Viral Entertainment as a Vehicle for Disseminating Development Services

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Call me "Ali"

ICT4D

Information and Communication Technologies for Development

More and better information and communication furthers the development of a society.

To achieve impact at a massive scale:

- Robust solutions to reach the masses using available means with minimum resource expenditures

How do you reach low-literate masses?

- TV, radio are non-interactive
- PCs are not feasible
- Smart phones are not always feasible
- Text is problematic for the non-literate

Speech over <u>simple</u> phones is a viable way to reach low-literate masses

Challenges: User Training, Motivation, and Mass Dissemination

1. How do you train low-literate masses to use telephone based speech interfaces?
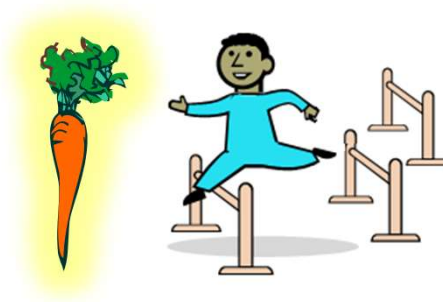
- Explicit user training is not scalable.

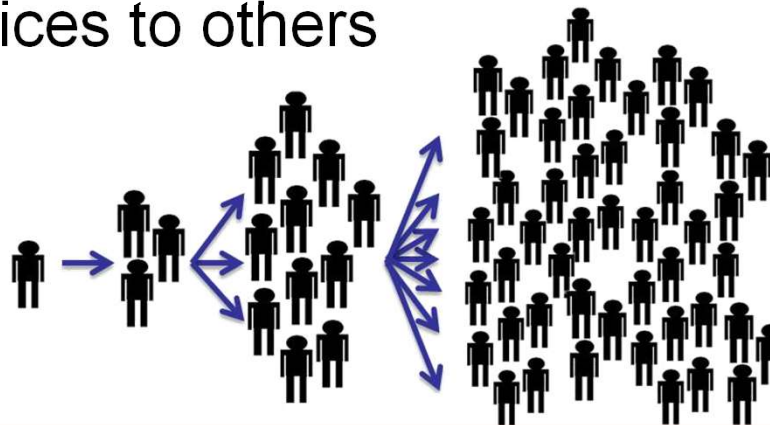2. How to advertise / communicate to masses who don't read?

Our Strategy: Viral Entertainment

Use simple voice-based entertainment to incentivize people to:

1. Train themselves and overcome UI hurdles

2. Spread these services to others

Use *Viral Entertainment* as a vehicle for disseminating *Development* related telephone-based services

Development services

Examples include speech-based:

- Marketplace (Craig's List), Citizen Journalism, message boards/blogs
- Health, agriculture, jobs, education,…
- Information gathering through surveys and polls,…

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**.

