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Viral Spread via Entertainment and Voice-Messaging Among Telephone Users in India

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Polly goes viral in India!

But

Unlike Pakistan, it took us several months to make it viral!

Polly 101

Situations where information and connectivity are the missing links to **Development**

Problem: Mass dissemination of information to low-literate masses

- PCs are not feasible
- Smartphones are not always feasible
- TV, radio are non-interactive
- SMS assumes literacy



Speech over simple phones is a viable way



Hurdles

User Interface hurdle: Even simple speech interfaces confuse low-literate, non-tech-savvy users

Motivation hurdle: Users are not motivated enough to change their ways

Uptake and spread hurdle: How do you spread your services to poorly connected masses

Our Strategy:

Entertainment

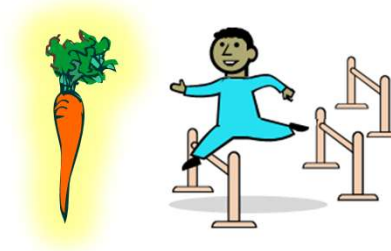


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For Entertainment:

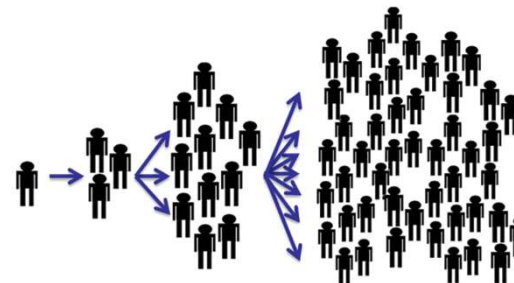
1. Users would overcome UI hurdles (Smyth et al. 2010)



2. Users don't need any convincing



3. Users may spread the services to others



***Viral Entertainment* as a vehicle for disseminating *Development* related services**



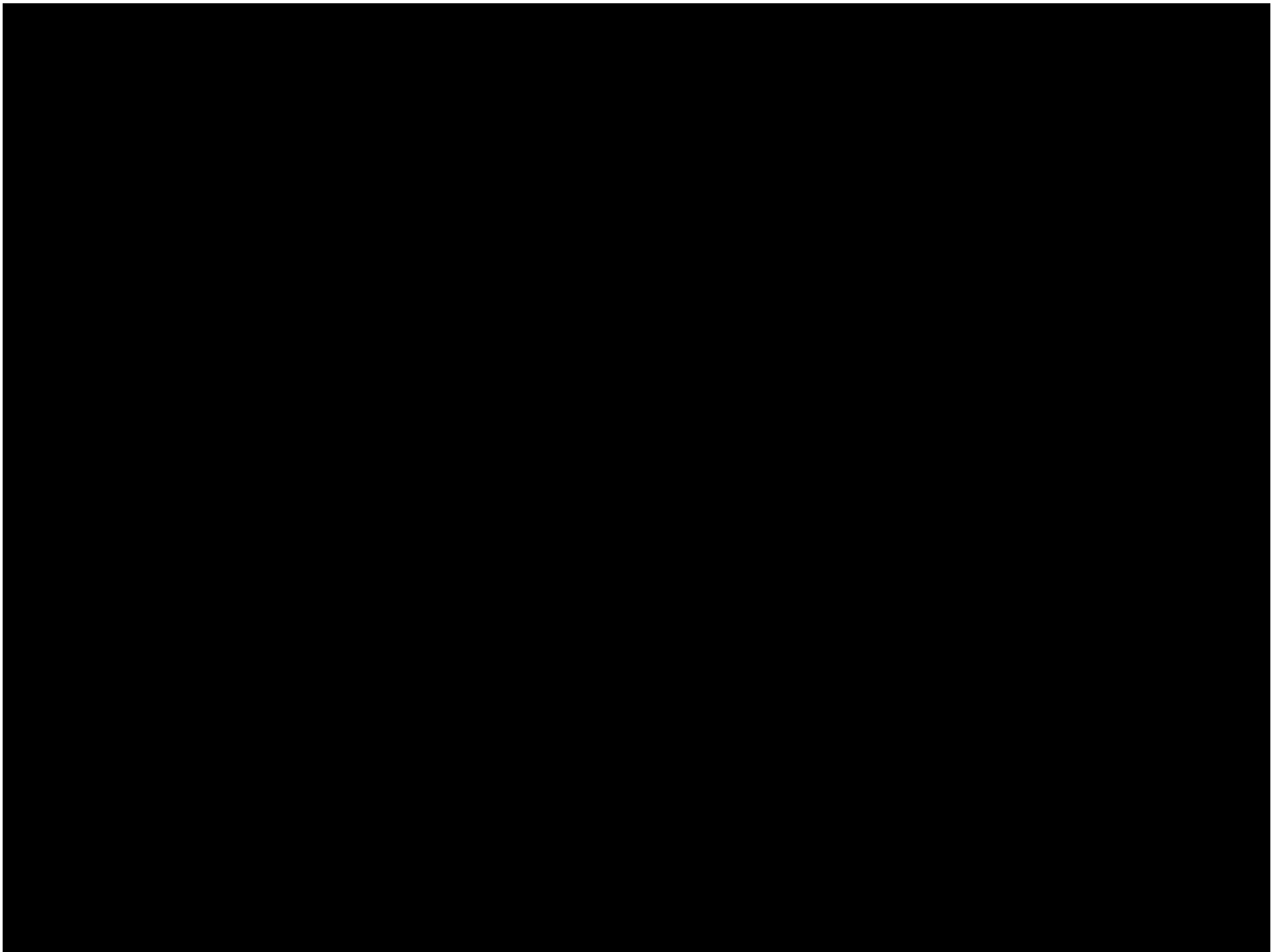
Polly (میاں مٹھو)

Polly is a **telephone-based, voice-based** service which allows users to make a short recording of their voice, **modify it** and **send the modified version to friends**.



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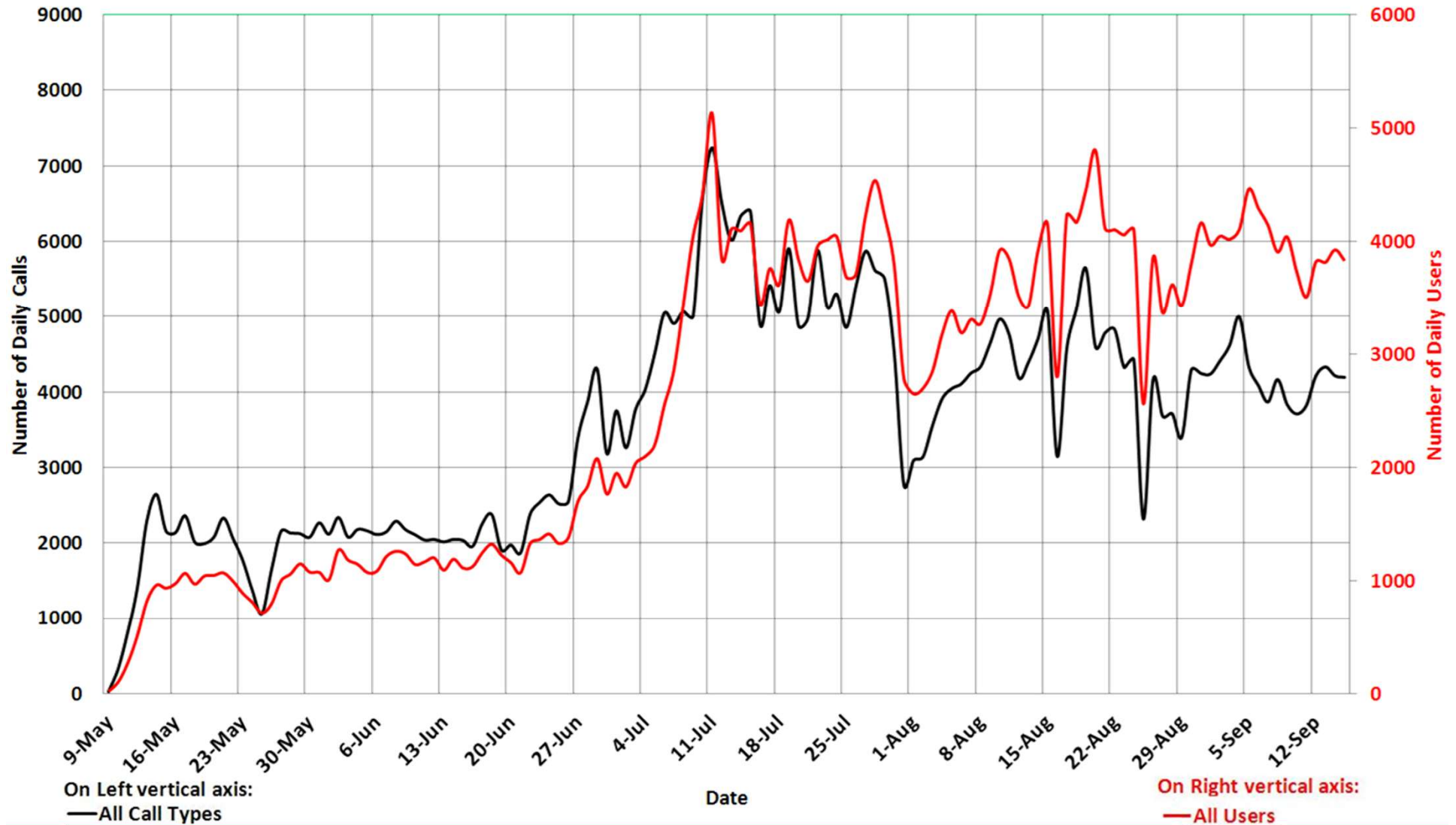


