the context of teachers who worked at his school:

> *"I believe the Tamil keyboard on the phone is different from the Bamini keyboard on the computer—since it is hard to press multiple keys at once on a phone keyboard, right?! So while they (teachers) know to type in Tamil on the computer keyboard, they did not make the effort to learn to do the same on the phone keyboard. Most of the content they write on the phone is chats/texts/non-professional, so they will type in English script (but in Tamil) only ...And they will sometimes use English words—like 'sir', and 'yes', in the middle of the Tamil words they are typing. This is probably the only instance where the written Tamil (in English script) is the same as the spoken/colloquial Tamil. " (Raja)*

Raja's explanation shows how some users simply gave up typing in local language scripts. However, participants also said they used workarounds in the event that they did want to write with local language scripts. The most common workaround they used was Google Translate:

> *"I will type on Whatsapp in either Hindi or English. When I type in Hindi script, I use Google Translate: I will type 'kahani' in English and Google will output the Hindi script for kahani and so I will paste that on WhatsApp. " (Samir)*

Another workaround took advantage of the fact that a computer keyboard was easier to type on—Bhavin said he used an app that ports text typed on the computer to smartphones to create mobile content in local language scripts. Via these user workarounds, we can see the effort that users must put into overcoming the prevalence of English on smartphones.

Challenges with Translation

One usability issue with translation was the low quality of translations. Tools such as Google Translate or Facebook's auto-translations of posts and comments were not always sensitive to the nuances of a language:

> *"If there was an app that automatically translated what I type in English into Marathi, I still wouldn't use or trust it. Literal translations often kill the grammar! That is what Google Translate does sometimes—the grammar gets ruined when I translate. So I will prefer any day to just type in English or directly type in Marathi instead of using a translation tool. I don't think I trust these translation apps." (Navya)*

Other participants noted that translating English to Hindi relies on the use of older, classical words. As one participant asked, *"How do you even say 'apps' in Hindi? (Ishan)"* To work around this desire to consume English content despite not being completely comfortable with it, participants preferred looking up words every once in a while as needed:

> *"For pure English text or image content I read, it can take me a little bit of time. I am still very comfortable, but it's usually slower. Typically, I will have the Google translate website open on the phone browser and I will copy-paste words I don't understand and translate them. Or I will use the dictionary app [...] " (Devansh)*

Another issue with translation came up when Rakesh changed Facebook's language settings to Telugu, his native language, out of curiosity. He found it pointless because some of the content was just English transliterated to Telugu anyway. Moreover, he mentioned that *"If you open* privacy*, all the rules and all, they are in English [language] only." (Rakesh)* These issues indicate not just the low quality of autotranslation of various content, but also the localization of established apps.

Challenges with Spellings

Ironically, a usability challenge that came up as a result of using English keyboards to avoid local language ones was the auto-correct feature that was also based on English. Because many participants typed local languages in Latin script, auto-correct could sometimes be overly helpful:

> *"If we type in Hinglish (Hindi but in English script), auto-correct will always correct it to the nearest English word and we will have to hit a backspace and undo the automatic correction. This was initially quite irritating, but now it is something that we all do unconsciously. No one has a fix for this—we all just do it this way." (Ishan)*

While Ishan seemingly got the hang of undoing auto-correct, not every participant did. Kiran mentioned that she did not know how to *"fix the auto-correct mistakes by the given options in spellings when the language is Hindi. I have to delete and write again."* Other participants adapted over time, changing their spellings of Hindi words in Latin script to avoid auto-correct's overzealousness:

> *"I'm able to now anticipate when auto-correct will mess up my Hinglish words . . . But sometimes it will be fine—like if you type yes in Hindi, if you spell it as 'Ha' instead of 'Haan', auto-correct will preserve the former because ha is also an English word. So we've identified these small modifications and we adapt [. . .]" (Madhu)*

These ongoing issues likely reflect how auto-correct features do not seem to add transliterated words to their dictionaries (similar to how "lol" might be incorporated) or make it intuitive for users to manually do so. Meanwhile, the reverse was also a problem. That is, when local language words were written in Latin script, it was sometimes unclear which word was being used: *"I often see Marathi words (in English script) that I don't understand, so I'll try to pronounce it in different ways to understand what they're saying." (Navya)*

Exploration of Alternate Modalities

To respond to the above usability challenges, participants turned to mechanisms such as audio, emoji, and text abbreviations, by choice or compulsion. Our interviews with visually impaired users were particularly illuminating in this regard, since they used audio with their screen reader software. Nevertheless, we found that screen reader software was subject to a host of language-related usability issues as well.

Audio-Based Input and Output

In cases where participants were low-literate overall, they were keen to rely on the use of audio messages (*e.g.* through WhatsApp) to communicate, especially when the message was long. Participants also used Google Assistant via voice commands to call someone or start an app. Visually impaired participants, in particular, used speech recognition apps to write on their phones in English. These apps, however, did not work in languages like Kannada, Telugu, and Tamil, making content production through this method English-dominated.