This brief video depicts a typical user interaction with Polly

USER INTERFACE

Job Audio-Browser

1. Scan Pakistani newspapers for jobs for low-skilled workers

Ref: paperpk.com

2. Record these ads
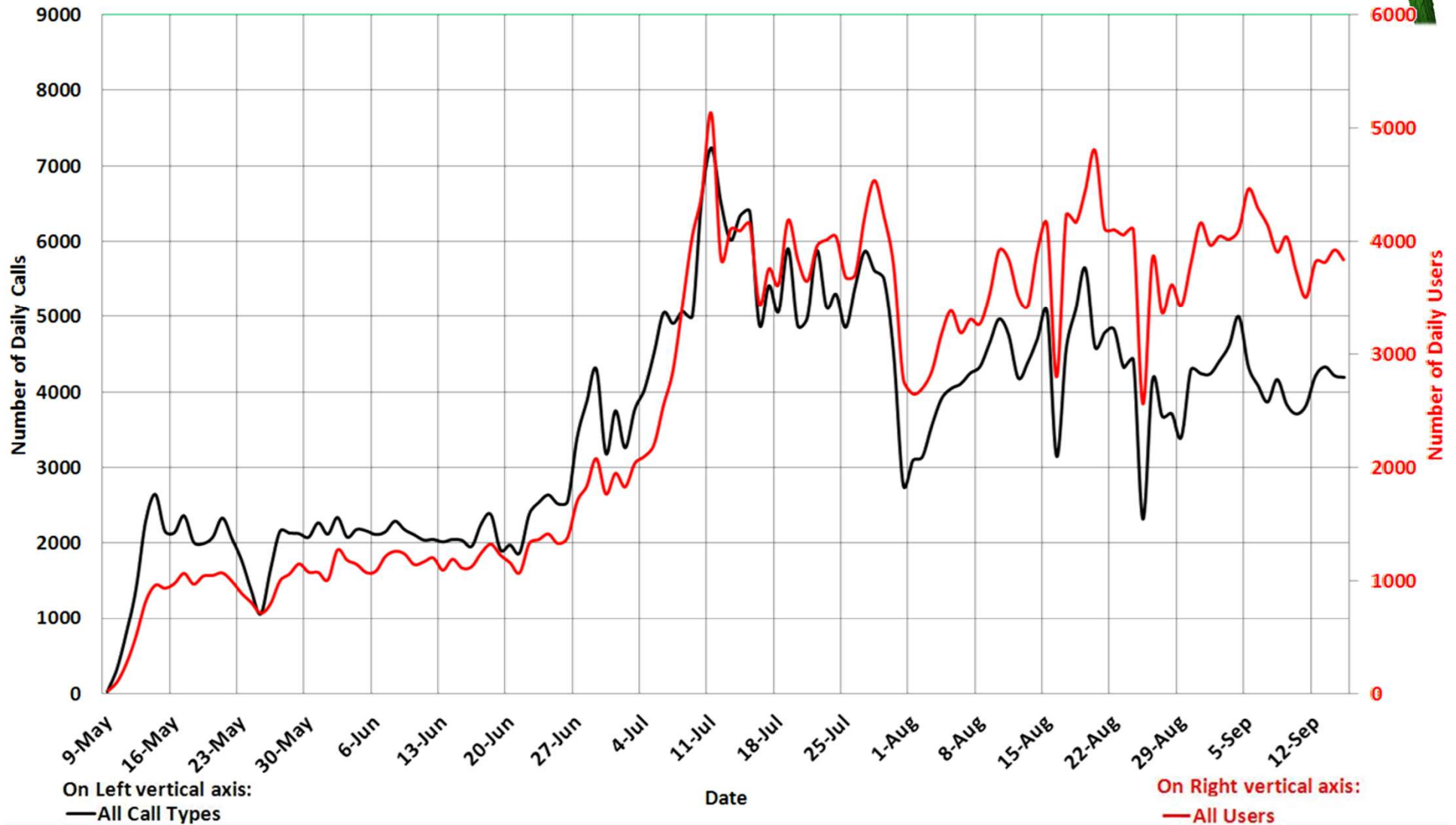3. Invite Polly's users to audio-browse them

Deployment in Lahore

- Launched on May 09, 2012:
  - Seeded with **5 users**

- After **4.5** months (mid-September 2012):
  - **495,000** calls
  - **85,000** users
  - Spreading to **1,000 new people daily**

