



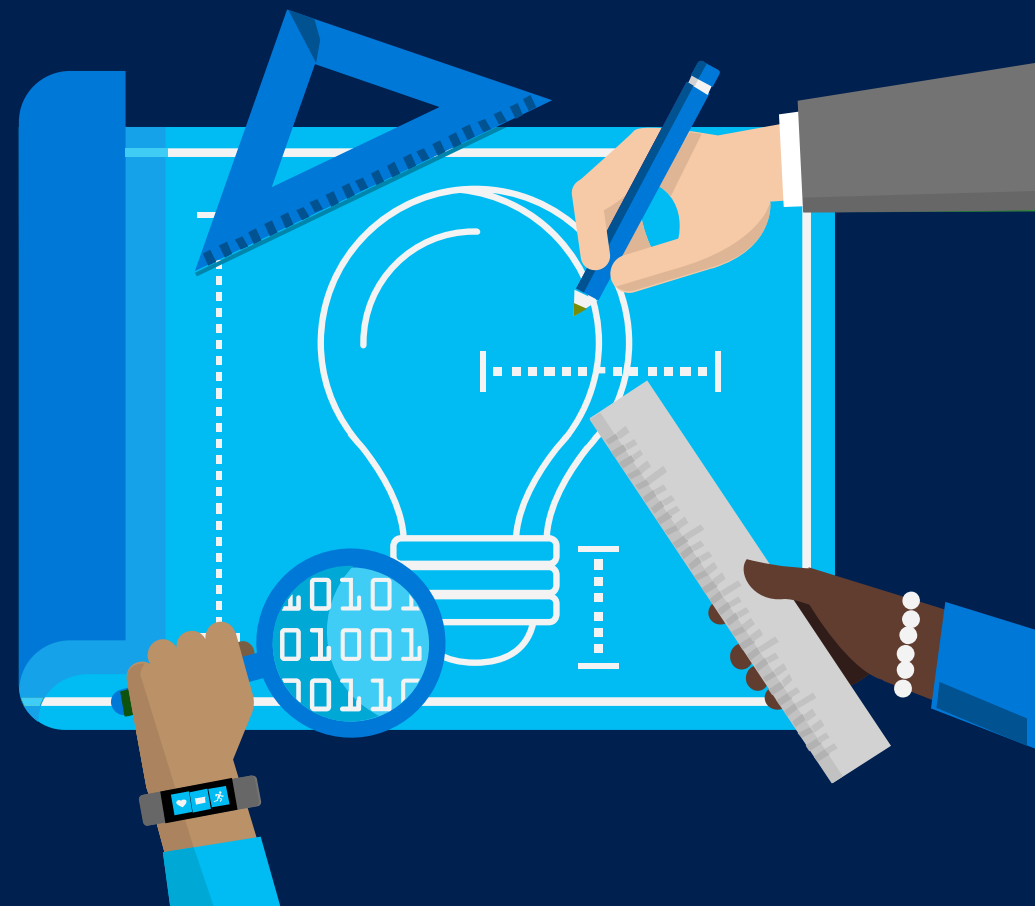
# PocketATM: Understanding & Improving ATM Accessibility in India

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Acknowledgements: Bill Thies & Manohar Swaminathan

*Presented at the 10<sup>th</sup> International Conference on Information and Communication Technologies and Development (ICTD '19), Ahmedabad, India*



