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Paisy: A Mobile Banking Experience
for Indians with Limited Digital Literacy

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Paisy: A Mobile Banking Experience
for Indians with Limited Digital Literacy

by

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Report

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Abstract

Paisy: A Mobile Banking Experience
for Indians with Limited Digital Literacy

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Abstract: While India is aiming to rapidly transform from a cash-only to a cashless and digital economy, people with low digital literacy, especially middle-aged adults in India who matured in the pre-smartphone period, find it difficult to switch to digital payments and digital banking. Although banks and private companies have created mobile payment solutions to enable cashless banking, these solutions seem to be designed only for digital natives, i.e., the young and digitally literate population. These solutions do not address the needs of novice digital users having limited digital literacy. I have therefore designed a mobile banking experience intended to empower middle-aged Indian adults with limited digital literacy to use mobile banking independently and confidently.

Keywords: Mobile Banking, India, Low digital literacy, Design for emerging markets, Novice digital users, User experience design, Design for elderly, Digital divide, Accessibility, Digital India, Next billion users, Human-centered design.

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INTRODUCTION

India is a developing country with a rapidly growing economy and great cultural diversity in terms of religions, castes, languages, cuisines, costumes, customs and traditions. It is one-third the geographic size of the USA but has a population almost four times that of the USA.[1] Although there has been a rapid growth in the adoption of technology for addressing day-to-day problems, India has always faced challenges providing all segments of the population with equitable access to infrastructures, including banking infrastructures.

Banking in India

Until 2016, India was a cash-based economy: 90% of transactions happened through cash payments and most banking-related tasks relied heavily on paper transactions.[2] People needed to visit banks to conduct even the most basic banking-related tasks, such as opening a new bank account, getting passbooks (transaction statements) updated, and depositing checks. But due to India's large population, its retail banking system was (and still is) overburdened. The banking system was both difficult to navigate and horribly inefficient, which often resulted in long queues and up to hour-long wait times (fig. 1).

Figure 1: Queue at a bank in India (https://mashable.com/2016/11/16/india-cashless-epayments-demonetization/). Retrieved April 25, 2019. (Image: European Pressphoto Agency (EPA) / Rajat Gupta).

However, the banking sector in India recently experienced a major transformation when the government of India announced a demonetization of banknotes in 2016 as a step in moving towards a cashless economy. The demonetization resulted in a drastic shortage of cash, as approximately 86% of the cash was canceled overnight.[3] The inconvenience caused due to the shortage of cash made a lot of Indians look for alternatives to traditional banking and motivated them to switch to digital payments. The government also started to offer a variety of solutions for digital payments and strongly encouraged people to use them. During this period, digital payment solutions such as Paytm, Tez, Freecharge,

PhonePe, etc., became popular with young, tech-savvy Indians, but those without smartphones and those who were recent adopters of digital technologies—especially middle-aged Indians—were often left behind.

Barriers to adoption of digital banking solutions

Digital literacy

Switching to digital payments has not been easy for everyone. Most Indian digital banking applications ("apps") seem to have been designed primarily for tech-savvy users. As a result, middle-aged and older adults, and people with low digital access and literacy, faced "digital exclusion"—and many payment and banking challenges—due to the shortage of cash and the growing expectation that they would become digital banking users.

Digital exclusion refers to the fact that certain parts of the population have substantially fewer opportunities to benefit from new technologies than other parts of the population.[4] Digital literacy is defined as an individual's ability to find, evaluate, produce and communicate clear information on various digital platforms.[5] In urban Indian populations, only 14.8% of people aged between 45-60 and 6.8% of people aged more than 60 are able to operate computers or smartphones.[6] This percentage is even lower for population rural areas (1.4% for the age group 45-60 and 0.3% for the age group 60+) (fig. 2).

3.22.3 Ability to operate a computer

3.22.3.1 For age 14 years and above, ability to operate computer at different age-groups is presented in Statement 3.21, gender-wise. Males were shown to be more adept in this regard than females for all-age groups.

Statement 3.21: Proportion (per 1000) of population (age 14 years and above) able to operate a computer

gender	rural				urban			
	age group (years)							
	14-29	30-45	46-60	60 and above	14-29	30-45	46-60	60 and above
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
male	227	64	22	6	536	309	209	106
female	135	19	5	1	438	173	87	28
persons	183	41	14	3	489	243	148	68

3.22.3.2 For those who can operate a computer it is essential to know whether they can use the basic functions of word processing like creating a document, naming/renaming of files, editing etc. or can use internet by using a search engine and fine-tune this for gathering desired information, visiting websites etc. or can communicate through internet by sending or reading e-mails, composing a message, attaching a file etc. Statement 3.22 provides such information.

Statement 3.22: Proportion (per 1000) of persons (age 14 years and above and can operate computer) by types of ability to use a computer

sector	able to use computer word processing/typing			able to use internet for searching desired information			able to use internet for sending e-mails		
	male	female	persons	male	female	persons	male	female	persons
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
rural	104	52	78	100	45	73	89	39	65
urban	334	225	281	331	207	271	311	193	254
rural + urban	177	106	142	173	95	135	160	87	124

Figure 2: Screenshot of Digital Literacy Statistics for India: National Sample Survey Office - Ministry of Statistics and Programme Implementation (MOSPI), Government of India (GOI) (2014), *Key Indicators of Social Consumption in India - Education.* (http://mail.mospi.gov.in/index.php/catalog/160/related_materials). Retrieved Oct 1, 2018.

Other barriers to digital banking: poor infrastructure, high cost, and language

While low digital literacy is one of the major barriers to these groups' adoption of digital payments, the cost of data and slow/spotty internet connections are additional challenges, as are language barriers and other cultural nuances that designers and sponsors of digital banking solutions often do not consider.

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The Indian market is cost-sensitive. While internet technology is rapidly spreading across both urban and rural areas in India, not everyone can afford expensive devices. In India, the internet is accessed on smartphones far more than on computers, as smartphones are much cheaper and are available for prices under $100. Smartphones that offer limited and basic features are popular in the Indian market as they are affordable. Such inexpensive phones have limited battery backup, memory and storage, and offer basic features like camera, flashlight, radio etc. Often times, the devices are shared between family members. Many people also still use "feature phones," the precursors to smartphones, which make calls and send SMS messages, but are not internet-enabled.

Prepaid mobile connections were used by 96% of mobile users in India as of 2017.[7] Rather than having a monthly service plan, people more often pre-pay for talk-time and data plans that offer limited bytes of internet data, limited minutes for making calls, and allow sending text messages for a limited period of time. Prepaid connections allow people to monitor and limit their expenses associated with phone usage over a certain period of time, as it provides transparency in terms of how much time and money they have remaining. People tend to save their data and talk-time, so it lasts until their plan expires.

Internet data plans are relatively expensive and therefore Indians consume data with utmost care. Infrastructure has been improving over the last decade, but still isn't very reliable in most parts of India. While there have been efforts by companies like Reliance Jio to provide faster and cheaper internet service, internet connectivity has remained unreliable, slow, flaky and intermittent. As a result, people are always conscious about their data usage and try to save data by switching the mobile data off, especially during

commutes. Free Wi-fi hotspots are rare, which makes mobile data the primary internet connection for outdoor internet usage. Mobile data is also closely related with battery consumption and is often turned off in order to save the battery.

Moreover, almost every state in India has its own regional language. In India, there are about twenty-two languages that are used for everyday communication, but Hindi is the national language of India and is commonly used in most parts of India.[8] Thanks to British colonization in the distant past and globalization more recently, English is also used widely across the country, but by no means universally. While the middle-aged generation is familiar with English, they typically have a larger vocabulary and much greater fluency and comfort in their national or regional language than in English. Many Indians prefer the fluidity across languages and transliterate as needed.[9]

The importance of designing for users with limited digital literacy

Narrowing the digital divide

A "digital divide" occurs when certain parts of the population have fewer opportunities to benefit from new technologies than other parts of the population.[10] The digital divide has three different components: an economic divide, a usability divide, and an empowerment divide. While design might not be able to address the issues associated with the economic divide, it certainly has potential to address the challenges related to the usability and empowerment divides.

In order to create technologies that benefit all parts of the Indian (or any other) population, it is important to handhold and train people with limited digital literacy towards

becoming well-informed, empowered and efficient digital users. This could be achieved in several ways such as by helping them build confidence, decluttering information and presenting it in step-by-step format, providing support in different languages, having a tolerance for mistakes, and giving users options to correct errors easily.

Market size and potential impact

Over 100 million new Internet users came online in India alone in both 2015 and 2016 (fig. 3).[11]
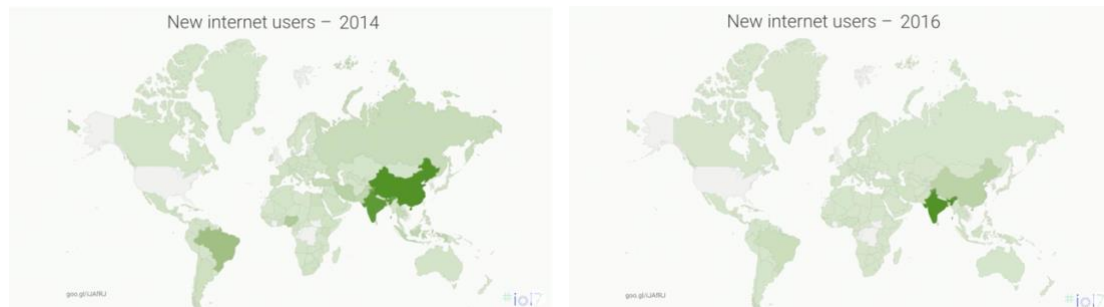
Figure 3: Screenshots of the slides from Google I/O 2017 presentation displaying the comparison between heatmaps of the number of new internet users in 2014 and 2016. (https://www.youtube.com/watch?v=wD3rpdiLMyY). Retrieved April 30, 2019.