  - **27,000** people used the job search service
  - listened **279,000** times to job ads
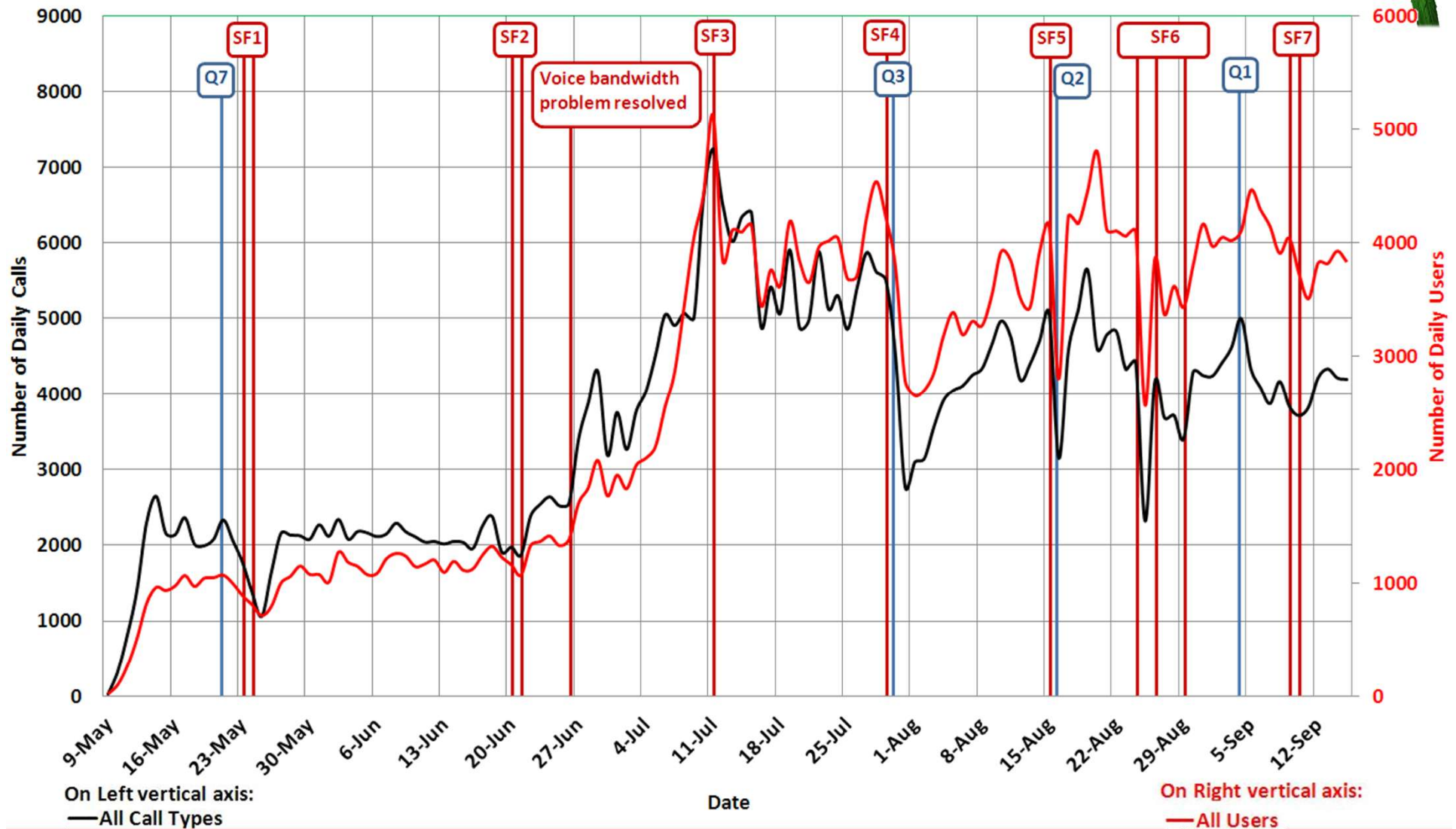 - and forwarded them **22,000** times to their friends.

Deployment in Lahore

Number of Daily Calls

Number of Daily Users

On Left vertical axis:
— All Call Types

Date

On Right vertical axis:
— All Users

INFORMATION TECHNOLOGY UNIVERSITY

Carnegie Mellon University

Deployment in Lahore

On Left vertical axis:
— All Call Types

On Right vertical axis:
— All Users

INFORMATION TECHNOLOGY UNIVERSITY
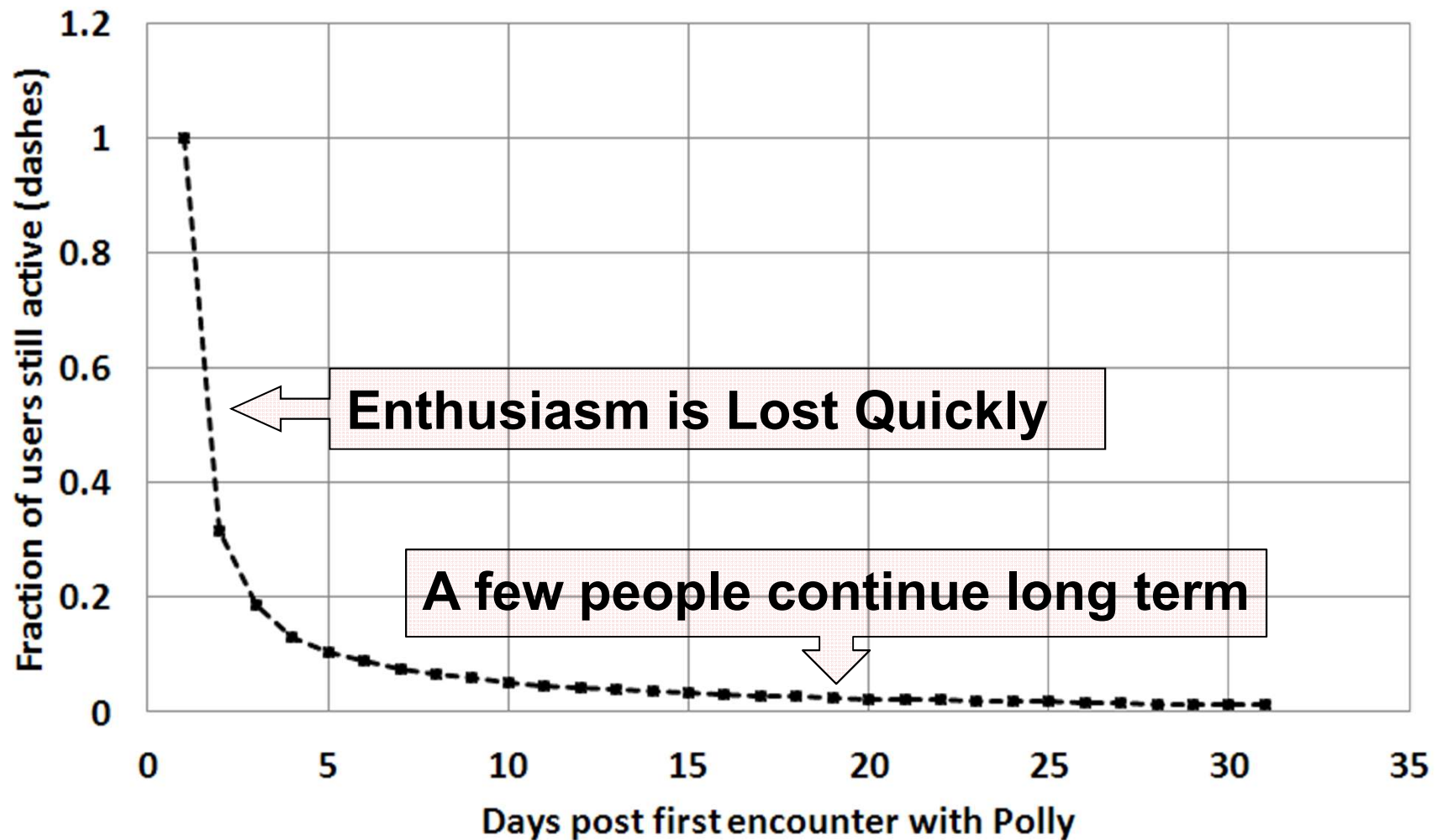
Carnegie Mellon University