Deployment in Lahore

Seeded with **5 users**

- Within **a year**:
 - **636,000** calls
 - **165,000** users
 - Spreading to **1,000 new people daily**
- **34,000** people used the job search service
- listened **386,199** times to **728** job ads
- and **19,000** users forwarded them to their friends.

Deployment in Lahore



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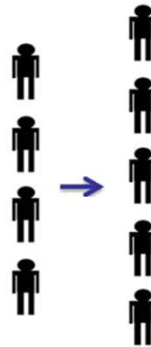
Virality and Exponential Spread

Virality is defined as long, sustained chains of transmission to new users

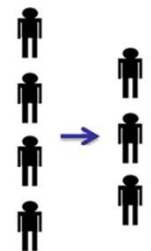


The **Basic Reproductive Rate** of spread, R_0 , is defined as the expected number of new users introduced by a current user over its lifetime, in a fully susceptible population.

$R_0 > 1$, exponential spread



$R_0 < 1$, exponential decay



Research Questions

- Can Polly become viral in a different country/culture?
- Is on-ground support necessary?
- What are the challenges of remote deployment of IVR services?
- How do Polly's spread patterns compare across countries/cultures?

Babajob.com Collaboration

A job-portal in Bangalore with an active listing of thousands of informal and entry level jobs

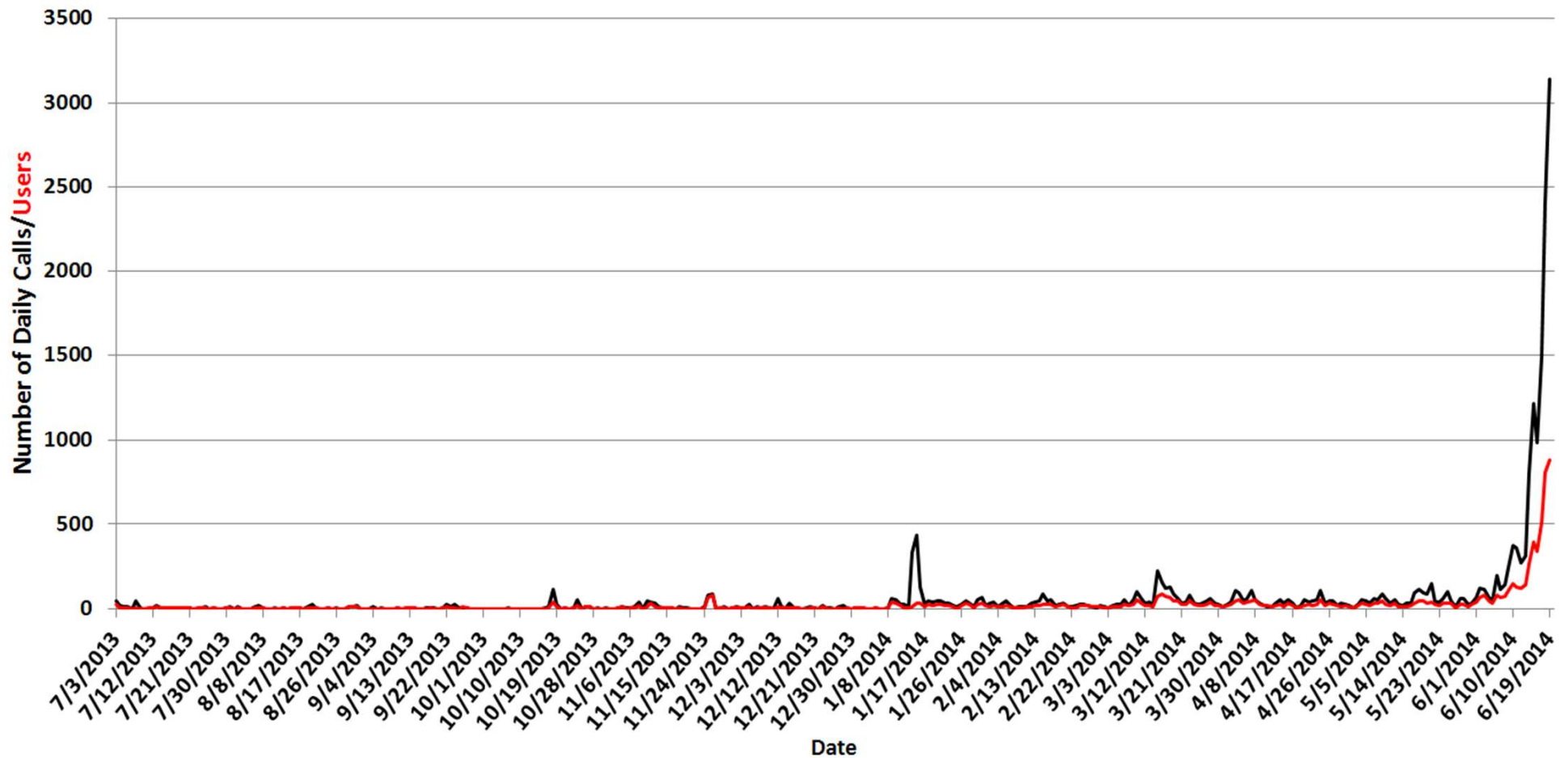
Setup in India

- A local phone number in Bangalore to receive “missed calls”
- Polly calls back from the US

Supports:

- Kannada and Hindi voice prompts
- Call transfer to Babajob.com’s IVR from Polly’s main menu