Visually impaired participants also used screen reader software to hear content on their phone, such as Facebook posts or messages. There were multiple brands that were popular, but often, the software could only be programmed to read one or two languages at a time, ignoring content in other languages. As a result, participants would have to use a combination of software to read the multitude of languages they came across on their phones, which required a high level of technical proficiency. Even when communicating with other visually impaired friends, they would have to think about which languages friends' screen reader software could support.

Because screen reader software was voice-based, reading speed and pronunciation also came into play. In general, participants liked to set the screen reader software to a high reading speed in order to use their phone efficiently, but the way screen reader software pronounced local languages written in Latin script slowed them down:

> *"Kannada I understand correctly, in one go [when it is read by the screen reader software], English I have to hear 2-3 times. It is because if you type Aditya, it will*

not say [the name] Aditya correctly, it will say Additty, Additty." (Rakesh)

So despite the speed with which the software read English, some participants were slowed down in their use of their smartphones anyway when local language words came into play. Bhavin, who felt that the software's pronunciation was poor even when set to a local language, found it easier to hear the software read English (which has been using since first getting a smartphone anyway).

Emoji and Shortened Text

To get around typing text, participants also turned to emoji. They often used emoji on Facebook/WhatsApp, sometimes downloading more than the ones available by default. In some cases, when the "right" emoji was not available, participants treated text like emoji as well. For example, one participant was keen to quickly express her sentiments in her day-to-day communication with her relatives:

"For close family I use Hindi only but use English keyboard. I write saubhagyashalini bhava *or* yashasvi bhava *(Hindi blessings) at the end for my children and younger relatives. " (Kiran)*

The phrases Kiran mentioned seemed to be used often, but were also lengthy and challenging to type, particularly with auto-correct issues. Zhou et al.'s work on emoji use shows that they could support the meaning of text, while also reducing the effort required to actually type text [79], bringing up questions of how prepackaging text might be another method of overcoming typing-related usability issues. To this end, participants also turned to creating abbreviations for words. However, these were not always standardized:

"We also use a lot of short-forms with friends—my friends will understand what I mean but sometimes others will not. When I say 'bye', I sometimes just type 'B' and people will understand I mean bye based on the context of the conversation. Otherwise, they will ask and I will clarify. But it's shorter to type a 'B', so I do that!" (Navya)

This mirrors Grinter and Eldridge's work on text messaging among British teenagers that found that users tended to shorten the words they used everyday, not necessarily long or challenging words [29]. This finding indicates that even short local language phrases might be prepackaged in order to help remove dependence on the context of the conversation.

DISCUSSION

Our findings provided insights into user preferences for local languages versus English and the issues that arise when using them on smartphones. We now describe how the use of English is performed as an act of identity that provides users with upward mobility—the ability to move up from one point to another with respect to social strata, physical location, or even access to digital content. We then describe how the affordances of English-based smartphones in turn support this act of identity. We end with a discussion of how to use an intersectional approach to understand language and identity in designing interactive systems for multilingual contexts.

Mobility and the Performance of English

To show how our participants used language in relation to identity, we turn to Pennycook's argument that we can better view language from the perspective of the speaker if we view language as local to an area [55]. Then we can begin to see how people within an area use language as a resource to accomplish goals [55]. In looking at what our participants used language for, there were clear contrasts between how local languages were used versus how English was used on smartphones. Certainly, local languages helped participants accomplish things close to what Agnihotri refers to as *"the hearth and home"* [3], such as communicating with others (particularly friends and family), consuming local information like the news or Facebook posts, or conveying content that was best suited to a local language, such as jokes. However, participants decidedly associated English with more aspirational topics, such as impressing someone, communicating with authority, and in general, getting ahead in life. We explore these contrasts further to understand identity and language.

In participants' use of smartphones, the overarching motivation for engaging with English was the desire for mobility, an association made by scholars in relation to India and the world at large [3, 47, 44, 68]. For some participants, particularly those who were younger or had migrated from rural to urban areas, the use of English itself led to social mobility. English was a step towards improving one's life, and using it in all aspects of life, even on one's smartphone, was important. Socially, chatting in English was also associated with formality with teachers and elders, making English a symbol of propriety. Additionally, English skills and access to English apps could even provide physical mobility. English was a *lingua franca* that participants could use to interact with people regardless of location, and default English apps like Uber provided a way to travel as long as one had a smartphone. Meanwhile, for other participants, particularly those who were older or from rural areas, English itself was not explicitly glorified but was a stepping stone to the digital and social mobility afforded by using a smartphone, consuming more online content, and having a common language with those who do not share local languages.