Deployment in Lahore

Started with **5 users**

- After **a year**:
  - **636,000** calls
  - **165,000** users

- **34,000** people used the job search service
- listened **386,199** times to **728** job ads
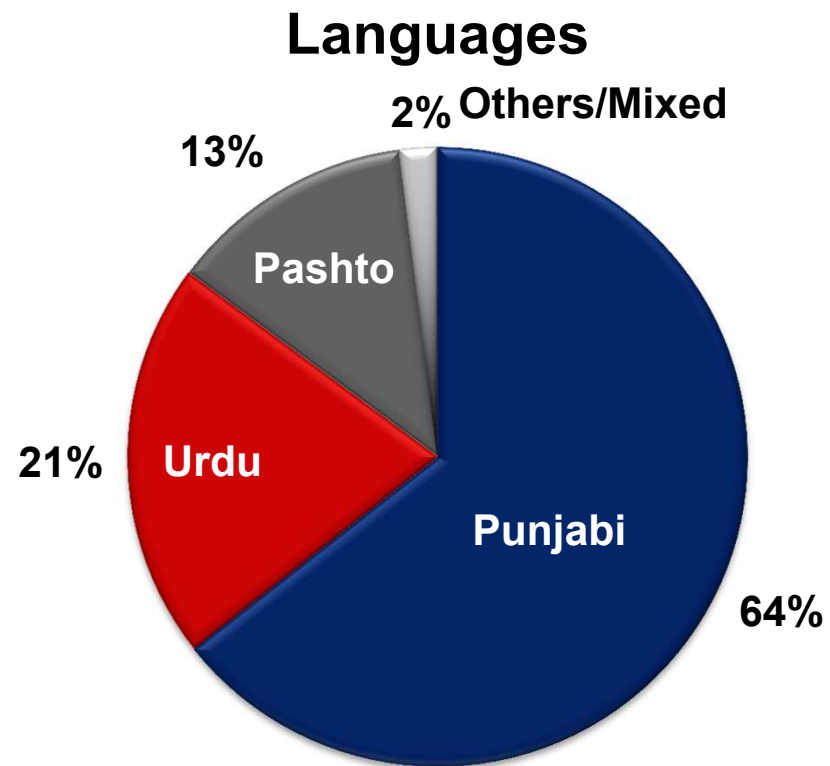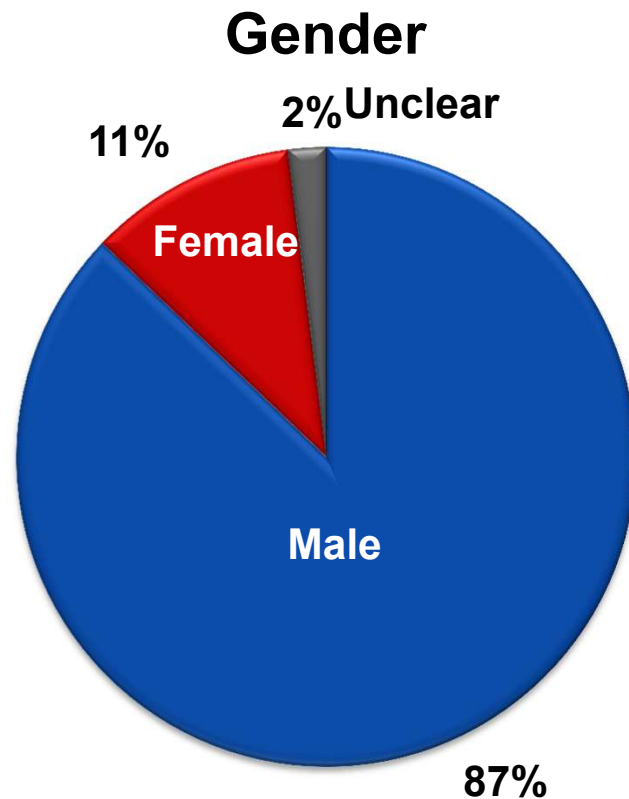- and **19,000** users forwarded them to their friends.