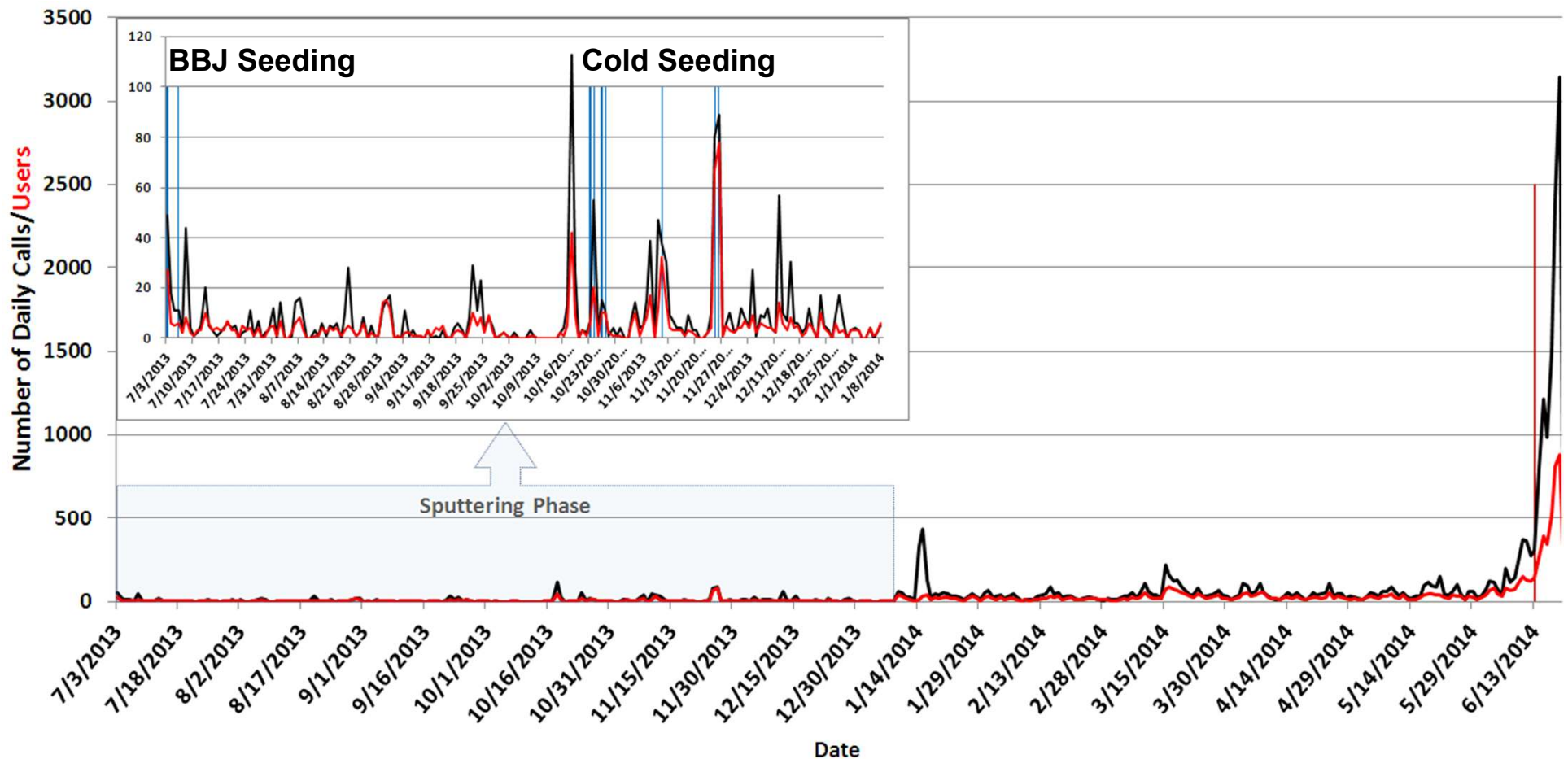
Polly-India



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Phases of Activity

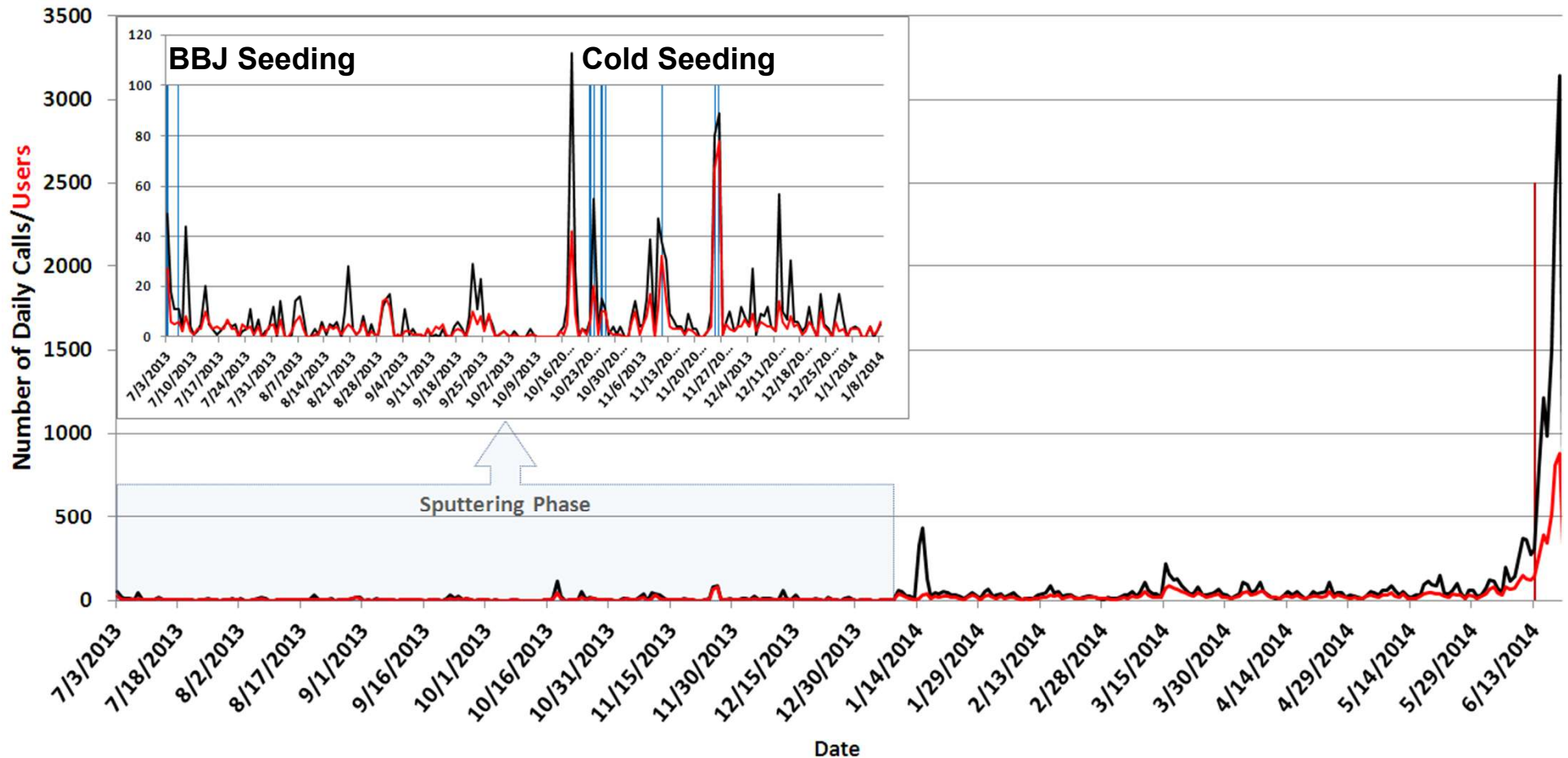


“Sputtering” Phase

Remote Deployment - Minimal on-ground Support

- Seeded via cold calls to active users of Babajob.com
- Seeded via cold calls to random phone numbers in Bangalore (avoiding *do-not-disturb* listing)
- User Interface tweaks
- **We were not able to actively monitor user feedback or conduct surveys**