To understand mobility, Cass et al. argue that we must also consider how achieving mobility is entrenched in mainstream societal values [11]. Indeed, our participants' use of English for mobility relied on *others* recognizing and respecting their ability to speak English ("well"). Corroborating this idea, Nakassis' study of English among Tamil youth found that many subjects had great anxiety over making mistakes when speaking English in public, lest others perceive them as not fluent [47]. Alluding to this importance of visibility in language use, Pennycook argues that there is no such thing as a native speaker or a non-native speaker, but rather individuals who *"perform"* language to pass as locals in the context that they are in [55]. This also links to Goffman's work on the presentation of self, in which he argues that for upward mobility, individuals feel the need to present *"ideal"* images of themselves that exemplify the values of a society [26]. For our participants, performing English to present oneself as upwardly mobile was how language related to identity.

Utilization of Language through Smartphone Use

We contend that the current design of smartphones and our participants' use of them make performance of English easier and utilization of local languages as a resource more difficult. Regarding English performance, smartphones aided in improving participants' legitimacy as English speakers and/or smartphone users. Smartphones allowed participants to slowly and privately type in English even if one was not fluent. Participants could also easily rely on translation apps to improve their English and continue to consume English content. Just the decision to use English interfaces was a step towards conveying ties to English.

Meanwhile, participants were obviously fluent in their local languages and did not need to put in the effort to perform as fluent speakers. There were also the participants who were not so adamant about using English, believing that having to engage with English sometimes was just a fact of life in order to use a smartphone. However, for these participants, English-based smartphones still created usability issues that hindered utilization of even local languages. For example, issues with local language keyboards made typing in local languages more difficult, entirely changing the nature of online communication (like with Tamil), or pushing users to come up with workarounds. English screen reader software did not provide a smooth user experience when content involved local languages in Latin script. In these ways, English-based smartphones have become apt tools for the performance of English and have edged out the use of local languages, contributing to the problematic perception that English is the default for all things technological.

An Intersectional Approach to Language in HCI

The way our participants utilized language through smartphones makes apparent the problem with simply localizing user interfaces by translating text to the predominant language in an area (an issue that prior work in HCI [24, 39, 65, 73] has alluded to). Our participants' backgrounds and subsequent attitudes towards English shaped their utilization of language and whether or not smartphones were a tool in the performance of English. If language is so deeply tied to identity, it does not make sense to design with language as a standalone tool. Instead, the design of interactive systems in multilingual contexts could draw from Pennycook's argument that we should create an anti-foundational view of language where *"language use is an act of identity"* that can take many forms depending on the speaker and local context [53].

Such a paradigm shift makes an intersectional framework apt for connecting language and identity in a structured way in design. Intersectionality is the idea that intersections of identities are shaped by power structures in different ways [13]. Intersectional feminist scholars have advocated for an anti-foundational view of identity as well [15, 38]. In place of attempting to study infinitely many identities and their experiences of oppression, scholars recommend focusing on the process through which identity is put forth and how structural forces marginalize these identities [15, 38].

Designers could apply intersectionality to the study of language in HCI by asking *(1)* how users put forth diverse facets of identity through their use of language and *(2)* the forces supporting or hindering their uses of language. Understanding users' motivations behind language use can help designers understand what values they are espousing in their technology design or the costs of supporting a certain language. For example, pilots of international flights are institutionally required to have English language skills, prompting the need to gain English proficiency [69]. However, this same regulation results in pilots with regional accents having more difficulty communicating with air traffic control [69]. This kind of design dilemma suggests that designing for flexibility of language use is also important. Such design is non-trivial (due to languages having diverse grammar rules, scripts, and sounds that technology must interpret and produce) but crucial for ensuring that the user experience does not exacerbate differences between languages or promote a certain language. Flexibility also applies to the localization of systems. Our findings show that there are merits to translation as a bottom-up process, where discussion of appropriate translations with users and being open to transliteration or not translating at all (all within a single system) are important. For example, crowdsourcing translations does not work when words like "brightness" do not have an appropriate translation that indicates brightness on a phone, so understanding what words users could become comfortable with is a bottom-up process. Such approaches, inspired by an anti-foundational view of language and identity, can better understand and take into account underlying and sometimes problematic reasons for users' language choices in multilingual contexts.

Limitations

Our sample had relatively fewer women and was centered around individuals with at least a high school education. Further, we only studied India, making our findings specific to how India's colonial past and cultural norms influence language. Such cultural specificity and the understudied nature of multilingualism in HCI provide ample motivation to study how history, writing and speaking norms, and the clout of a dominant language might influence language preferences in other multilingual contexts around the world as well.

CONCLUSIONS AND FUTURE WORK

We studied multilingualism in smartphone use by Indian users for whom English was not a native language. Through data collected from five sites across India, we offered an enriched understanding of the factors that shape language preference on smartphones. We found that participants used English, even when they were more fluent in another language. We found that this preference was tied to mobility depending on participants' backgrounds, and described how English-based smartphones helped or hindered participants' use of language. We concluded with the merits of examining language through an intersectional lens for the design of multilingual interactive systems. We surmise that conducting future work in contexts where other languages take the place of English, such as Mandarin Chinese in China or Afrikaans in South Africa, could lead to further, important insights, given the paucity of research in the domain.

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