Around sixty five percent of India's population is not yet online, and by 2020 there will likely be about 1 billion unique mobile users in India alone.[12] These users might have never used computers before and have experienced using the internet only on mobile devices, and therefore have a very different mental model of how things work online than

people who converted from desktop to mobile internet use.[13] Considering the attitude, behavior, needs, pain-points, and expectations of these many new digital users is crucial to creating experiences that are usable, useful, accessible, meaningful and even delightful for them. (And even though my project focuses on the needs of novice digital users who are middle-aged and older, arguably the same approach could be useful for younger novice users as well.)

PROBLEM ANALYSIS

Secondary research

Understanding the problem

　　To get a deeper understanding of the challenges that middle-aged and older Indians face in using digital banking apps, I started to gather information, data, inspirations, and theories related to their device usage, financial behavior, digital behavior, and commonly used banking and payment solutions in India. I started pinning all my research material to the wall and used that space as a dumping ground for all the known factors and for my assumptions and hypotheses. This process made the gaps in the information clearer and helped me identify areas where I needed to gather more data. Initially, I concentrated more on gathering as much material as possible rather than filtering it or categorizing it in groups. Later, having everything put up on the wall helped me identify patterns and themes, based on which I started to group information together to start making sense of the data. This exercise helped me prioritize key themes and narrow my focus area further (fig. 4).

Figure 4: Compilation of secondary research for identifying pattern and themes.

I also tried to analyze trends in areas related to my research problem, such as banking, user experience design, designing for emerging markets, and the 'Digital India' Initiative (a flagship program of the Indian government whose aim is to transform India into a digitally empowered society and knowledge economy).[14] This study helped me look at the problem holistically and think about how to create a solution that would be relevant now and into the near future (fig. 5).

Figure 5: Mapping of trends in related industries and how those might impact the mobile banking sector.

Analysis of existing solutions

The largest, most popular banks in India have been offering digital banking applications for years. However, most of these solutions were primarily designed for desktop usage and were not optimized for mobile devices. After demonetization, this scenario has certainly changed due to the rise in demand and increasing number of private players in the mobile payment sector such as Paytm, Phonepe, Paypal, Freecharge, etc. (fig. 6).
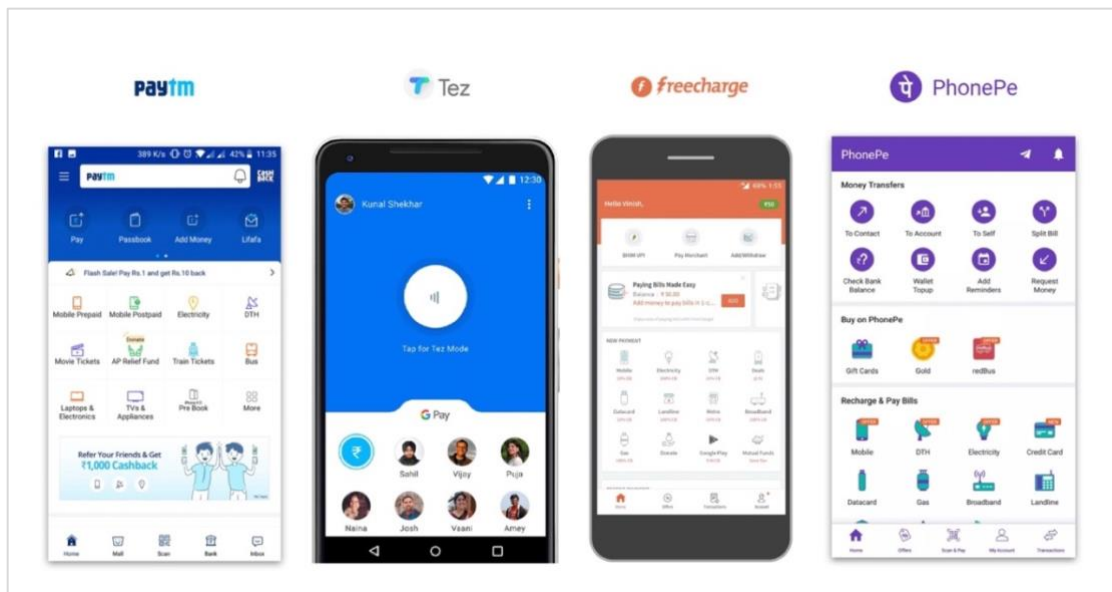
Figure 6: Screenshots of mobile banking and payment apps offered by some of the most popular banks and private companies in India such Paytm, Google Tez (Now converted to Google Pay), Freecharge, and PhonePe.

Banks have also started realizing the need to offer digital banking solutions designed for mobile phones (fig. 7, fig. 8).
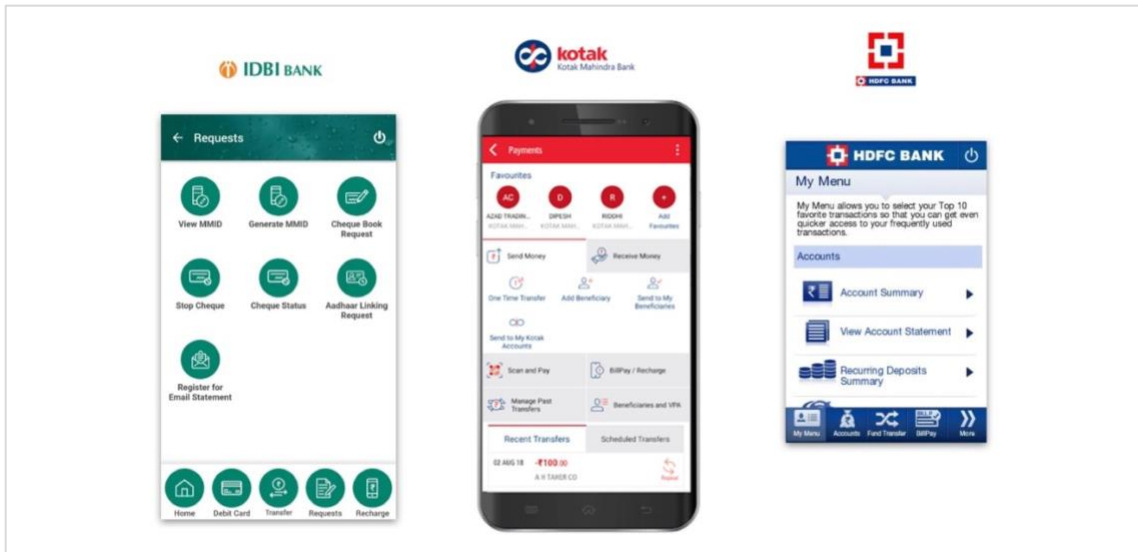
Figure 7: Screenshots of mobile banking and payment apps offered by some of the most popular banks in India such as IDBI Bank, Kotak Mahindra Bank and HDFC Bank.
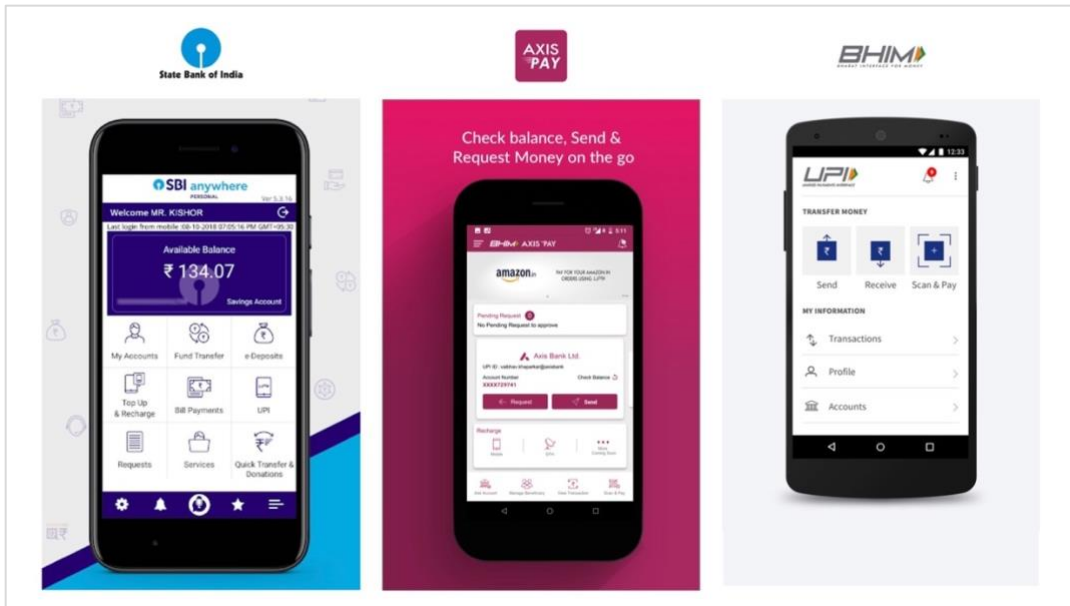
Figure 8: Screenshots of mobile banking and payment apps offered by some of the most popular banks in India such as State Bank of India and Axis Bank, plus the BHIM app offered by the Government of India.

While there have been improvements recently in the quality of Indian mobile banking apps, most of these solutions seem to be designed only for tech-savvy users. Although there are digital banking and payment solutions that have a fairly simple interface, they fail to provide enough guidance and support for people with limited digital literacy. While some tools have been providing the experience in different languages, my research indicates that their interface still feels overwhelming to use for people with low digital literacy. People with low digital literacy still do not feel confident about using any of the digital banking solutions, or in fact any digital applications.[15] While many tools attempt to resolve this issue through building a simpler interface, they often achieve their

clean visual design by hiding and collapsing options within "hamburger" (three-line or three-dot) menus, which are not intuitive for users with low digital literacy to use.[16] Although banks and third-party app developers have created apps to "solve" the problem of cashless banking, they have not designed these apps for people with low digital literacy, low English literacy and common age-related vision impairments.