Phases of Activity



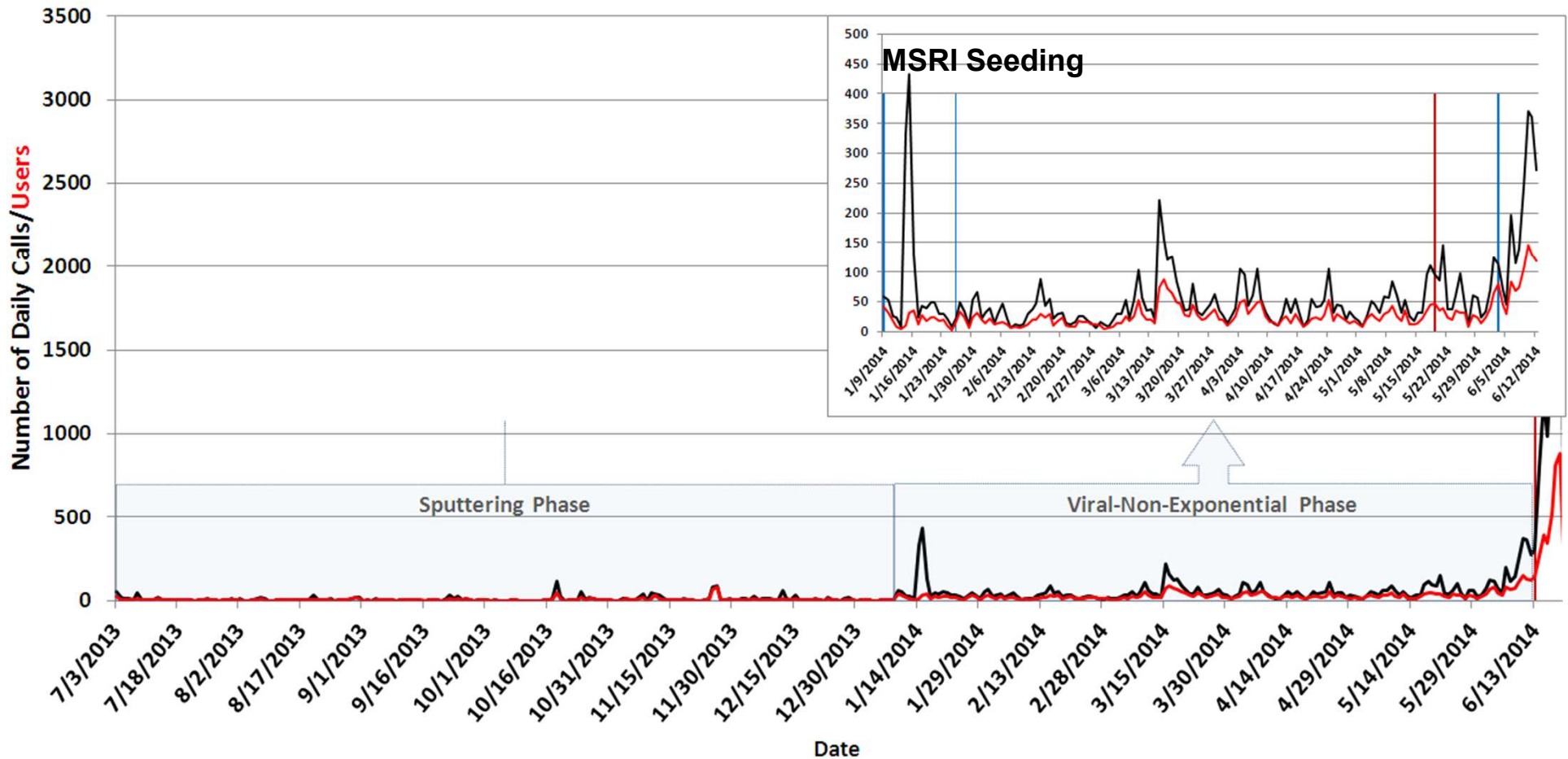
Fluctuating, intermittent activity



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Phases of Activity



Sustained transmission but no exponential spread



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Viral, Non-Exponential Phase

Remote Deployment – MSRI Collaboration

- Face-to-face seeding via drivers
- Seeded via university students who posted about Polly on their blogs , Facebook etc.
- **Actively responded to user feedback**
- **Conduct surveys**

User Surveys

(from 87 survey calls)

- **Send messages without modifying the voice: 55%**
- **Increase message recording interval: 32%**
- **Make Polly available in Bangla: 19%**
- Other feedback and suggestions: 32%

Also learned from the surveys:

- Although seeded with undergraduate students, Polly was largely being used by low-SES users!
- Used by a large group of blind users at a training institute.

Feedback collected through Polly

(based on 82 recordings)

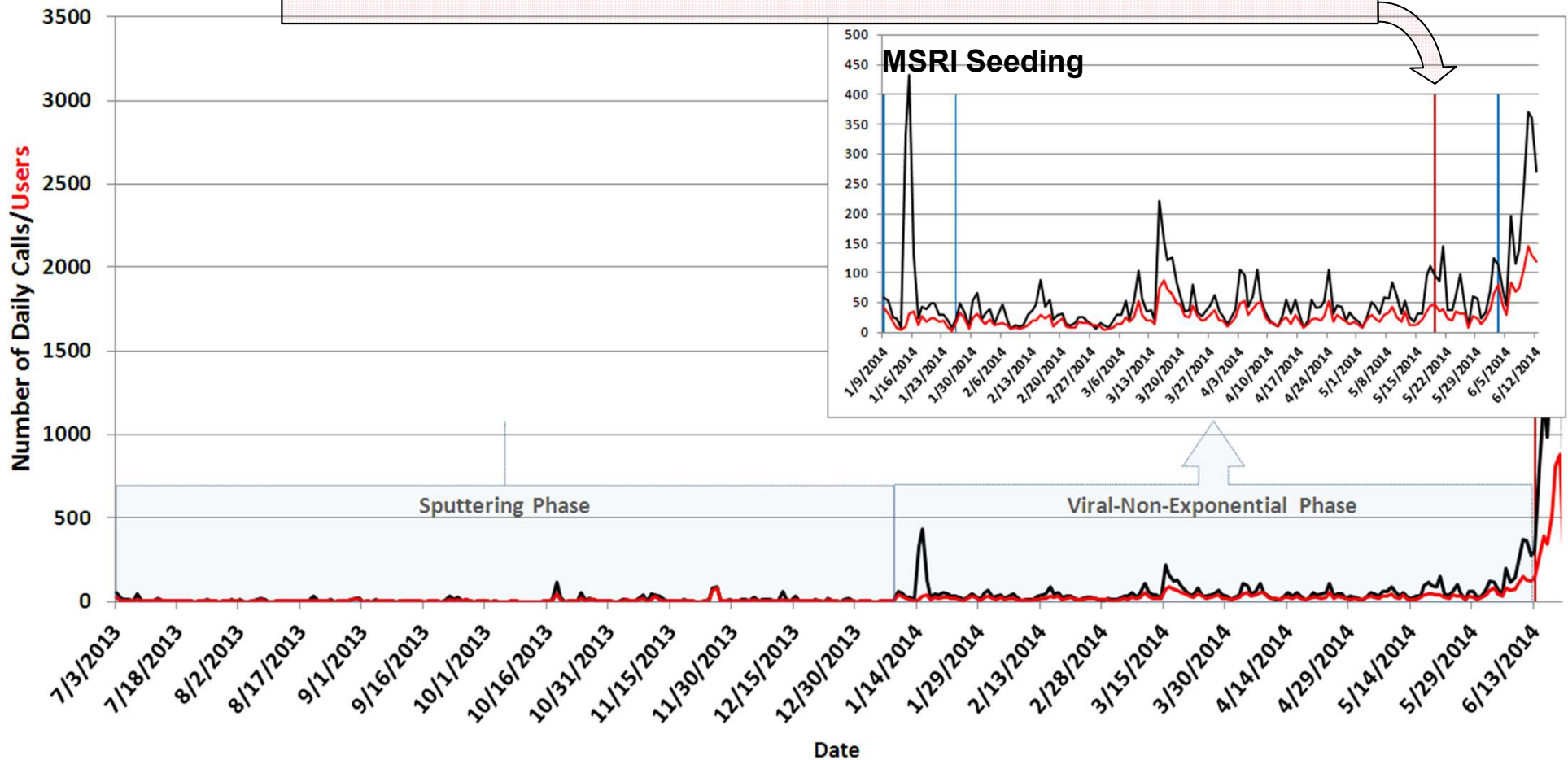
- **Send messages without modifying the voice: 22%**
- **Increase message recording interval: 18%**
- **Other voice messaging features: 21%**
- **Make Polly available in Bangla: 16%**
- **Other feedback and suggestions: 21%**