# People



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Venkatesh Potluri



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Indrani Medhi-Thies

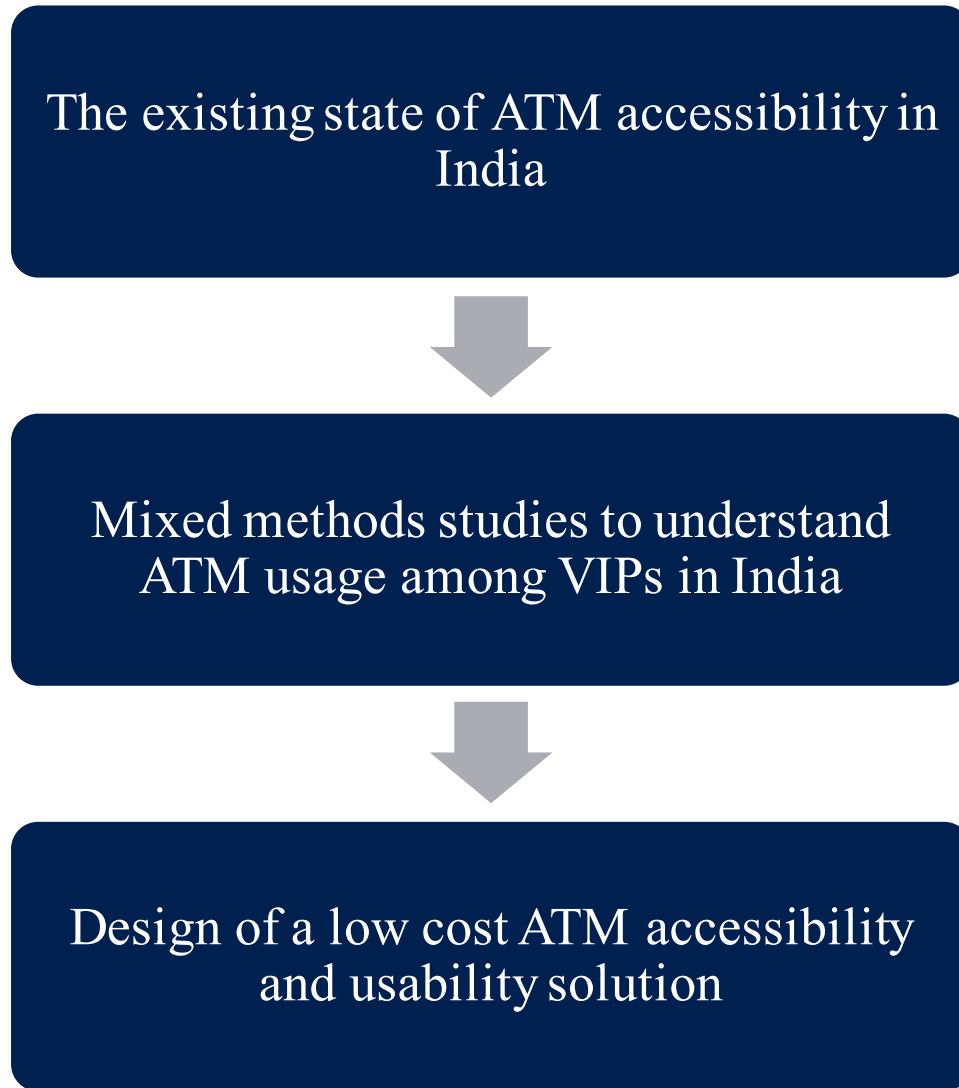
# Motivation

- Visually Impaired People (VIPs) face challenges while performing financial transactions
- India is home to 1/3<sup>rd</sup> of the world's visually impaired population
- VIPs interact with an accessible ATM through audio feedback



(Top): Image taken during a visit to an ATM in Bangalore

# The Journey so far...



(Top): Image taken from iconfinder

# Motivation

- Talking ATM provides audible instructions of the screen contents.
- Reserve Bank of India (RBI) mandates accessibility of all banking services
  - At least 1/3<sup>rd</sup> of the ATMs in the country need to be accessible



# Personal Experiences

- The circular has not been implemented
- The status of accessibility is not what has been mandated



(Top): Image sourced from the internet

(Right): Images taken during our visits to the ATM



# Personal Experiences

- ATMs out of cash making it hard for VIPs
- Newer touch screen ATMs do not honor standard accessibility gestures
- Unavailability of headphone jack
- Braille labels rendered unusable because of thick plastic covering
- Lack of awareness among security personnel about audio based usage
- Some banks complied to guidelines by programming ATMs to only say static messages



Images from IndiaToday and SBI ATM OKI

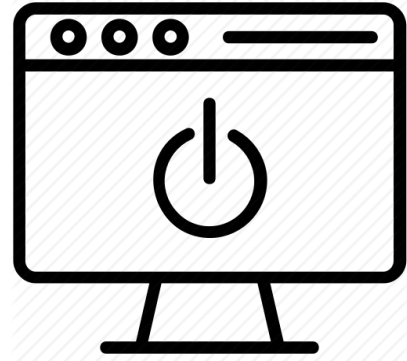
# Persistent Regulatory Action without Effect



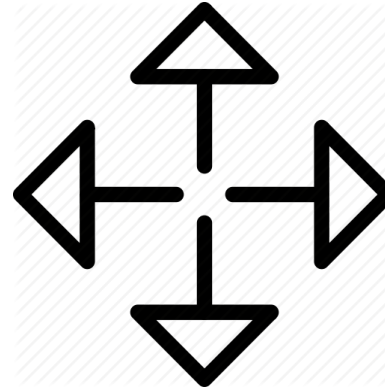
# What makes an Accessible ATM?