To understand how well the existing solutions might perform for users with limited digital literacy, I tried to evaluate the most popular existing solutions against the metrics such as the features they offer, the design of their interface and the ease of use. I did this evaluation by trying out the apps and also on the basis of the reviews, and evaluations done by other researchers and experts (fig. 9).[17]

	BHIM	Tez	PhonePe	State Bank of India	Paytm
Features offered	3	6	8	6	8
Interface	8	8	6	5	6
Ease of use	8	7	5	4	5
	kotak Kotak Mahindra Bank	IDBI BANK	HDFC BANK	freecharge	AXIS PAY
Features offered	9	9	9	7	5
Interface	3	2	3	6	7
Ease of use	4	2	3	4	4

Figure 9: Evaluation of the existing mobile banking and payment solutions on a scale from 1 to 10, with 1 being the worst and 10 being the best.

Opportunity mapping

I tried to identify the area of opportunity by placing the existing solutions in different quadrants based on the features offered and ease of use (fig. 10).

Figure 10: Competitive analysis

This helped me realize that there aren't many user-friendly solutions available that focus on offering basic features that address the primary financial needs of the average users (fig. 11).

Figure 11: Mapping the area of opportunity for intervention.

One of the very few currently available is the BHIM app, sponsored by the Indian government, which has simple features and is easy to use, but is far from delightful visually (fig. 12).
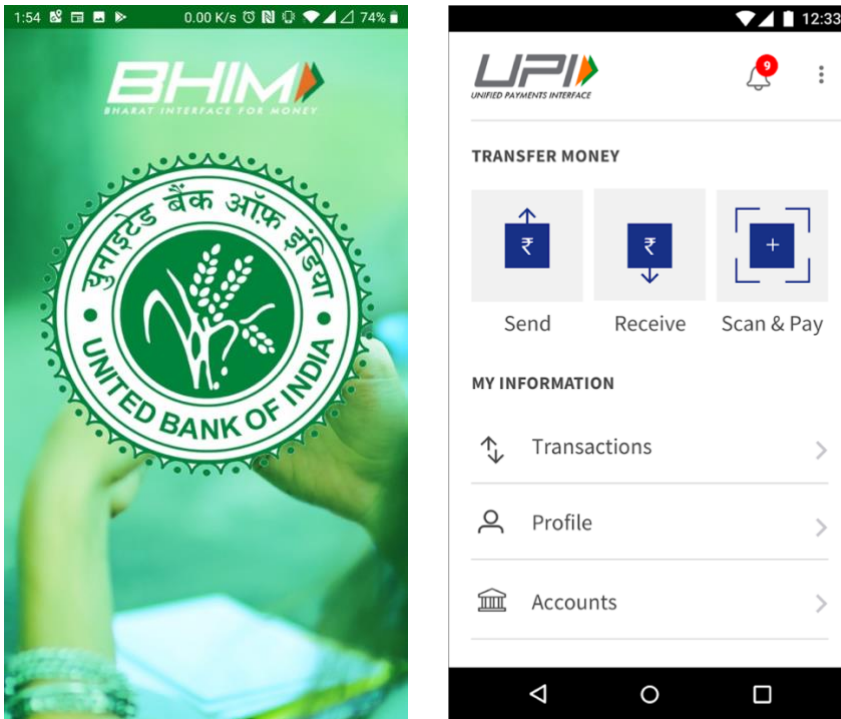
Figure 12: Screenshots of BHIM UPI Payment app
(https://play.google.com/store/apps/details?id=in.org.npci.upiapp&hl=en_US). Retrieved May 2, 2019.

User research

Personas and Journey mapping

Based on my primary research, I started defining personas to get a better understanding of the needs of my target user group and their likes, dislikes, pain-points, financial behavior, digital behavior and user scenarios (fig. 13, fig. 14).

Figure 13: Defining primary personas to guide the design process.

Figure 14: Defining secondary persona to guide the design process.

As a next step, I started mapping out journeys of each persona while navigating through the existing banking experience. This exercise helped me gain insights into the negative experiences during the journey and also helped me broaden my understanding of the scenarios (fig. 15, fig. 16).

Figure 15: Mapping the journey of the primary persona while navigating through different touchpoints of the banking experience.

NITIN RAO
Age: 67
Location: Pune
Income: Rs. 3 lakhs a year (pension)

Background: Lives with a son, daughter-in-law and a grand-daughter

Profession: Retired government employee

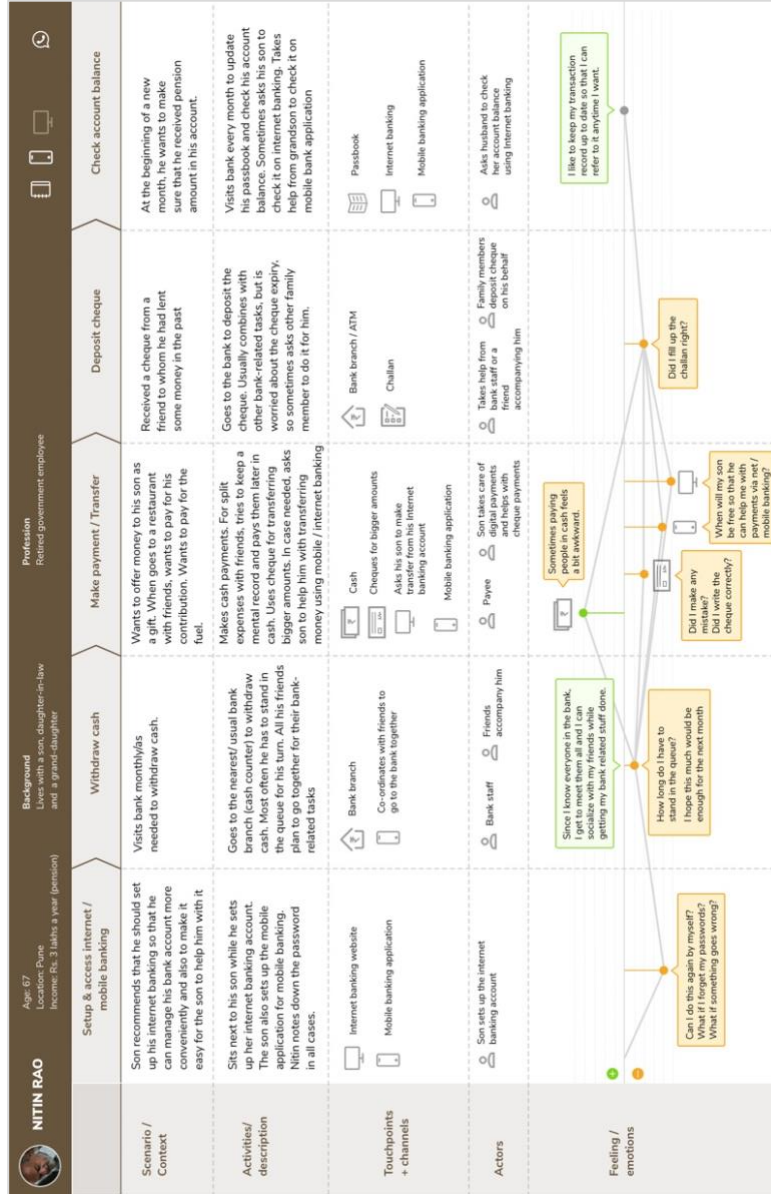|	Setup & access internet / mobile banking	Withdraw cash	Make payment / Transfer	Deposit cheque	Check account balance
Scenario / Context	Son recommends that he should set up his internet banking so that he can manage his bank account more conveniently and also to make it easy for the son to help him with it	Visits bank monthly/as needed to withdraw cash.	Wants to offer money to his son as a gift. When goes to a restaurant with friends, wants to pay for his contribution. Wants to pay for the fuel.	Received a cheque from a friend to whom he had lent some money in the past	At the beginning of a new month, he wants to make sure that he received pension amount in his account.
Activities/ description	Sits next to his son while he sets up her internet banking account. The son also sets up the mobile application for mobile banking. Nitin notes down the password in all cases.	Goes to the nearest/ usual bank branch (cash counter) to withdraw cash. Most often he has to stand in the queue for his turn. All his friends plan to go together for their bank-related tasks	Makes cash payments. For split expenses with friends, tries to keep a mental record and pays them later in cash. Uses cheque for transferring bigger amounts. In case needed, asks son to help him with transferring money using mobile / internet banking	Goes to the bank to deposit the cheque. Usually combines with other bank-related tasks, but is worried about the cheque expiry, so sometimes asks other family member to do it for him.	Visits bank every month to update his passbook and check his account balance. Sometimes asks his son to check it on internet banking. Takes help from grandson to check it on mobile bank application
Touchpoints + channels	Internet banking website; Mobile banking application	Bank branch; Co-ordinates with friends to go to the bank together	Cash; Cheques for bigger amounts; Asks his son to make transfer from his internet banking account; Mobile banking application	Bank branch / ATM; Challan	Passbook; Internet banking; Mobile banking application
Actors	Son sets up the internet banking account	Bank staff; Friends accompany him	Payee; Son takes care of digital payments and helps with cheque payments	Takes help from bank staff or a friend accompanying him; Family members deposit cheque on his behalf	Asks husband to check her account balance using Internet banking
Feeling / emotions	Can I do this again by myself? What if I forget my passwords? What if something goes wrong?	Since I know everyone in the bank, I get to meet them all and I can socialize with my friends while getting my bank related stuff done. / How long do I have to stand in the queue? I hope this much would be enough for the next month	Sometimes paying people in cash feels a bit awkward. / Did I make any mistake? Did I write the cheque correctly? / When will my son be free so that he can help me with payments via net / mobile banking?	Did I fill up the challan right?	I like to keep my transaction record up to date so that I can refer to it anytime I want.