Raza et al. 2013, CHI, *best paper award*.

User Retention

Enthusiasm is Lost Quickly

A few people continue long term

User Demographics

Determined by listening to a sample of recordings:

Gender

- 2% Unclear
- 11% Female
- 87% Male

Languages

- 2% Others/Mixed
- 13% Pashto
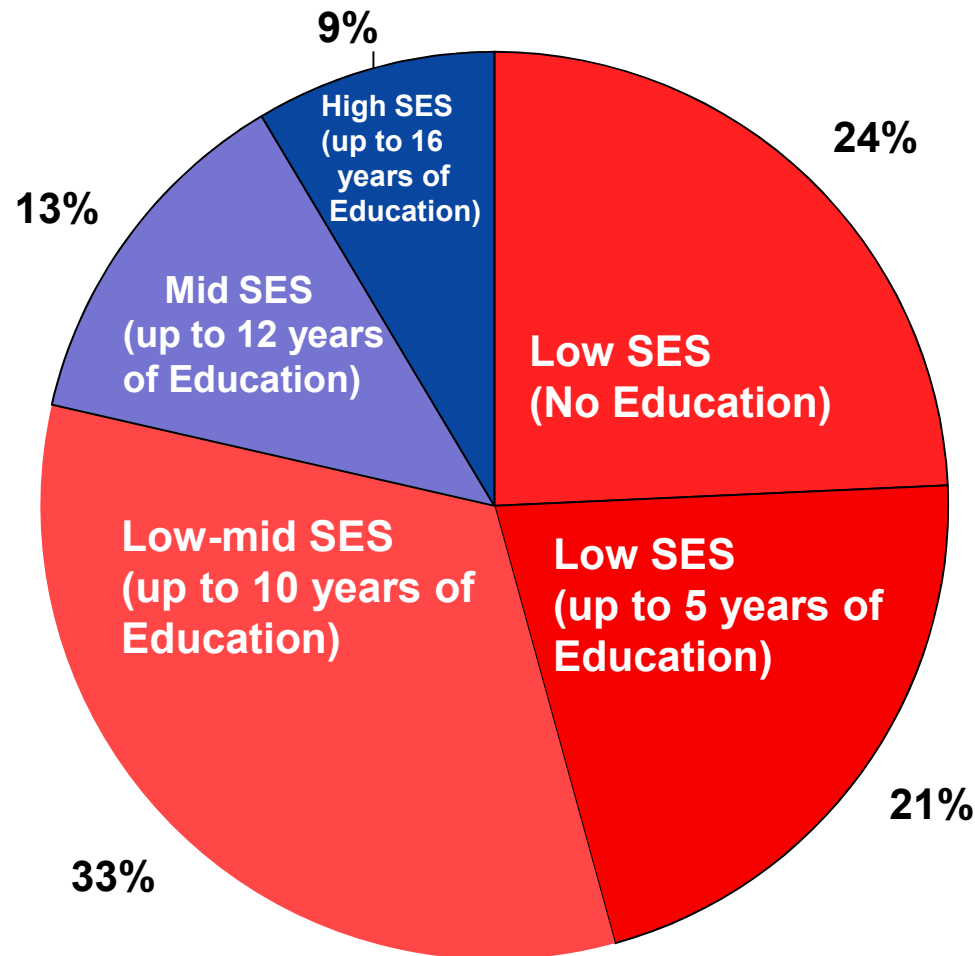- 21% Urdu
- 64% Punjabi