Interface Changes

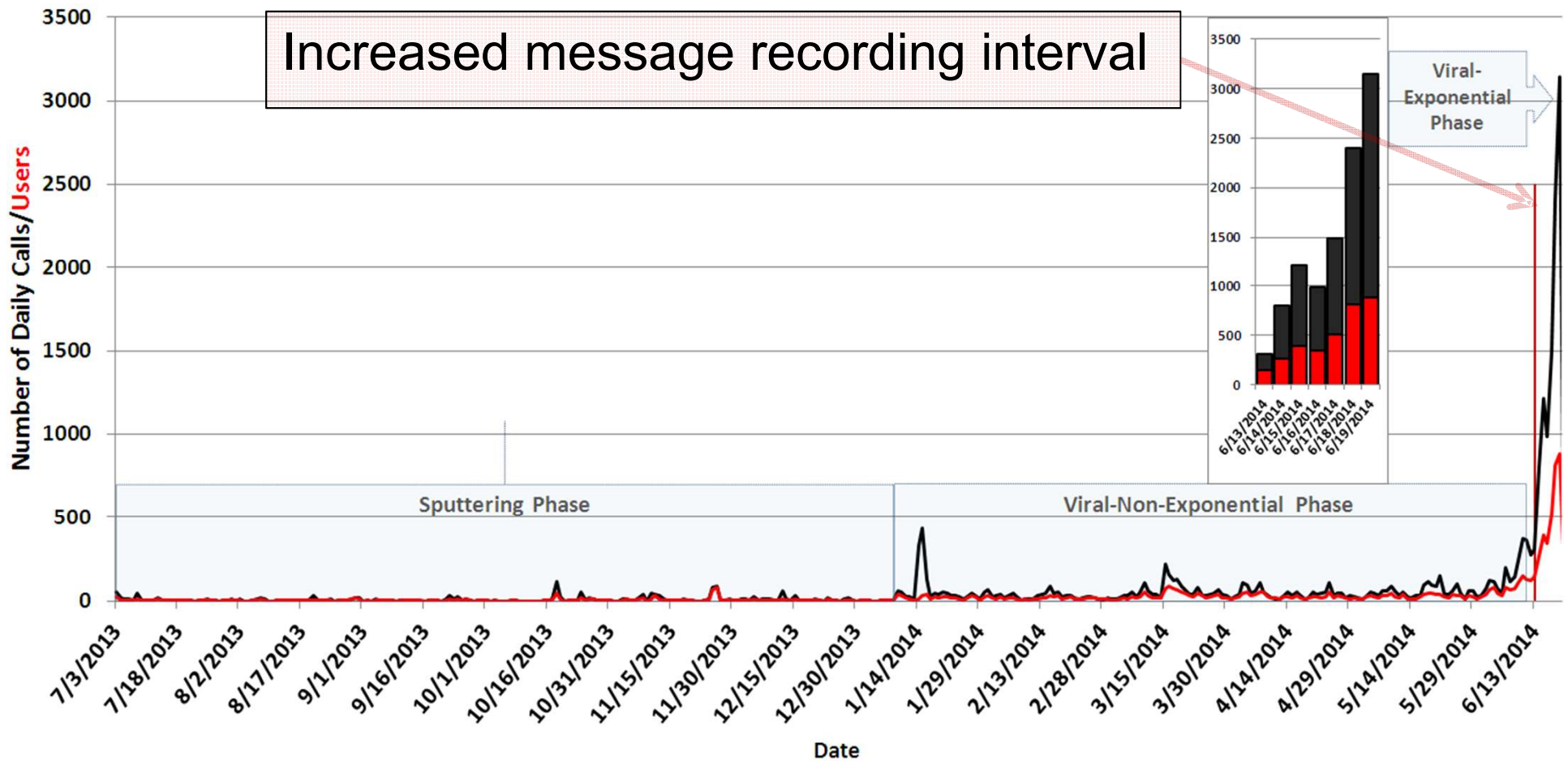
- **Added an explicit option to send unmodified voice messages**
- **Increased recording interval from 10 to 25 seconds**

Phases of Activity

Unadvertised option to send unmodified voice



Phases of Activity



Exponential Phase

7 days

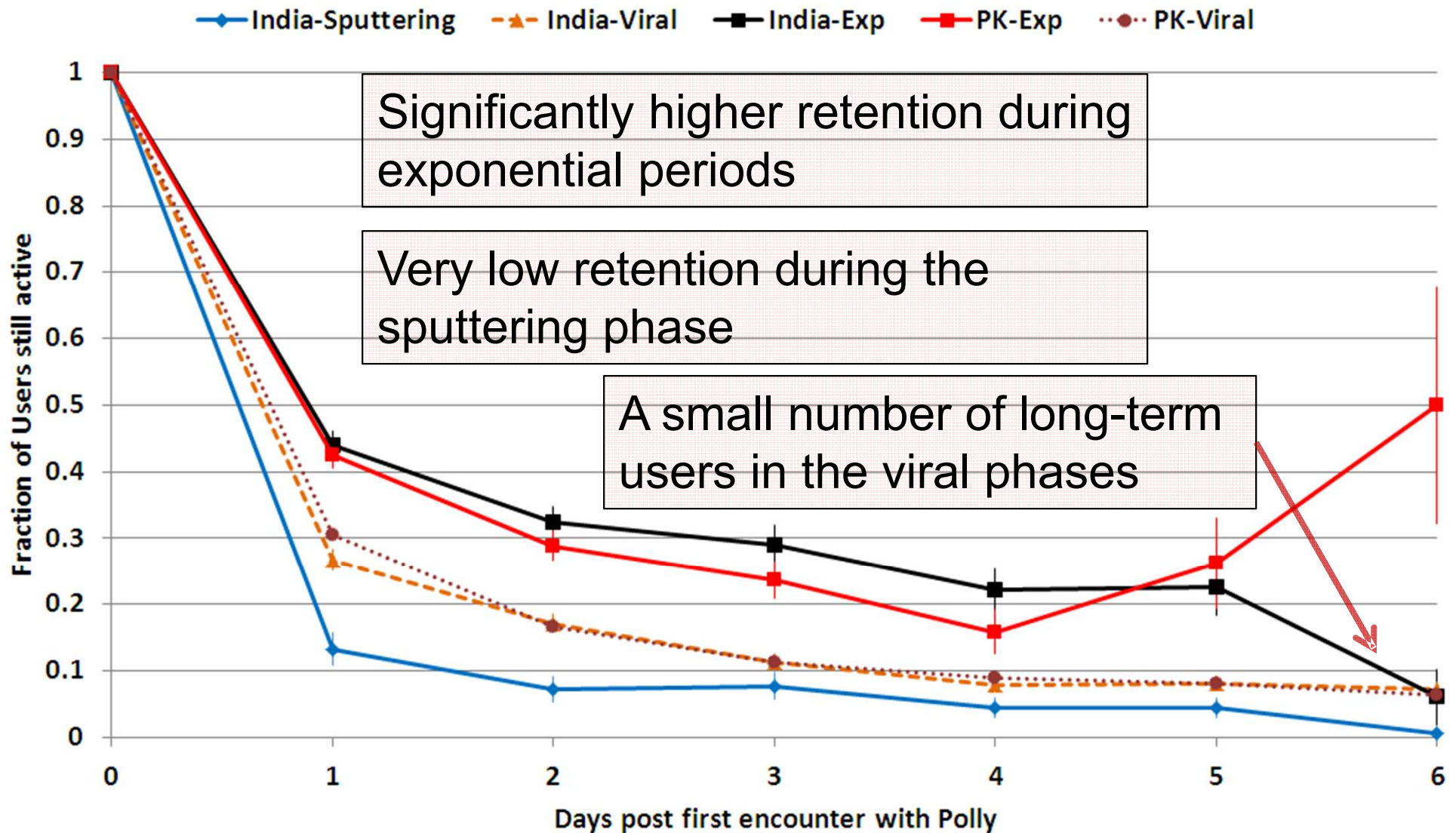
- **10,349** calls
- **1,613** users

Virality and Exponential Spread

	India-Sputter	India-Viral	India-Exp	PK-Exp	PK-Capacity Bound
Length of phase	6 months and 6 days	5 months and 4 days	7 days	7 days	1 month 11 days
R_0	0.2	0.7	1.2	1.3	0.7
Avg Chain Length	0.9	9.3	5	8.1	3.7
Max Chain Length	7	26	15	21	23



User Retention (Tendency to keep returning to Polly)



Distribution of Old vs. New Users

- **Exponential phases:** Activity mostly due to new users
- **Viral, non-exponential phases:** Users are a mixture of old and new
- **Non-viral phases:** Activity is sustained by old users

User Fecundity (Tendency to introduce new users)

- Less than 20% of users are ever fecund
- A small fraction of users remains fecund for several months!