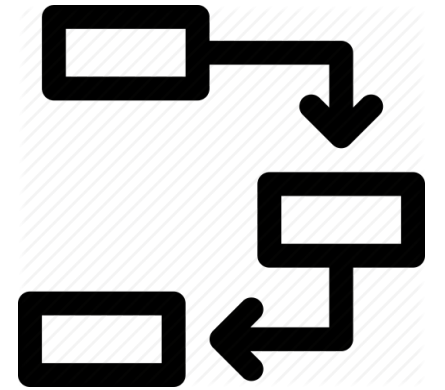
Availability of  
a working  
headphone jack



Ability to turn  
screen display  
On | Off



Navigate user  
through all the  
ATM screens



Orient the user and  
provide detailed  
instructions

# Initial Exploration

- Visited 20 random ATMs in central Bangalore
- Evaluated the ATMs for accessibility conditions
- Only 3/20 ATMs were accessible



# Filing an RTI Request to RBI

1. How many ATMs owned/maintained by the banks are accessible to VIPs?
2. What are the technical features of these ATMs?
3. What kind of headphone jack do they use?
4. Does the ATM provide option for voice guidance?
5. Does the ATM announce only Welcome/Thank You messages?
6. Are other screens like balance enquiry, check balance etc., announced by the ATMs?
7. What are technical specifications and manufacturer details of the ATMs?
8. Who is responsible for the accessibility status of ATMs?

Filed as RTI request number RBIND/R/2017/80259/2



8/21

Public sector banks  
have responded to  
the RTI requests

# Claims in the RTI responses

- One bank claimed 100% accessibility of their ATM machines
  - Inaccurate since our initial exploration showed otherwise
- Some banks claimed around 27% accessibility
- One bank mentioned they have not deployed *any* accessible ATMs and will start soon
- 2 banks denied providing the information citing that it cannot be disclosed or request doesn't fall under 'information'

# Crowdsourcing Efforts

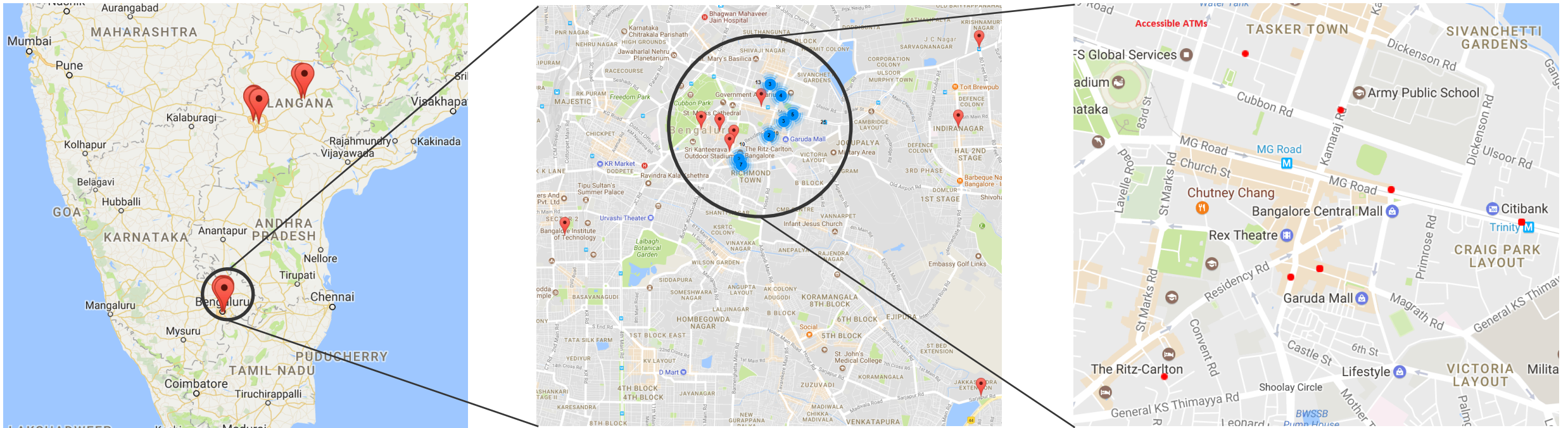
Gather responses from the crowd volunteers for their visit to an ATM.

The image displays four sequential screenshots of a mobile application interface, each representing a step in a survey process. The app is running on an Android device, as indicated by the navigation bar at the bottom of each screen. The status bar at the top shows the time as 12:29 and various system icons.