Used mostly by Punjabi speaking men…
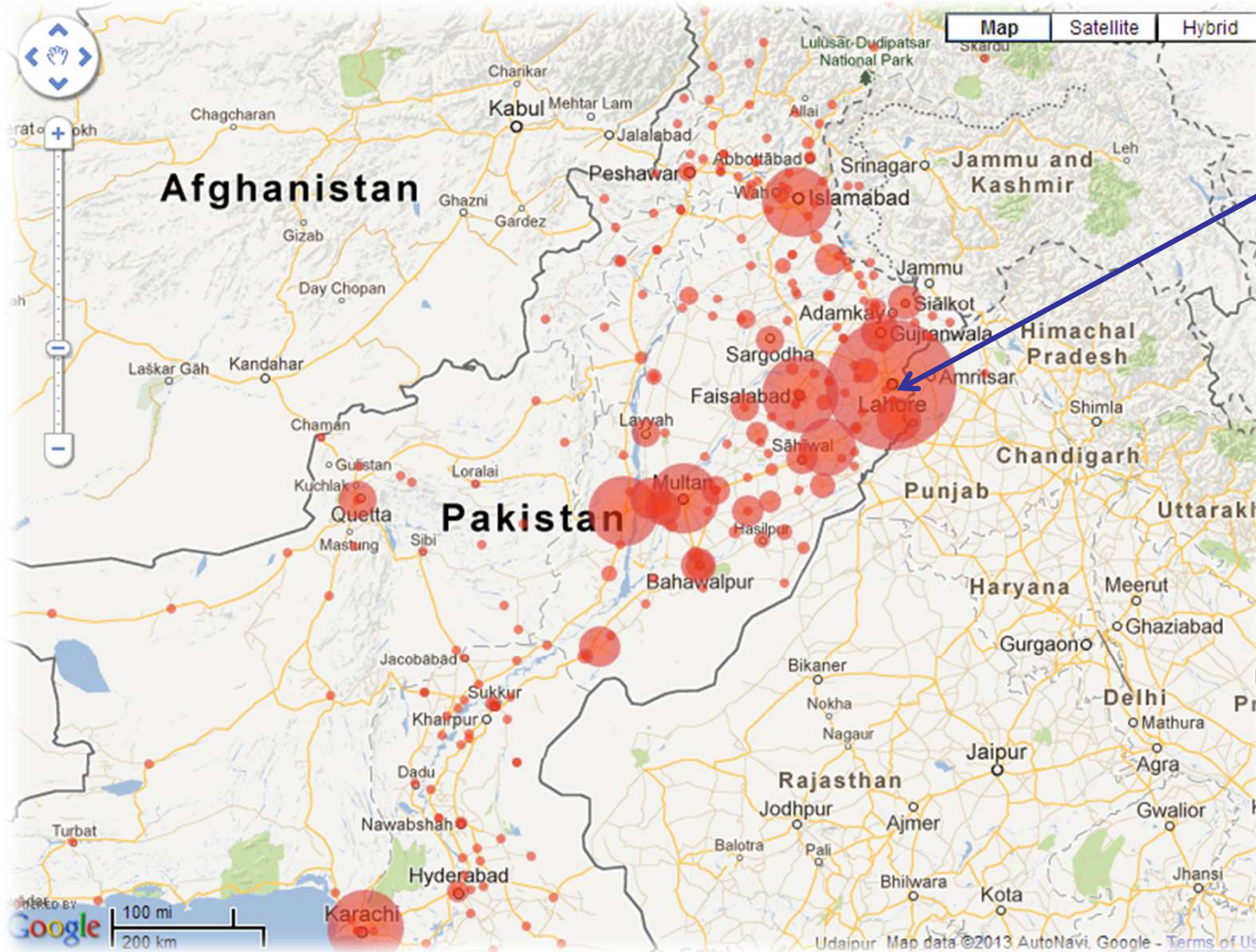
User Demographics

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

INFORMATION TECHNOLOGY UNIVERSITY

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Major Development Services

- **Job Audio-Browser[1]**: Audio browse newspaper job ads appropriate for low-skilled workers (Pakistan; 2011-12)

- **Babajob.com[2]:** Audio portal for entry level jobs (India; 2013-14)

- **Jharkhand Mobile Vaani[3]:** Cross-spread Polly and a citizen radio-over-phone platform (India; 2014-15)