Figure 16: Mapping the journey of the primary persona while navigating through different touchpoints of the banking experience.

Contextual Inquiry

To understand the overall attitude and behavior around banking in India, I remotely interviewed five people over the phone. Through these interviews, I tried to gain insights into their needs, solutions they currently use to address their financial needs, what they use (or want to use) those solutions for, things they like and dislike about them, pain-points and expectations.

Insights from the interviews

When it comes to digital banking, middle-aged Indian adults often need guidance from a person they trust, usually a younger member of their family. However, they also hate to trouble their family members for resolving their phone-related problems and feel dependent on them for completing their banking tasks. They tend to double-check before they enter the information online and yet feel anxious and afraid of making a mistake. Also, they feel more comfortable with physical mediums like passbooks, notebooks, receipts etc. for tracking their transactions.

Another insight was that most of the middle-aged adults I interviewed primarily need to carry out basic banking tasks such as paying individuals, paying bills, checking account balances, monitoring check deposits, etc. I realized that they would benefit from a simplified experience designed around these basic needs.

DESIGN BRIEF

The intent

Based on the insights from my primary and secondary research, I narrowed my focus and defined the design brief for my project. I decided to focus on designing a mobile banking experience for middle-aged Indian adults with limited digital literacy. The goal of my project was to guide and empower middle-aged Indian adults with limited digital literacy to use mobile banking independently and confidently. The intent was to create an intuitive, user-friendly, and culturally relevant solution to address their banking needs.

Considerations

While designing a solution for my target audience, I defined a few design considerations to guide my design process. I realized that most of the potential users from my target group might have never used a computer before and started using the internet on mobile devices directly. Therefore, they might have a completely different mental model for how things should work. Also, while there is a demand for content in local languages, sometimes English is preferred over the local languages, especially when it comes to commonly used and technical terms. Despite their low fluency in English, many people prefer to use English because it is the aspirational language closely associated with social status and upward social mobility.[18] Due to multilingualism, hybrid languages such as Hinglish—which mix Hindi with English within conversations, individual sentences and even words—are becoming popular.[19]

DESIGN PROCESS

Inspiration

For inspiration, I looked at some analogous examples to see how others are addressing similar issues and also looked at their strategies for designing solutions for middle-aged adults and the elderly.

One of the inspirations was a packaging and onboarding experience for Samsung phones designed for the elderly (fig. 17).

Figure 17: Out of the box, a phone manual designed for elderly to guide them step by step through the process of setting up their smart phones (http://specialprojects.studio/project/out-of-the-box/). Retrieved April 25, 2019.

The solution was focused on providing guidance for digital experiences using physical media that the elderly are already comfortable with, such as a book.

I also looked at mobile applications designed for collaboration, where the users can share their mobile screen with others and also view others' screens. I closely analyzed the interactions of applications such as Inkwire and TeamViewer that offer such features. It gave me insights into how the remote access and screen-sharing could be made secure and user-friendly.

Another source of inspiration came from an example of a TV remote control modified for the elderly (fig. 18).

Figure 18: TV Remote for grandparents (http://www.dailymail.co.uk/femail/article-5214547/Photos-prove-grandparents-technology-dont-mix.html#i-1a51cb5c96883e16). Retrieved April 29, 2019.

It truly grabbed my attention as it highlighted one of the key differences for the strategies to be followed while designing for tech-savvy users and non-tech-savvy users, i.e., presentation and decluttering of the information. In this example, the buttons that aren't usually used on the remote control were masked to help simplify the user's interaction. Also, the most commonly used station—PBS, channel 522—was marked at the bottom. The words on, off, and undo were in large, high-contrast print.

I also looked at the mobile application most used by middle-aged adults in India: WhatsApp. From personal observation, I have known many middle-aged Indian adults who bought smartphones only so that they can use WhatsApp to keep in touch with family members far away without paying for phone calls. WhatsApp is on 90% of smartphones in India.[20] WhatsApp's interface is simple and easy to use (fig. 19).
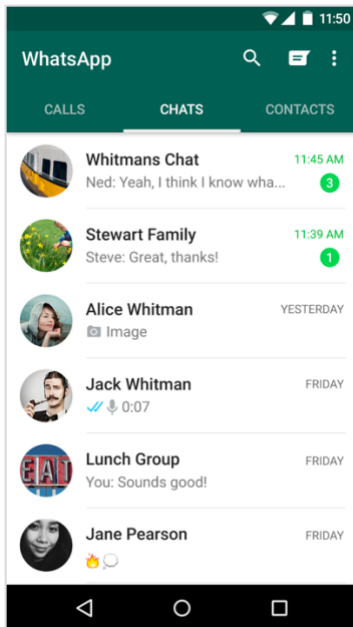
Figure 19: Screenshot of WhatsApp Messenger, WhatsApp Inc.
(https://play.google.com/store/apps/details?id=com.whatsapp&hl=en_US).
Retrieved April 29, 2019.

Although it does have a hamburger menu at upper right, the three most important features are visible as tabs at all times, making it easy for people to figure out how to get where they want to go. WhatsApp has a low learning curve and therefore has become the most popular mode of communication in India, even among middle-aged and older adults with low digital literacy.

Ideation

After chalking out a very specific brief to work on, I started thinking about how to address some of the issues I had identified in my research. My goal was to come up with as many

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ideas as possible and then try to filter them down based on the feedback that I received from people in my target user demographic.

One of my concepts was to design an experience that would build on users' familiarity with WhatsApp. In the concept I designed, I tried to have a conversational interaction wherever possible in the app that was similar in spirit to the chat feature of WhatsApp, so that the interface would feel familiar to users. In the chat interaction, I also tried to provide "canned" responses to reduce the amount of typing people had to do (fig. 20).
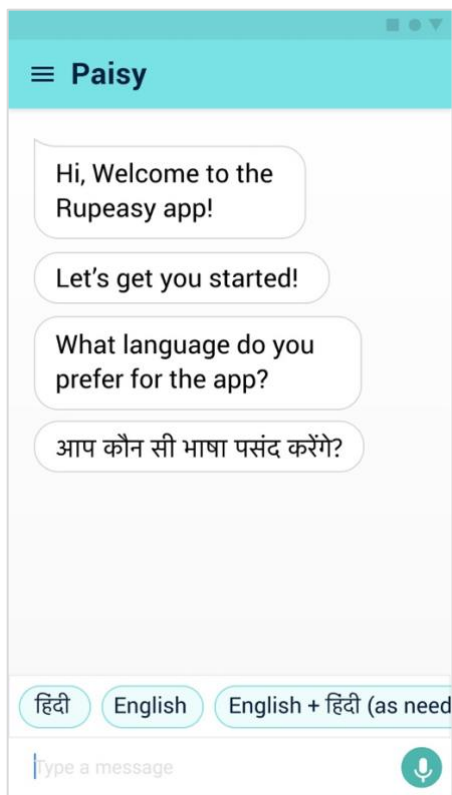

Figure 20: Initial concept: conversational interface for onboarding.

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In another concept, I focused on providing a way for users to practice making payments and other banking features. The idea was to help users build confidence in using mobile banking by giving them a hands-on experience of using the mobile application with fake money. Using practice mode, users could practice the features of the app offline. Also, their actions would have no impact on their actual money when they are in practice mode. Practicing the app would allow them to walk through all the screens and help prepare them for making real transactions.

I also tried to build on users' familiarity and comfort with physical mediums such as notebooks, address books, cards etc. The idea was to provide customized QR cards for the tasks that users need to carry out the most. These QR cards, when scanned from the application would directly launch that specific feature, rather than users having to look for that feature in the app.

Similarly, there could be a way to export the QR codes of the frequently used contacts and send it to the users in the form of a contact-book. These cards could be used to make payments to the individuals simply by scanning the QR code.

Concept validation

During the winter break, I went to India and tested out these concepts with users in my target demographic. The intent of the concept testing was to evaluate the desirability of the concepts, validate the concepts, and understand what values are being added by the concepts.

Recruiting users

       I recruited five participants through my network who aligned well with the personas I had defined in an earlier phase of the project, in terms of their demographic characteristics. I also interviewed two family members of those five people to understand the role they played as "app advisors" or helpers to the users.

Creating scenario-based test script and prototypes

       To make sure there was consistency in the format of all the concept testing sessions I was planning to conduct, I first defined the objectives of the concept testing session. Based on that, I created a detailed research plan to meet those objectives through the concept testing. I also created a test script for myself in order to conduct the sessions consistently and smoothly without missing out on any important questions.

       As per the research plan, I divided the concept testing session into three parts: 1) Exploration 2) Experiment 3) Concept Evaluation.

       In the first part of the session—exploration—I tried to get feedback and reactions on the concepts I had designed by showing the users the print-outs of the mockups I had created. As a preparation for the experiment part, I created click-through interactive mock-ups of the concepts using the tools like Sketch, Invision and Principle. During the experiment part of the session, I conducted a scenario and task-based usability testing for my concepts by asking the users to interact with the prototype by imagining themselves in those particular scenarios. As the concluding part of the session, I asked the users to

evaluate the concepts based on the different criteria such as desirability and usefulness of the concept in their everyday life, usability of the concept and discoverability of the information.

Insights from concept testing

Some of the key insights from my concept testing were: overall, there was a lot of text and people didn't want to read, the messages were not easy to understand when the users just glanced through the text, non-fluent English speakers misunderstood and deduced different meanings altogether which led them to unintended interactions, and the language needed to be basic, direct and without any jargon. Color contrast needed to be greater and type size needed to be bigger. Also, some secondary actions needed to better convey that they were tappable.

In the concept testing, concepts such as Practice Mode and Customized QR cards were very well-received and appreciated by the users. To my surprise, though, even though users were comfortable with a chat interface, it turned out not to be needed for this particular application and was in fact creating confusion in users' mind about how the app was supposed to be used.