- Screen 1 (1/9):** The question is "Can you share the map location of the ATM?". Below the question, the word "Bangalore" is entered into a search field. A dropdown menu shows several location suggestions, including "Bangalore Karnataka, India", "Bangalore City Station M.G. Railway Colony, Ben...", "Bangalore Rural Karnataka, India", "Bangalore Cantonment Cantonment Railway Sta...", and "Bangalore Corporation Industrial Estate Beng...". A "powered by Google" logo is visible at the bottom of the dropdown. A right arrow button is at the bottom right.
- Screen 2 (3/9):** The question is "Which of these headphone jacks did the ATM machine have?". Below the question, there are three options: "3.5mm Audio Input" with a corresponding icon, "Dual Headphone" with a corresponding icon, and "N/A" with "None" written below it. A right arrow button is at the bottom right.
- Screen 3 (4/9):** The question is "Did the ATM provide you with an option to enable voice guidance?". Below the question, there are three options: "Yes" with a checkmark icon, "No" with an 'X' icon, and "N/A" with "Not Sure" written below it. A right arrow button is at the bottom right.
- Screen 4 (9/9):** The question is "How long did you take to use the ATM services with voice guidance?". Below the question, there are three options: "< 1 minute" with a "1" icon, "1 - 3 minutes" with a clock icon, and "> 3 minutes" with a "5" icon. A right arrow button is at the bottom right.

# Findings from crowdsourcing efforts

- Surveyed 107 ATM machines by 15 volunteer participants
  - 94 : Bangalore
  - 13 : Hyderabad, Delhi and Warangal



# Findings from crowdsourcing efforts

33%

of ATMs did not  
contain  
headphone slot

51%

ATMs had a  
headphone slot but  
did not have audio  
based navigation

66%

of ATMs did not  
allow users to turn  
on/off display

# Understanding ATM usage among VIPs

- 22 Participants (17 Male + 5 Female) 18 – 50 years old
  - 13 Participants – Completely blind
  - 3 Participants – Blind in one eye
  - 6 Participants – Low vision
  - All participants were familiar with screen reader usage on smartphones

# Understanding ATM usage among VIPs

1. Misconceptions & Lack of Policy Awareness
2. Lack of Standardization of Design of ATM Machines
3. Concerns about safety and inconveniencing others
4. Privacy concerns and choosing banks over ATMs

*“The bank **denied** me from having an ATM card, **maybe because of my impairment or education**” – P14*

*“I cannot ask someone else for help because **they might cheat me and take my money**. I have to go to a bank and stand in the line twice a month to take the money I need” – P9*

*“... it is **difficult to understand all the functions offered by the ATM** and even **figuring out the basics** like where the card insert slot is, where the cash is given out from, the type of screen etc..,” – P1*

# PocketATM: Moving the ATM to the Phone

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1. Tell my smartphone I want to withdraw cash (Rs. 1000)
  - ATM PIN required
2. Walk to *any* ATM and swipe my card
3. Authenticate further using OTP to my mobile device:
  - Enter OTP on the ATM keypad (**or**)
  - Enter OTP on the mobile device
4. Receive cash

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Implementation is simple, secure and doesn't require any updates to existing ATM infrastructure (see paper)

# Preliminary Usability Study



**Task:** Use the mobile app to withdraw 500 INR from the account.

**Stage 1:** Pre-authorize amount from smartphone

**Stage 2:** Interact with the PocketATM prototype and withdraw

**Metrics recorded:**

1. Active usage time
2. Time taken to pre-authorize a transaction from mobile application
3. Number of failed attempts and system errors

# Preliminary Results

- PocketATM guarantees that the ATM is accessible
  - 100% of the participants successfully withdrew money
- PocketATM reduces time spent at the ATM
  - Existing Accessible ATMs: Roughly *4 minutes* at ATM
  - Using PocketATM: Less than *1 minute* at ATM
- Time to pre-authorize a transaction reduces with practice
  - Average time to pre-authorize a transaction is 1.8 minutes for 58 transactions

# Participant Feedback Interviews

- Concerns with delivery of OTP while using PocketATM
  - Timely delivery of the OTP
  - Consequences of entering the wrong OTP
- Ease of usage of PocketATM
  - Participants reported the system to be easy to use with 9.1 on a 10 point likert scale
    - 1: Least Usable
    - 10: Most Usable
- Additional suggestions by users with low vision
  - Avoid the login button and automatically enter the next screen after validation
  - Send a record of denomination of notes provided by the ATM machine

# Conclusions & Future Work

- This study demonstrated that less than 33% of the ATMs in India are accessible even after a decade since the regulatory mandate
  - Physical variations of the machines make it difficult to understand and use the ATM
  - Weak policy suggests an ATM is accessible if it speaks, opening up a loophole for implementation
- PocketATM is a simple approach to make every ATM accessible
  - Validated with exploratory user studies
- Current work is in the Indian context but adaptable to other countries with similar financial infrastructure
  - Explore possibilities of longer term real world deployments