Lessons

- **Design Principles:** Deploy Simple. Monitor feedback. Fail early and often.
- On-going local support is necessary.
- Remote deployment works!
- Cold-seeding does not work.
 - Seeding must be personal, face-to-face and accompanied by demos

Lessons

- *Virality* is easier to obtain as compared to *exponential spread*
- Virality requires a significant fraction of *loyal spreaders* as opposed to a handful of *super-spreaders*.
- Polly “filters” its users and stays among low-SES masses
- Spread does not follow a strict “Ring-of-fire” pattern

For more details please visit

<http://www.cs.cmu.edu/~araza/>



Thank you!



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Symposium on Computing for Development ACM DEV 2016

- **Paper deadline**

June 24, 2016



- **Conference details**

November 18 – 21, 2016

Nairobi, Kenya

- **More information**

<http://acmdev.org/>

<http://papers.acmdev.org/>

Summary

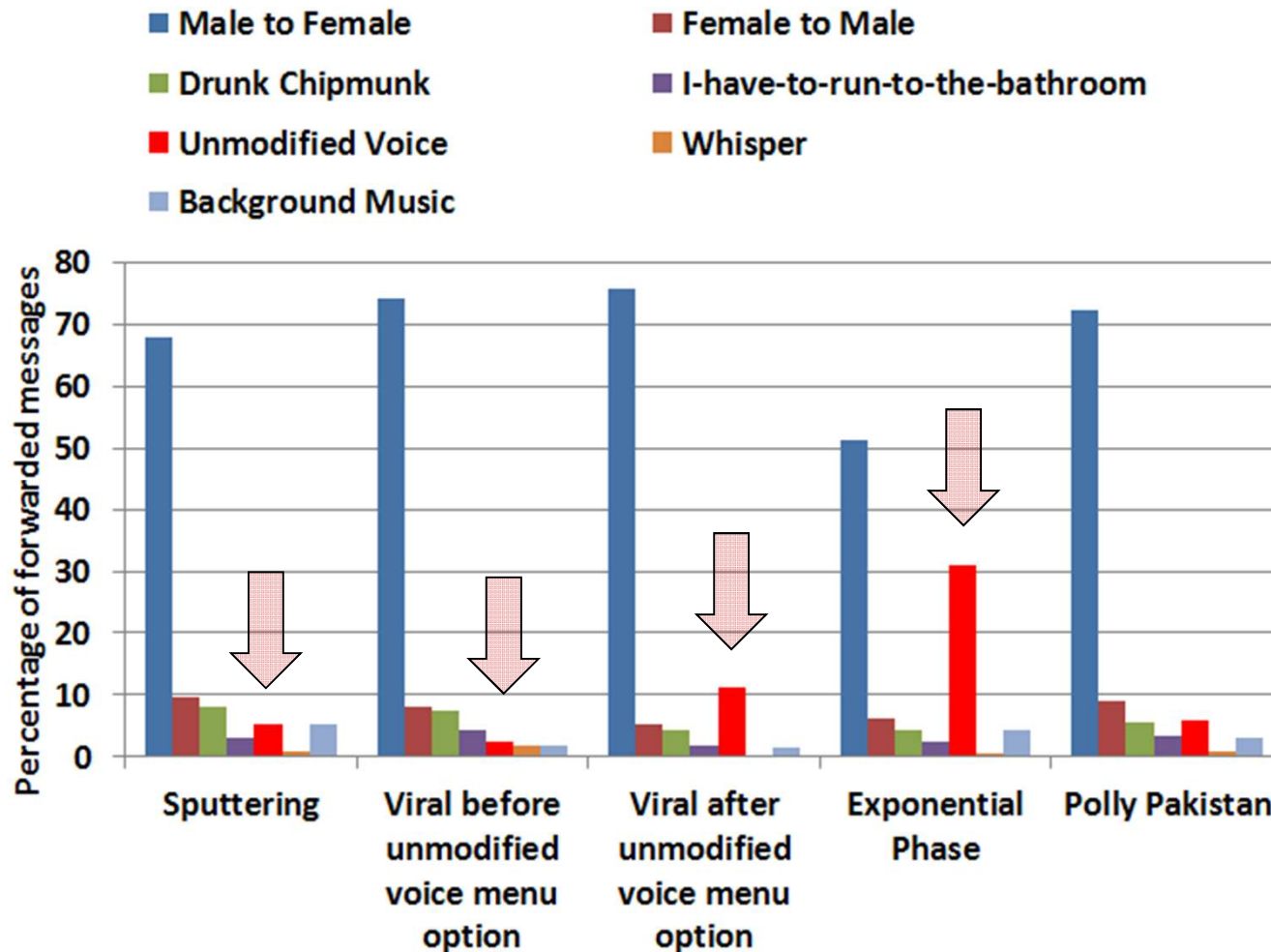
Opportunities

- Spreads virally and exponentially
- “Filters” target audience and stays among low-SES masses
- Delivers development-related services
- Trains and motivates users
- Quick and easy to deploy and made multilingual

Challenges

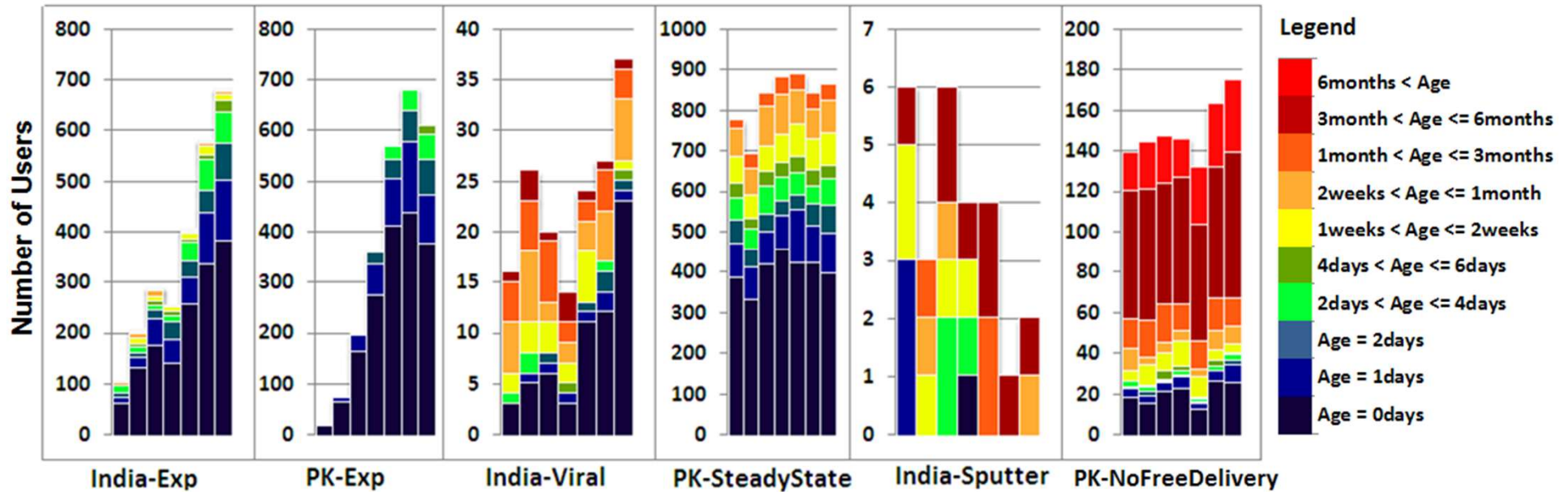
- Airtime!
- Committed local partners for setup, translations, recording, seeding