The insights from the concept testing helped me prioritize the concepts and identify areas for improvement. I realized that all these concepts needed to be housed together and needed to work together as an integrated solution.

Concept refinement

DEFINING USE-CASES

Based on the user research I also got a better sense of the primary use-cases for a mobile banking app. I decided to focus on the basic financial needs of the target audience such as making payments to individuals, bill payments, requesting payments, and checking the account summary. I decided to craft the experience primarily for these use-cases rather than crowding the application with a bunch of features which the target user might not even need.

TASK FLOWS

Based on the tasks I had identified as primary use-cases, I started fleshing out task flows for each use-case. The intent was to break down a bigger task into steps and chunks to make it easy for the users to understand and complete the task with confidence. By defining task flows, I got better clarity about how users should navigate through the application while completing different tasks.

INFORMATION ARCHITECTURE

The intent of the information architecture was to help users easily find the information they need in order to complete tasks.[21] In order to define the information architecture, I compared the different use-cases for my app in relation with each other based on their priority and frequency of use. This exercise helped me define the navigation for

my app. An important design decision I made during this stage was not to hide any options and to keep all the primary options visible for better discoverability. To achieve this, grouping the information in appropriate categories was crucial. I decided on the content groups and labels for those groups based on the task flows and use-cases.
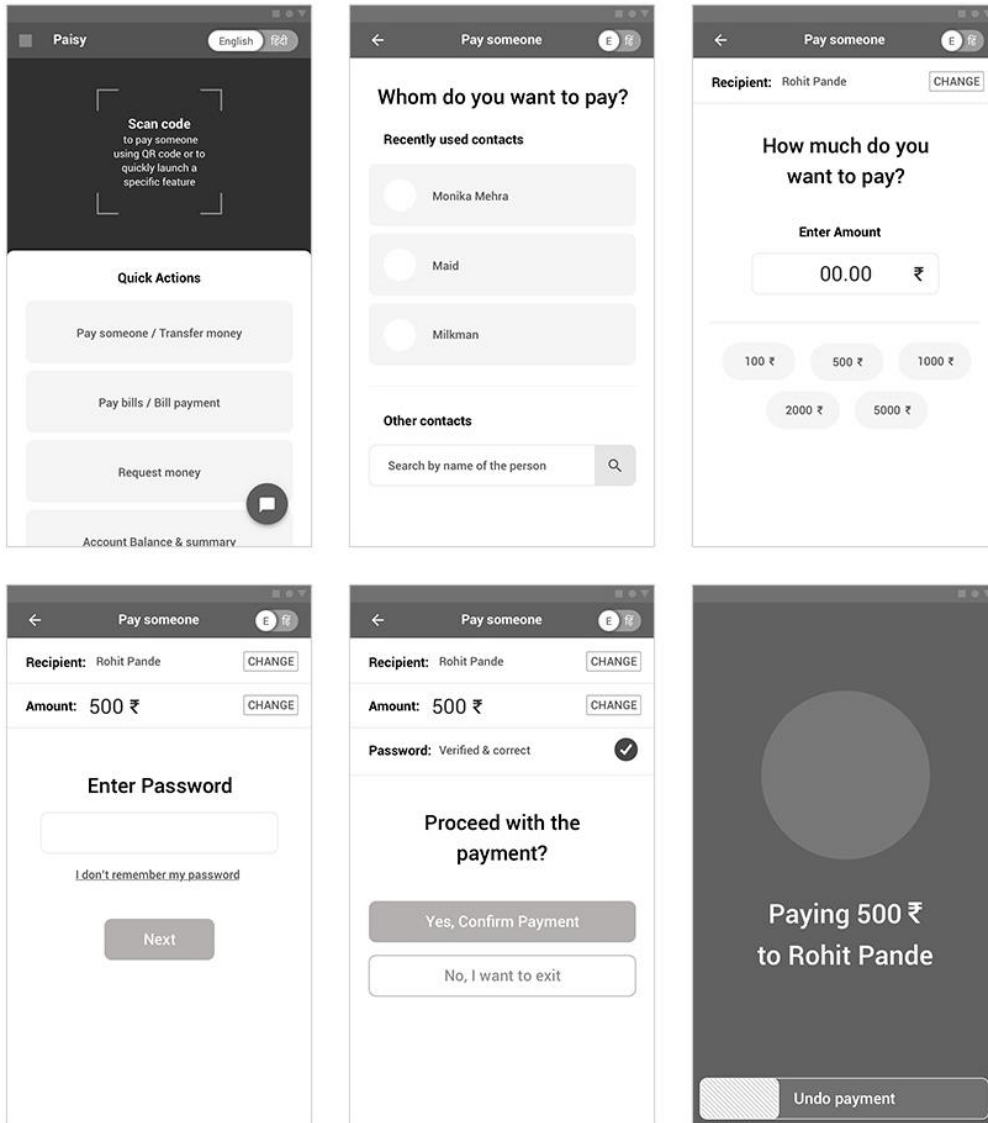
Wireframes

Figure 21: Wireframes

Branding and visual language

Brand personality

Brand personality is a combination of characteristics, values and attributes that helps shape the users' emotional response and associations with the app. Considering the differentiating factors of my solution, the attributes I chose for my brand personality were 'warm, friendly, inviting, simple, and easy-going.'

Brand name

The brand name is important to communicate the value, function, and positioning of any product. While choosing a brand name for my solution, I considered different factors such as its phonetic symbolism, cultural associations and relevance, as well as the brand personality and values. I started with the keywords related to my solution such as "pay", "easy", "aid", "Rupees" "*Paise*" (Indian currency and translation of the word "money" in Hindi). After trying multiple combinations of these keywords, I came up with the name "Paisy", which clearly communicates the "Payment" aspect of the solution and also makes it easy to deduce the meaning of it as it sounds like a short version of "Pay-Easy" (fig. 22).
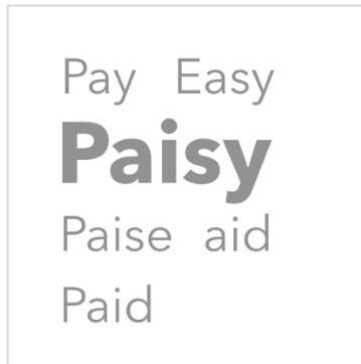
Figure 22: Snapshot of the associations with the brand name "Paisy"

Logo and Typography

For the logo, I took inspiration from the shapes and structures of the two physical objects involved in mobile banking, i.e., the currency notes and the mobile phone. In the logo, I also wanted to highlight the fact that it's a mobile banking app, and therefore another keyword I was considering for guiding my logo explorations was "transfer." Considering these aspects, I explored ways to showcase transfer through simple rectangular shapes that resonate with the shapes of mobile phone and currency notes. For typography, I chose "Quicksand" font for my logo, as it is rounded and feels friendly. I also chose not to use title case, as the non-capitalized text feels more friendly and inviting (fig. 23).

Figure 23: Paisy logo and tagline

Brand colors

I studied the brands in the banking and finance sector and tried to extract the commonly used colors in this domain (fig. 24). This exercise helped me identify the potential color combination for Paisy brand (fig. 25).
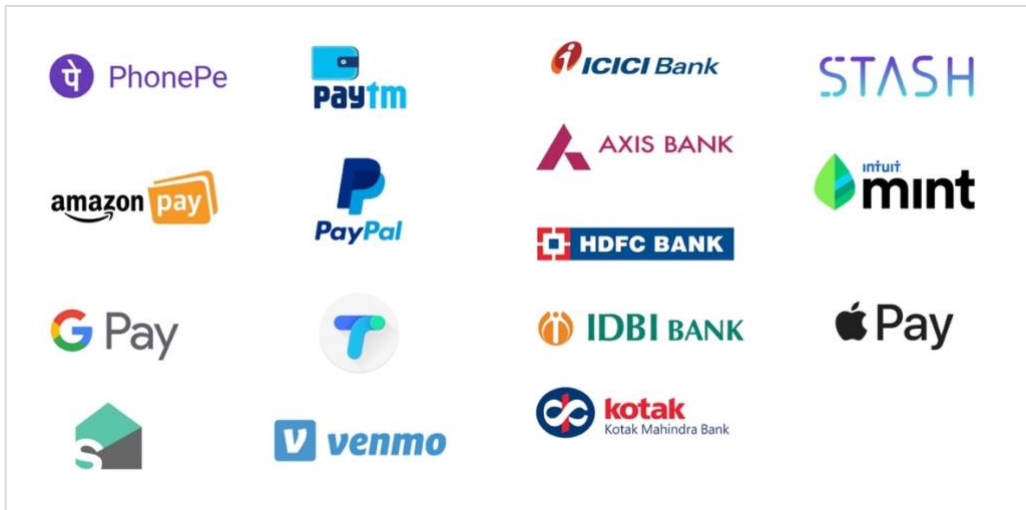

Figure 24: Logos of some of the best-recognized brands in the finance and banking sector.
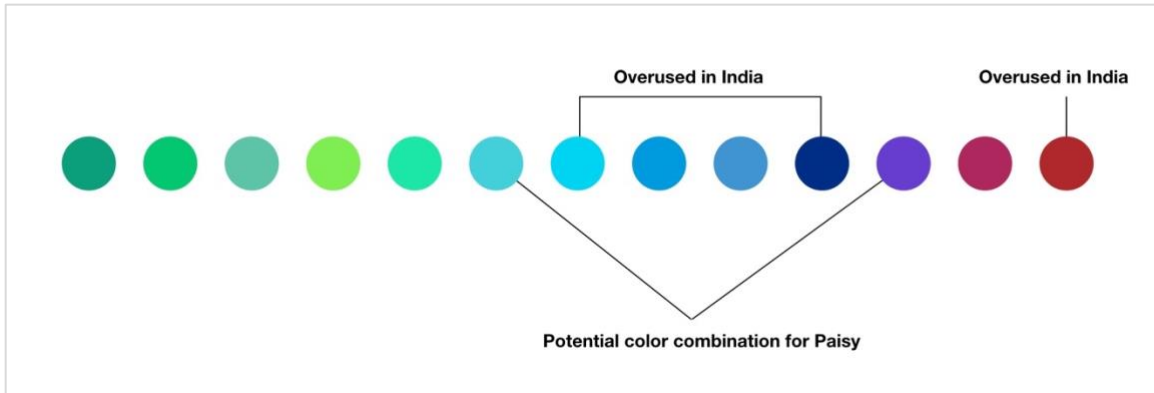
38

Figure 25: Analysis of the colors extracted from the logos of the recognized brands in Finance and Banking sector.