- **Ebola Healthline[4]**: Browse and spread authoritative messages about Ebola (Guinea; 2014-present)

[1] Raza et al. 2013, CHI, *best paper award*.
[2] Raza et al. 2016, ICTD.
[3] Unpublished. Being analyzed.
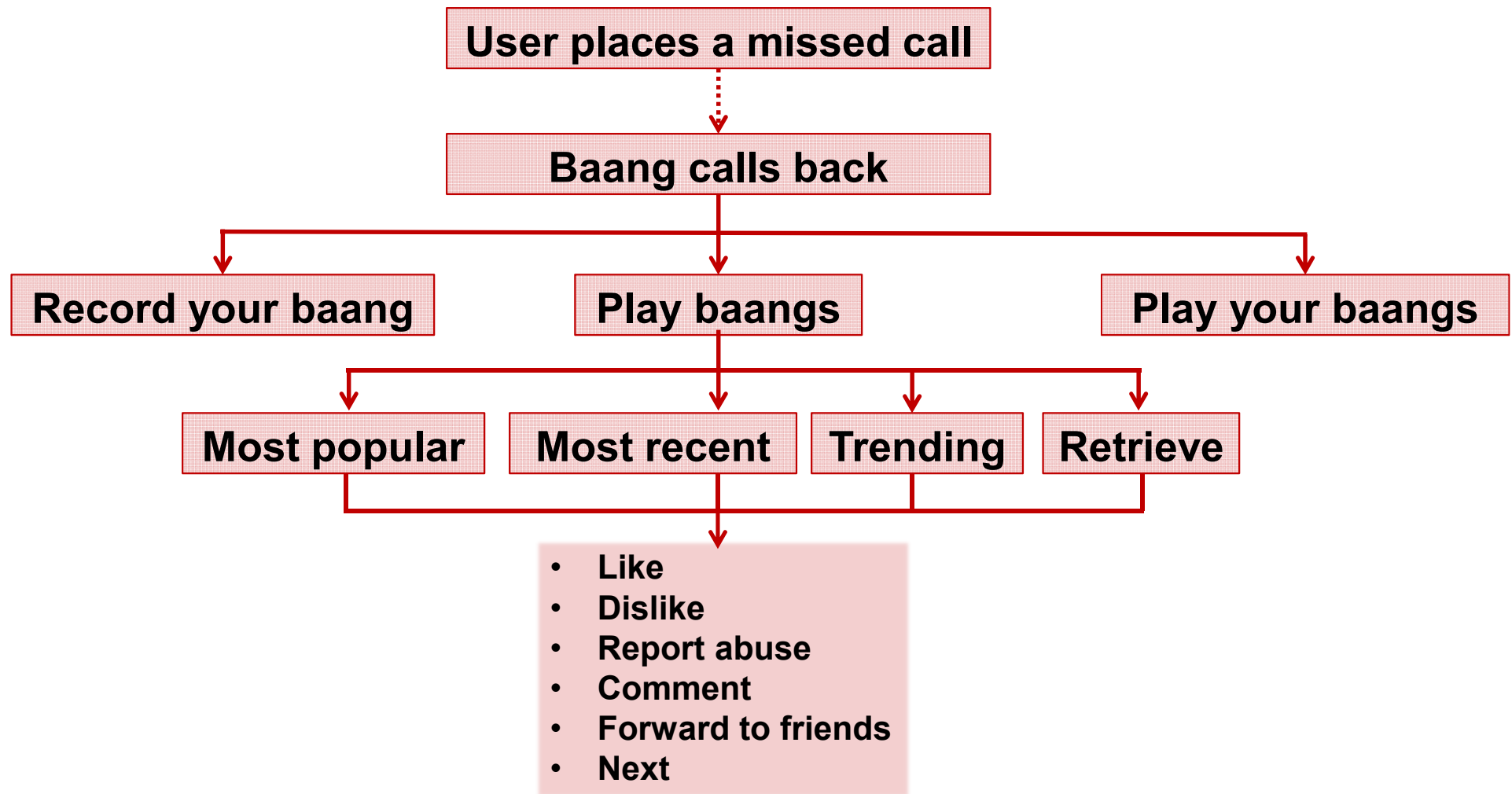[4] Wolfe et al. 2015, SLaTE, InterSpeech.

New Speech Services

- **Baang[1]**: A voice-based, telephone-based community forum (Pakistan; 2015-16)

- **Sawaal[1]:** A voice-based, telephone-based community quiz/question answering (Pakistan; 2015-16)

[1] Unpublished. Being analyzed.