Choice of Voice Modifications



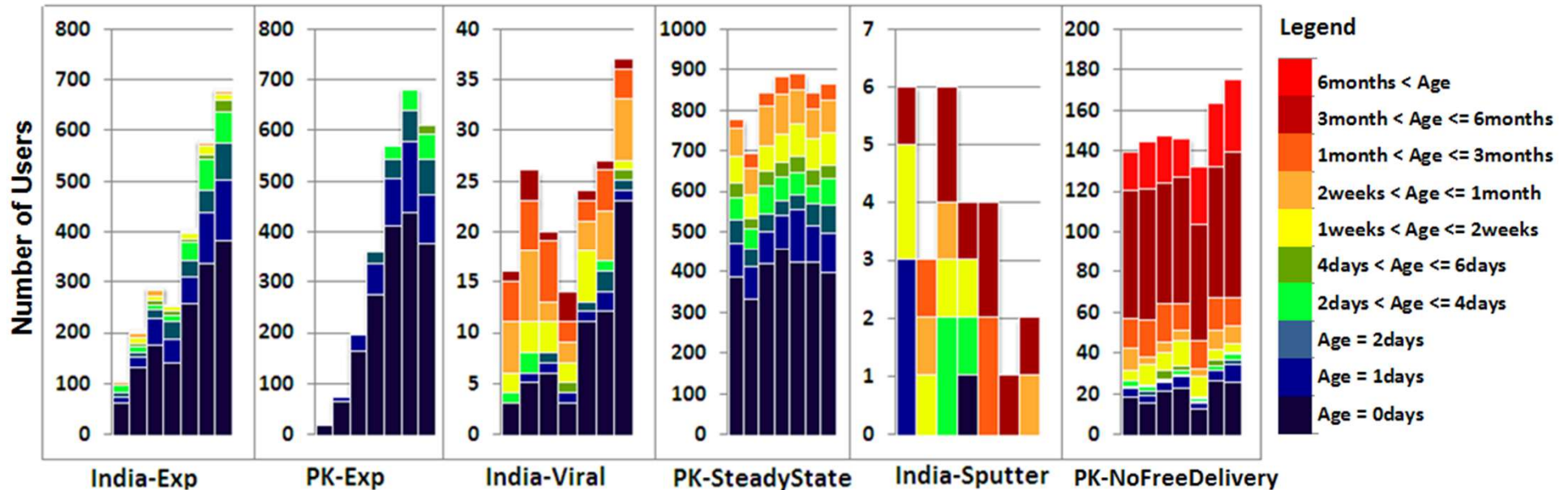
The use of unmodified voice increased significantly after the menu option and increased recording interval.