Color contrast ratio based on accessibility standards was one of my key criteria for choosing the brand colors. I used online tools like "Accessible-color-matrix"[22] and "WebAIM: Color Contrast Checker"[23] to make sure that all the color combinations for text and the background meet the contrast ratio of 4:5:1 and conform with the accessibility standards (fig. 26, fig. 27).

Figure 26: Screenshot of Color Palette for Paisy built using Accessible Color Palette Builder (https://toolness.github.io/accessible-color-matrix/) Accessed September 30, 2018.
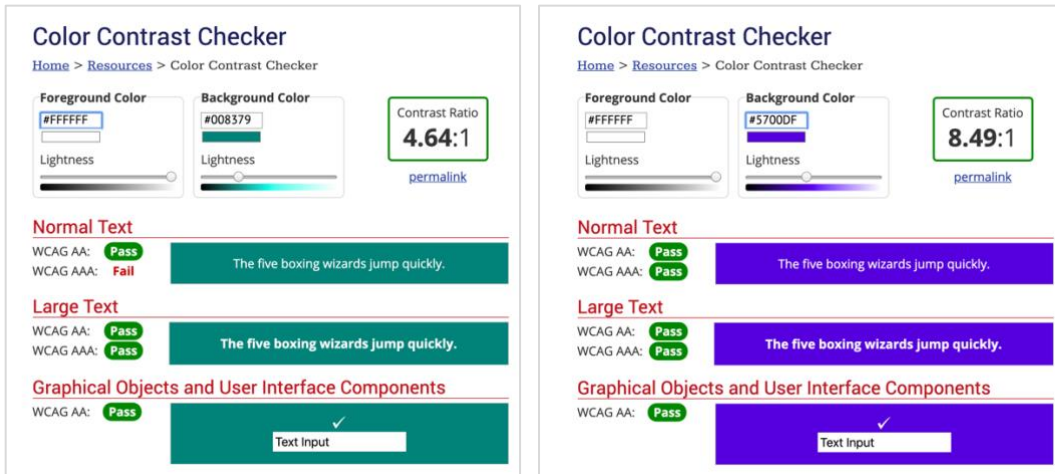
Figure 27: Color contrast ratio for primary and secondary.

I chose purple as my primary accent color at it is fresh, bright and yet has a great contrast ratio with white and black. In the app, I decided to use purple color primarily to indicate tappable design elements to clearly differentiate the actionable items from the rest. To complement purple, I used teal as the secondary color for the app, and I tried to use it only when the use of secondary color was required.

PROPOSED SOLUTION

How it works

Practice mode

      Practice mode allows users to practice making mobile payments and also the other mobile banking features in the app. Users can practice mobile banking until they feel confident about making a real mobile payment. Practice mode gives users a visibility into all the steps involved in making mobile payments. Also, users do not have to transfer actual money while trying out mobile payments in practice mode. Practice mode can be accessed offline and wouldn't require internet connectivity. The intent of having a practice mode is to reduce anxiety and fear of making mistakes and help users make mobile payments with confidence (fig. 28).
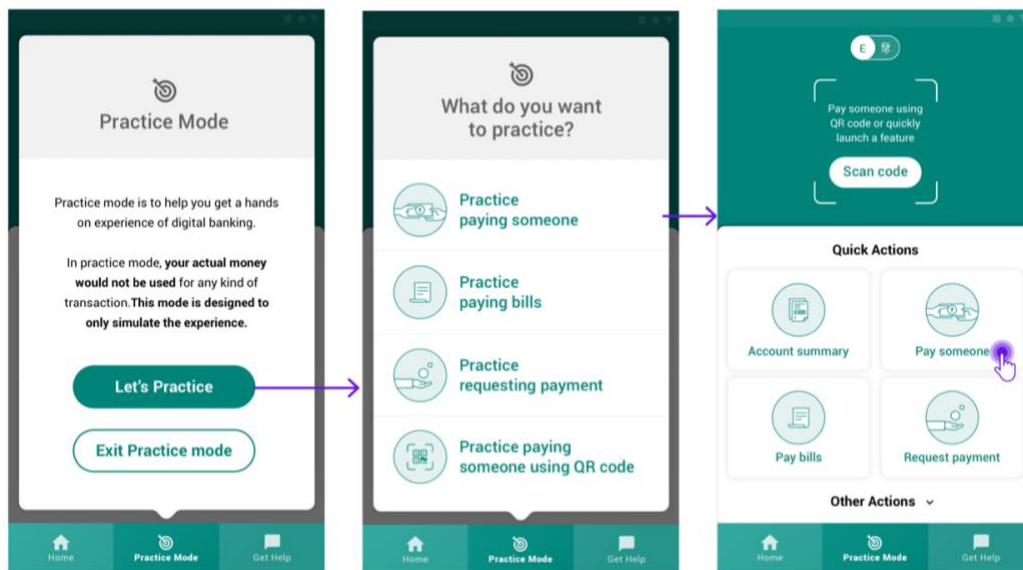

Figure 28: Paisy: Practice mode interaction.

Customized QR cards

Users can get customized QR cards for the features they need the most, such as checking their account balance, paying electricity bills, etc. When these cards are scanned from the Paisy app's QR scanner, Paisy would directly launch that specific feature in the app (fig. 29). This makes it simple and quick since users don't have to find the feature in the app. The intent is to address users' pain-point when they don't understand where to find a particular feature in the app and spend time going back and forth to locate it but give up if they don't find it.
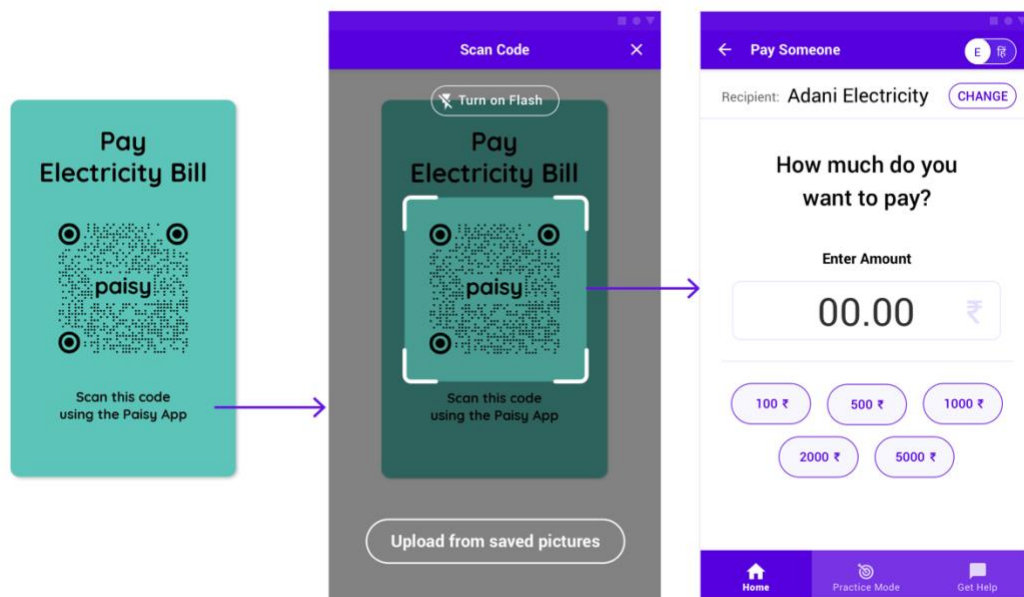

Figure 29: Paisy: How customized QR cards work.

Contact cards

In India, there are plenty of local businesses such as local shops, grocery stores, salons, dairies (for daily home delivery of milk and milk products), newspaper delivery, maids that offer cleaning services, food delivery, tea and snacks stalls, laundry and ironing services, etc. Users often have to pay the owners of these businesses for the services they offer. Moreover, when people eat out in groups, one of the group members pays for the entire group for simplicity's sake. Later, the other group members pay their individual expenses to that person. Overall, daily transactions in India involve a large number of peer-to-peer transactions.

To make these peer-to-peer payments easy for middle-aged Indian adults, I thought it would be good idea to provide them with a QR-enabled contact cards for their contacts they need to pay frequently. When a user scans a contact card, the app would launch a screen with auto-filled contact information. To proceed with the payment, users then only have to enter the amount and confirm the transaction (fig. 30).
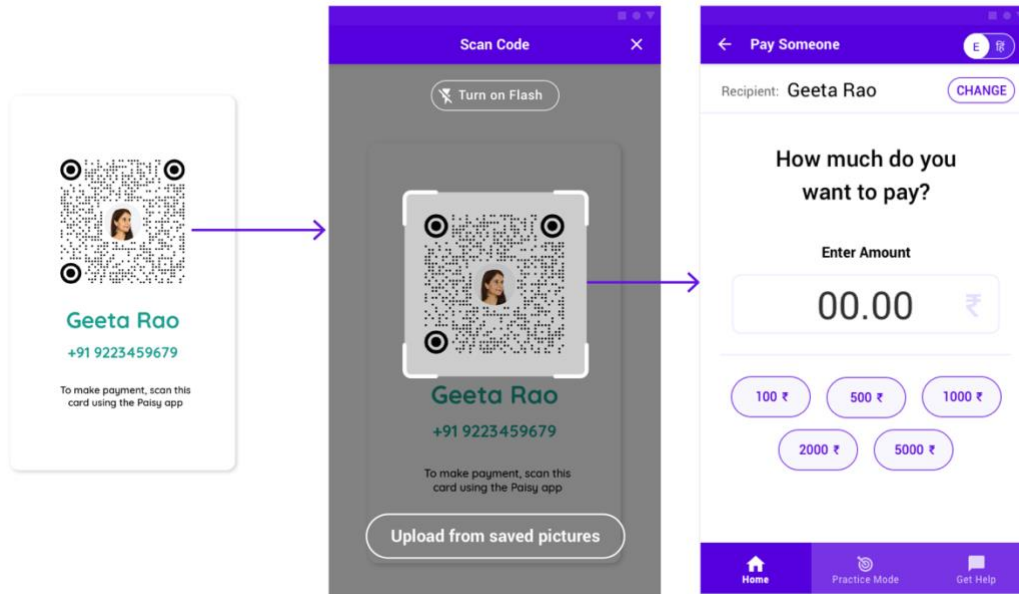
Figure 30: Paisy: How QR based contact cards work.

Another use-case where having a contact-cards would be helpful is when the users are making payments for their monthly expenses. Currently, users often have to personally meet the individuals or visit multiple platforms for making cash payments. With Paisy's contact-book, users would be able to simply start scanning the contacts from the contact-book one by one and complete making all the payments for their monthly expenses in one session.

Undo payments

According to Jakob Nielsen, one of the usability heuristics for user interface design is "User control and freedom," meaning that good design provides a way for users to leave

an unwanted state and correct their mistake without having to go through an extended process.[24] During my initial user research, most of the users I talked to mentioned their concern and fear of losing money in case they made a mistake. To address this issue, I added an option to cancel the payments within 30 seconds after making the payment. I believe this approach would be helpful in terms of helping users feel confident and in control (fig. 31).

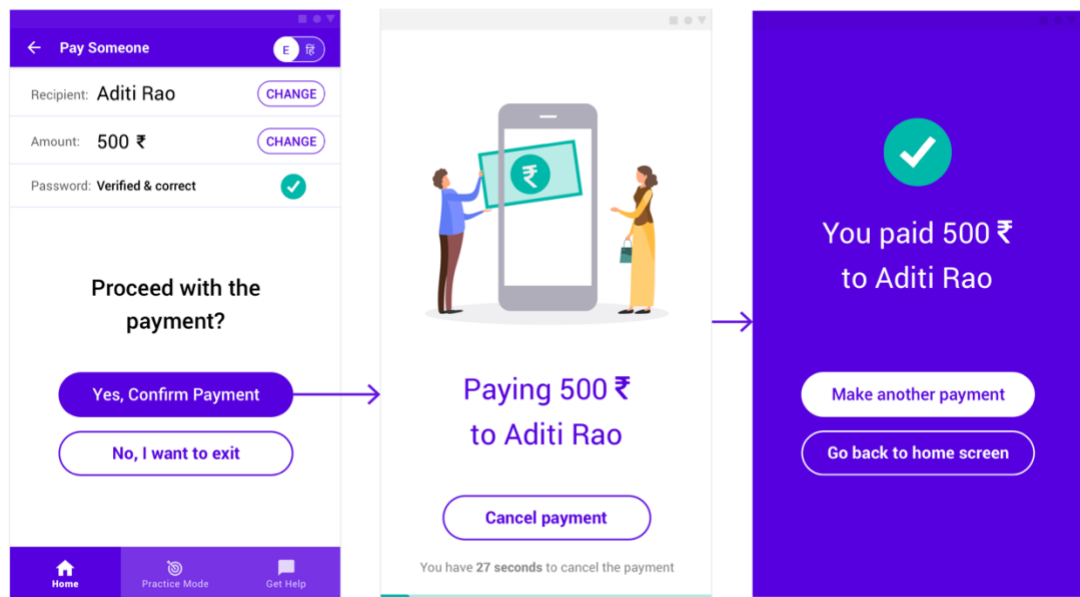
Figure 31: Paisy: Cancel payments within 30 seconds.

Get remote help

One of the findings from my primary and secondary research was that middle-aged and older Indian adults typically rely on younger members in their family to help them with

their phone-related queries. However, it is hard to get help when the trusted person from their family is not around. This often leads to waiting until they meet again when the trusted person has time to answer the queries. Also, for younger family members, it is difficult to communicate and help older adults over a phone without knowing what's happening on the screen. To address this issue, I provided a way in the app for the older adults to assign a person they trust as their helper. To get remote help from their helper, they can securely chat with them within the app. They can also call and share their screen with them remotely. This way, the helper can "see" the problem and they can provide clear step-by-step instructions as they can see what's happening on the screen (fig. 32).
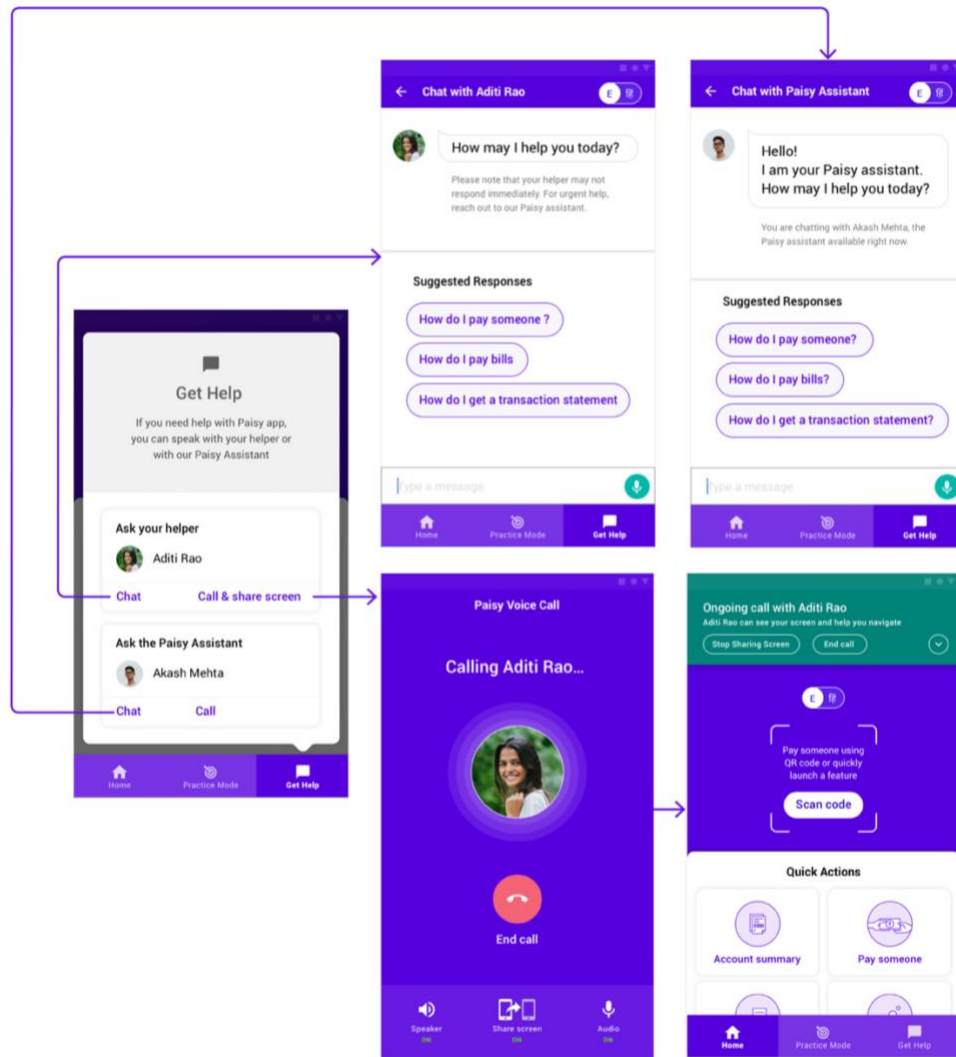
Figure 32: Paisy: Get remote help.

Key design considerations

No hidden menus

The interface of the Paisy app is simple and user-friendly. The navigation is designed in a way that there are no hidden or collapsed menus. All the features and options available in the app are presented in an expanded format up front.

Minimum learning curve

There are only three interactions—scroll, tap, and type—consistently used across the app. The app should therefore have a short learning curve, considering that users are likely to be familiar with these basic interactions and don't have to learn other gestures or interactions in order to use the app.

Accessibility

While color contrast ratio is an important aspect of accessible design, I also looked at other factors that are crucial for creating accessible design. I tried to have a clear visual hierarchy in the app to help users process the information better. While devices nowadays have accessibility settings that allow users to set the text size as per their preference, not everyone is aware of this option. Considering that many middle-aged adults in India wear spectacles and some might even have visual impairments, I provided an option within the app to choose a text size that feels comfortable to them.

Support in local languages was another key consideration for creating an accessible design. While the users from my target group might not be fluent in English, some technical

banking related English terms are commonly used and are preferred over the technical terms in local languages. Therefore, I provided a slider that allows users to switch back and forth from English to Hindi.

Building trust by leveraging the human relationships

Trust is an important factor, especially when it comes to finance and banking. Trust varies in different cultures as it is closely associated with human relationships and family structures. Based on my primary and secondary research, it occurred to me that the users from my target group trust their family members for their phone-related issues, even with banking and mobile payment applications. While designing Paisy, I decided to leverage the users' trust relationship with their family members, in order to help them use mobile banking confidently.