Distribution of Daily Users by their Polly Age



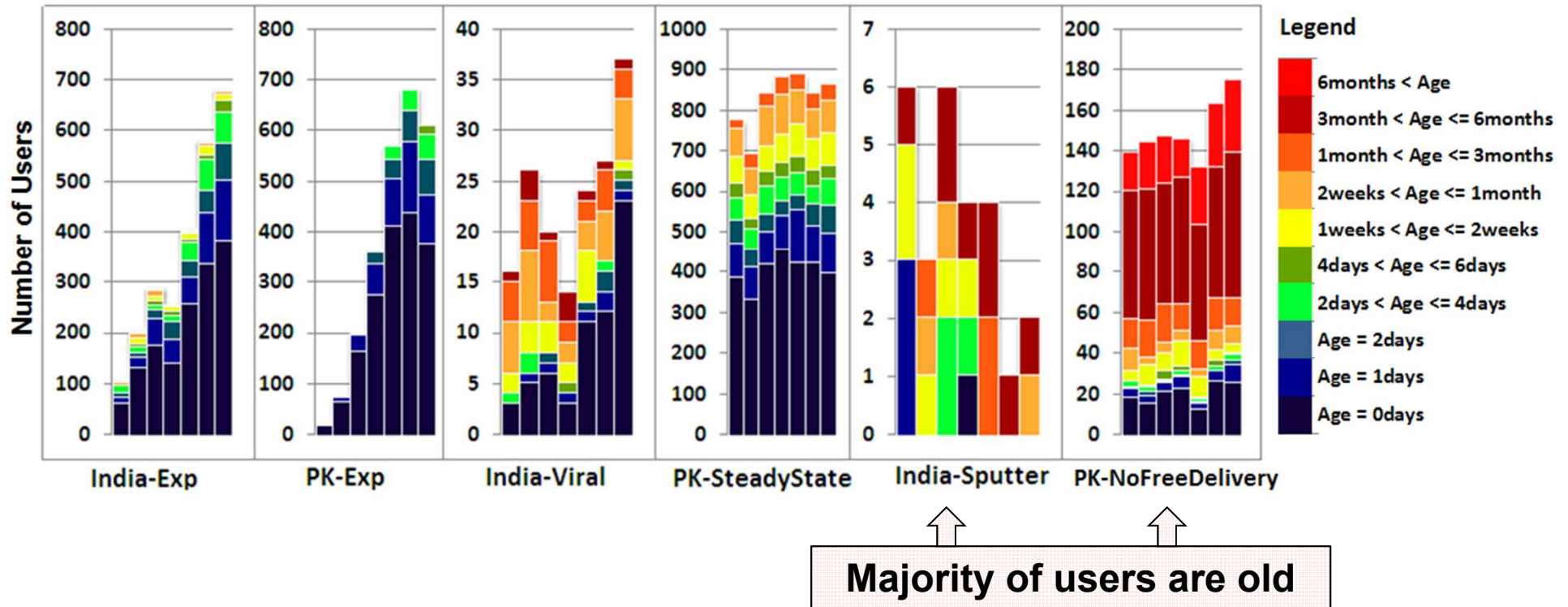
Majority of users are new

Distribution of Daily Users by their Polly Age

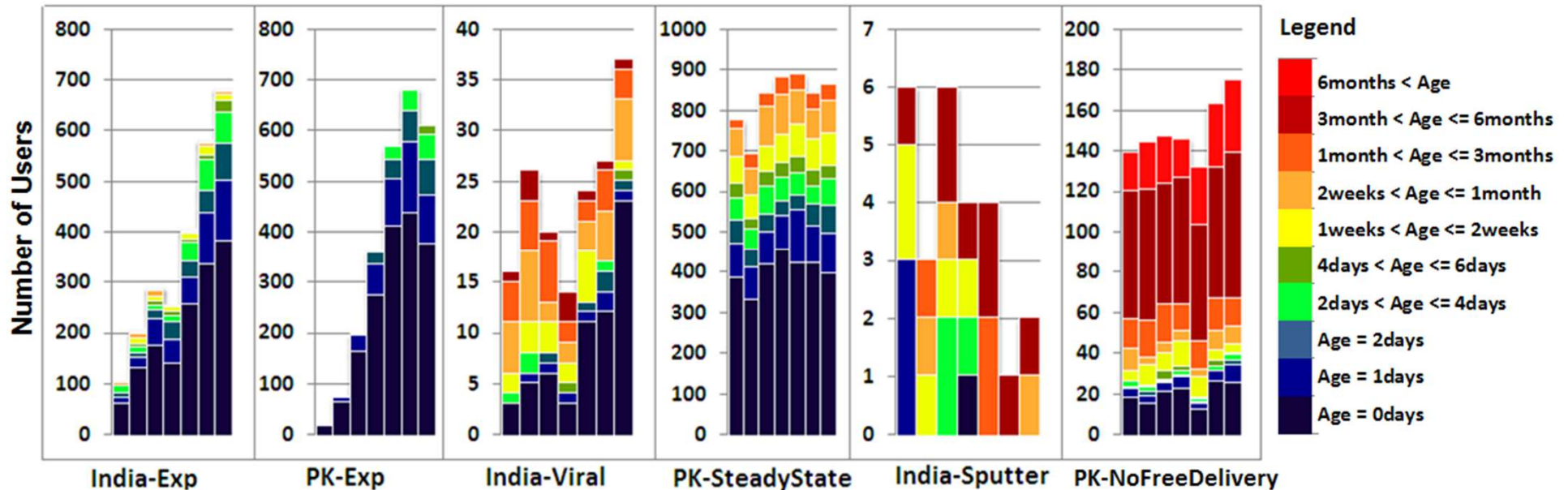


A Significant number of old users

Distribution of Daily Users by their Polly Age



Distribution of Daily Users by their Polly Age

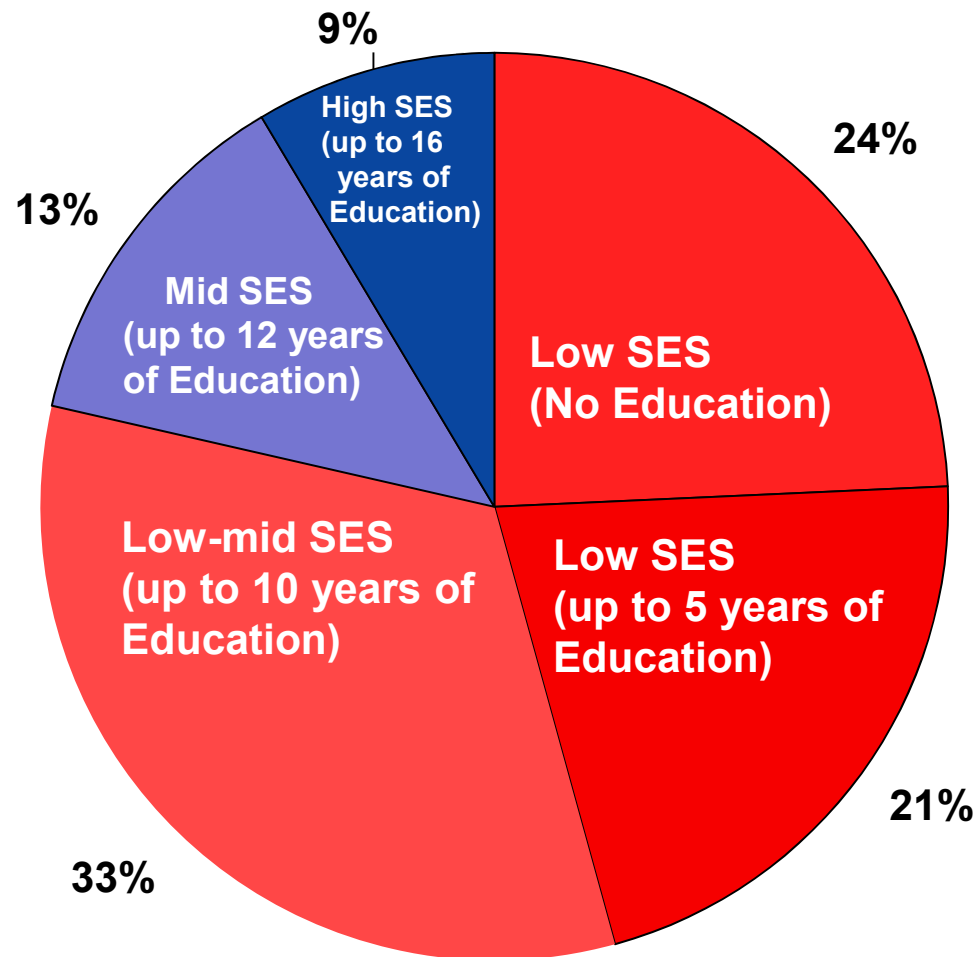


During non-exponential periods, activity mostly due to Long-term & Utility Oriented users!

User Demographics

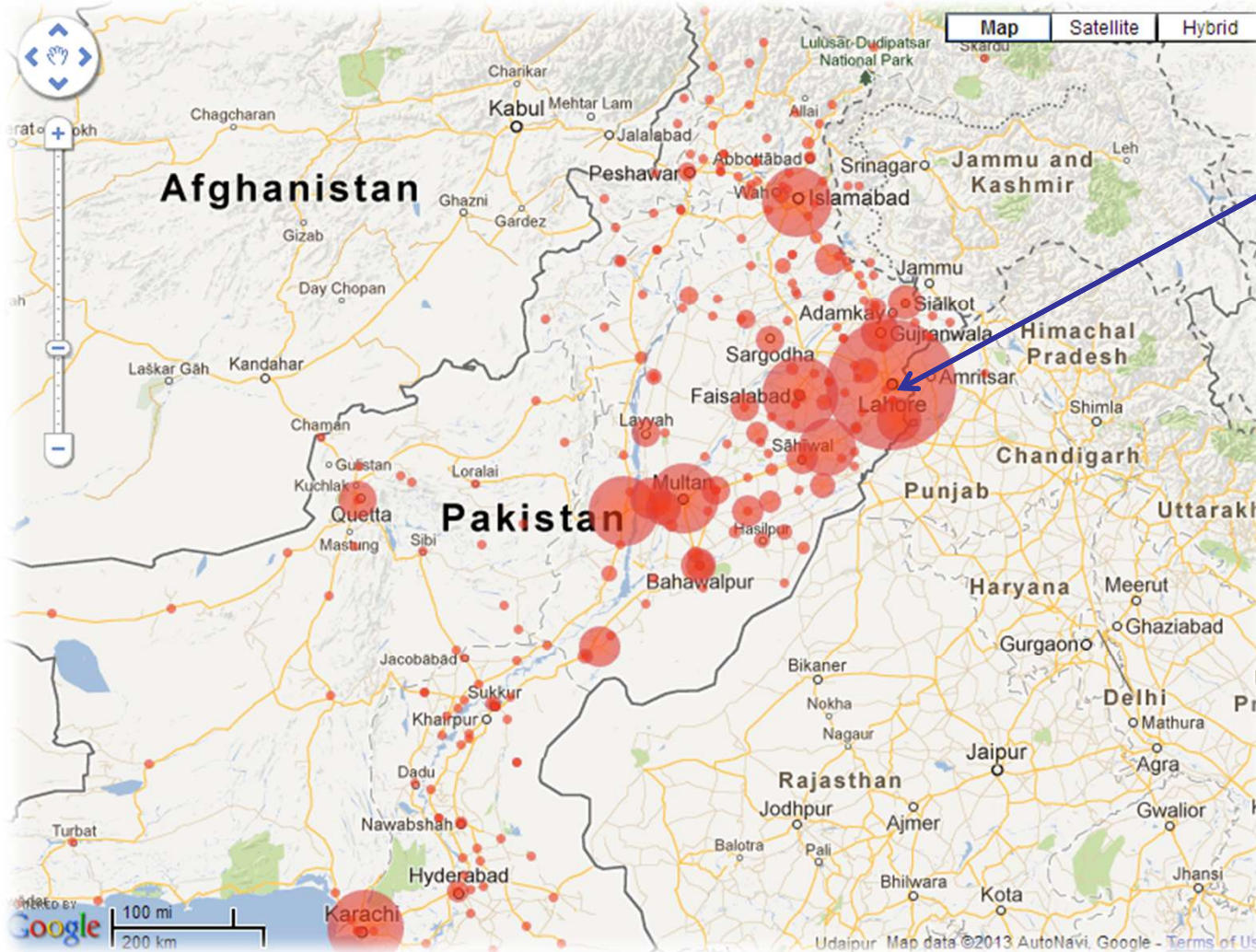
Estimated from 207 survey calls

Socio-Economic Status



Primarily used by
low-educated,
low-income people

Geographical Spread



- Seeded in Lahore and Okara
- Reached all parts of Pakistan.
- And also a handful of calls from:
 - India
 - Belgium
 - Oman
 - Saudi Arabia
 - UAE