Currently, users tend to call the bank staff for help. Building on this behavior, I tried to have a way in the app to reach out to a bank assistant and get help from them as well.

Enabling users to double-check, confirm and edit at any point

Error prevention is one of the basic principles of usability.[25] To help users avoid making errors in Paisy—which is crucial given that it is a banking app—I tried to present the information at every step for the users to review and confirm, before they take final actions. I also tried to provide ways for users to modify the information easily in case they notice an error (fig. 33).
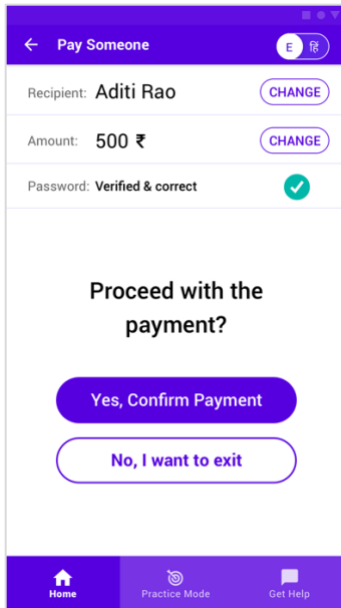
Figure 33: Paisy: Payment confirmation screen with options to change the recipient and the amount.

NEXT STEPS

Potential applications and collaborations

While Paisy is a product by itself, I consider it as a plug-in which can be applied to any existing mobile banking application. There is an opportunity to collaborate with the banks and private companies in India who might be looking for ways to make their mobile banking applications more relevant for the needs of middle-aged and older Indian adults. While designing Paisy, I derived some design principles and good practices to design for middle-aged and older adults with limited digital literacy. I hope to incorporate my learnings in other domains such as healthcare, e-commerce, etc., to design meaningful, useful, usable and delightful solutions to everyday problems for middle-aged and older Indian adults.

Future scope for improvement

Design is an incomplete and endless process, with room for continuous improvements. I believe designing Paisy was just a starting point to something much bigger, which is designing apps that are useful not only to middle-aged and older Indian population with low digital literacy, but also to the millions—even billions—of new mobile users from developing countries who will be joining the digital economy over the next five to ten years.

Security is an important aspect when it comes to digital and financial products. Besides having a secured system at the back end, there is a lot of work that needs to go into

the design of Paisy to *reassure* users that it is secure. Considering the target audience for this app, the security aspect needs to be incorporated in the experience at multiple steps in order to build trust with the users. Currently, Paisy requires users to enter the password when they are making the payments, and lets the user know once the password is verified. There could be an additional layer of security immediately after launching the app, where users would have to enter an additional PIN to proceed.

While the app currently caters to limited use-cases such as making payments to individuals, bill payments, checking transaction statements, etc., it could be designed to cater to other important use-cases as well. However, this would need to be done carefully in to ensure that the experience remains simple, not overwhelming.

More thought, too, can be put into designing for offline conditions, considering the infrastructural limitations in India. It would be interesting to incorporate offline design principles in the design of Paisy such as clearly displaying when there is no internet connectivity, resuming the actions automatically when the internet connection is back online, etc., to better cater to the specific needs of the target audience.[26]

Considering the infrastructural limitations and popularity of inexpensive smartphones and basic feature phones, Paisy's experience could also be expanded beyond an app, to also looking at how banking could be made more user-friendly through different ways of communication channels such as text messages, phone calls, etc. that do not require internet connections. There is an opportunity to improve the retail banking experience using technologies and interfaces designed on the basis of strategies used in the design of Paisy.

CONCLUSION

The strategy and principles I used and discovered through the process of designing Paisy are in fact probably good practices to use in designing solutions catered to people with limited digital literacy in *all* age-groups, and in many parts of the world. Some of the key takeaways for me from this project include decluttering the information, following a step-by-step approach to present the information effectively, using simple, direct language that clearly conveys the content of the message, using consistent and basic interactions that do not require users to learn new gestures, helping prevent users from making errors by providing them with ways to review the information, providing ways to rectify errors quickly and easily, providing content in different languages and also providing a way to switch between languages to support multilingual users.

My hope is that the insights derived from my research can inform the design of other mobile applications in other domains targeted at older Indian populations with low digital literacy, and perhaps also the design of mobile applications targeted at other populations having low digital literacy across the globe.

References

[1] Nation Master. All stats: India and United States compared. https://www.nationmaster.com/country-info/compare/India/United-States Accessed April 29, 2019.

[2] Justin Rowlatt. Why India wiped out 86% of its cash overnight.https://www.bbc.com/news/world-asia-india-37974423. Published November 14, 2016. Accessed April 28, 2019.

[3] Justin Rowlatt. Why India wiped out 86% of its cash overnight.https://www.bbc.com/news/world-asia-india-37974423. Published November 14, 2016. Accessed April 28, 2019.

[4] Jakob Nielsen. Digital Divide: The 3 Stages. Nielsen Norman Group. https://www.nngroup.com/articles/digital-divide-the-three-stages/. Published November 20, 2006. Accessed September 30, 2018.

[5] Digital literacy. Wikipedia. https://en.wikipedia.org/wiki/Digital_literacy. Published 03 2019. Accessed April 28, 2019.

[6] National Sample Survey Office - Ministry of Statistics and Programme Implementation (MOSPI), Government of India (GOI). *Key Indicators of Social Consumption in India - Education*.; 2015:39. http://www.mospi.nic.in/sites/default/files/publication_reports/nss_71st_ki_education_30june15.pdf. Accessed October 1, 2018.

[7] Google Developers. *Accessibility UX Insights: Designing for the Next Billion Users (Google I/O '17)*. 2017. https://www.youtube.com/watch?v=38fbB8wCPzg. Accessed April 29, 2019.

[8] Office of the Registrar General & Census Commissioner, India Ministry of Home Affairs, Government of India. Census Data 2001 : General Note. http://www.censusindia.gov.in/Census_Data_2001/Census_Data_Online/Language/gen_note.html. Accessed April 29, 2019.

[9] Google Developers. *Accessibility UX Insights: Designing for the Next Billion Users (Google I/O '17)*. 2017. https://www.youtube.com/watch?v=38fbB8wCPzg. Accessed April 29, 2019.

[10] Jakob Nielsen. Digital Divide: The 3 Stages. Nielsen Norman Group. https://www.nngroup.com/articles/digital-divide-the-three-stages/. Published November 20, 2006. Accessed September 30, 2018.

[11] Internet Users by Country (2015). internet live stats. http://www.internetlivestats.com/internet-users-by-country/2015/. Published July 1, 2015. Accessed April 29, 2019; Internet Users by Country (2016). internet live stats. http://www.internetlivestats.com/internet-users-by-country/. Published July 1, 2016. Accessed April 29, 2019.

[12] Google Chrome Developers. *Building for Your Next Billion Users (Google I/O '17)*. 2017. https://www.youtube.com/watch?v=wD3rpdiLMyY. Accessed April 29, 2019.

[13] Google Developers. *Accessibility UX Insights: Designing for the Next Billion Users (Google I/O '17)*. 2017. https://www.youtube.com/watch?v=38fbB8wCPzg. Accessed April 29, 2019.

[14] Ministry of Electronics & Information Technology, Government of India. Digital India. https://www.digitalindia.gov.in/. Accessed April 30, 2019.

[15] Ranjita Ganesan. Being old in the digital age. *Rediff News*. https://www.rediff.com/news/special/being-old-in-the-digital-age-with-whatsapp-skype-demonetisation-mobile-phone/20161219.htm. Published December 19, 2016. Accessed April 30, 2019.

[16] Rizki Rahmat Ridha. 3 Good Reasons Why You Might Want to Remove that Hamburger Menu from Your Product. February 2018. https://medium.muz.li/3-good-reason-why-you-might-want-to-remove-that-hamburger-menu-from-your-product-69b9499ba7e2. Accessed April 30, 2019.

[17] Admin, Postgully.com. 5 Best UPI Apps in India for Digital Payments. https://postgully.com/5-best-upi-apps-in-india-for-digital-payments/. Published December 4, 2018. Accessed May 1, 2019; Best UPI Payment Apps in India [2019]. UPI Payments. https://upipayments.co.in/best-upi-apps/. Published April 24, 2019.

[18] Google Developers. *Accessibility UX Insights: Designing for the Next Billion Users (Google I/O '17)*. 2017. https://www.youtube.com/watch?v=38fbB8wCPzg. Accessed April 29, 2019.

[19] The rise and rise of Hinglish in India. *The Conversation*. February 2016. http://theconversation.com/the-rise-and-rise-of-hinglish-in-india-53476 Accessed May 1, 2019.

[20] Top 25 Used Apps in India: December 2015. *Jana*. March 2016. https://blog.jana.com/blog/2016/03/04/top-25-used-apps-in-india. Accessed April 29, 2019.

[21] Information Architecture Basics. usability.gov. https://www.usability.gov/what-and-why/information-architecture.html. Accessed April 28, 2019.

[22] Atul Varma. Accessible color palette builder. github. https://toolness.github.io/accessible-color-matrix/? Published January 8, 2017. Accessed September 30, 2018.

[23] Color Contrast Checker. WebAIM. https://webaim.org/resources/contrastchecker/. Accessed April 29, 2019.

[24] Jakob Nielsen. 10 Usability Heuristics for User Interface Design. Nielsen Norman Group. https://www.nngroup.com/articles/ten-usability-heuristics/. Published April 24, 1994. Accessed April 28, 2019.

[25] Page Laubheimer. Preventing User Errors: Avoiding Unconscious Slips. Nielsen Norman Group. https://www.nngroup.com/articles/slips/. Published August 23, 2015. Accessed April 28, 2019.

[26] Susanna Zaraysky and Next Billion Users. Design for Offline. Google Design. https://design.google/library/offline-design/. Published March 21, 2018. Accessed April 28, 2019.