Baang (بانگ)

A voice-based "reddit" for the low-literate

```
                  ┌──────────────────────────────┐
                  │   User places a missed call  │
                  └──────────────┬───────────────┘
                                 ┊
                  ┌──────────────▼───────────────┐
                  │       Baang calls back       │
                  └──────────────────────────────┘
```

Record your baang	Play baangs	Play your baangs

Most popular	Most recent	Trending	Retrieve

- Like
- Dislike
- Report abuse
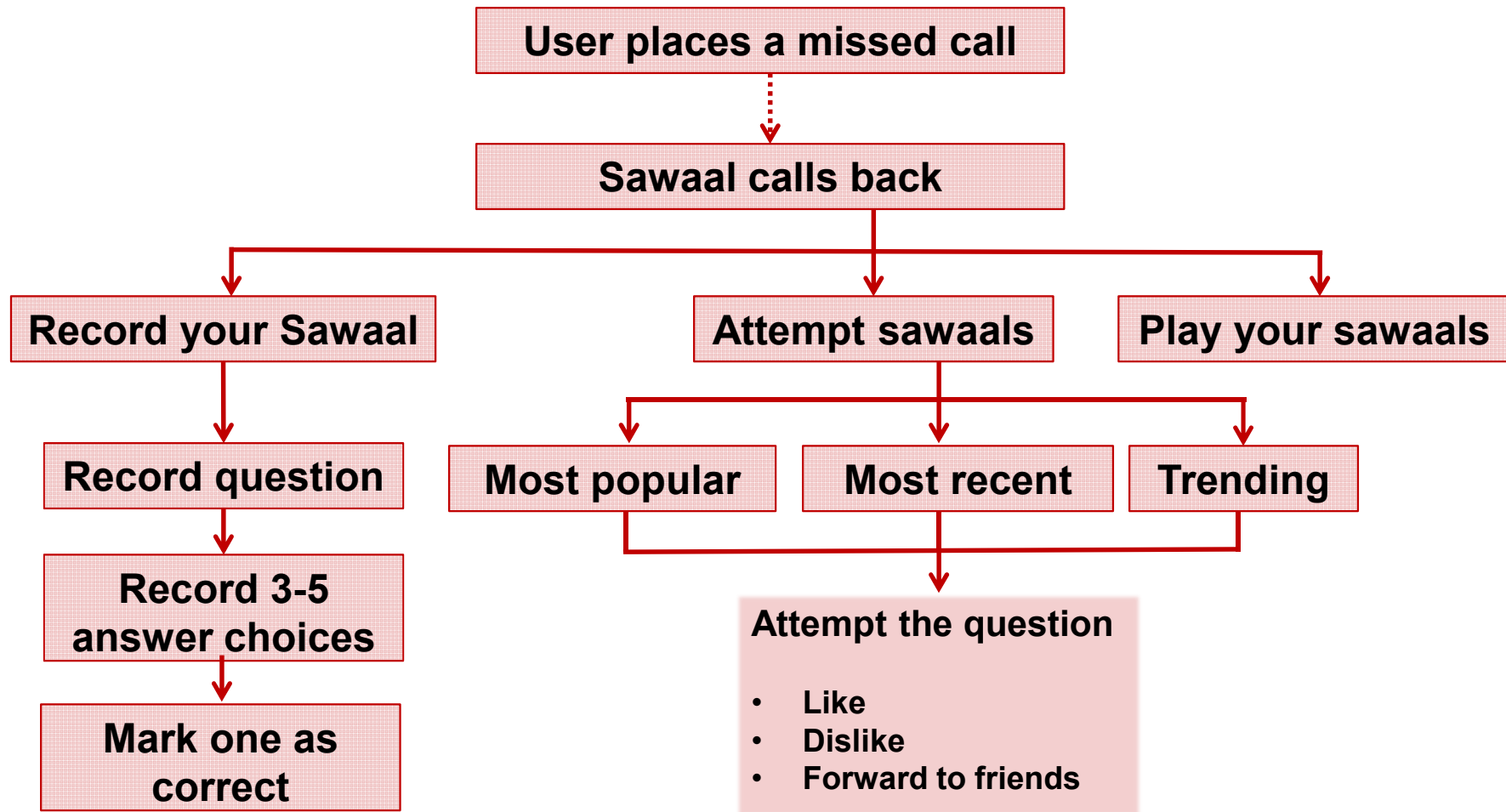- Comment
- Forward to friends
- Next

Baang (بانگ)

Within 3 months of its launch *Baang* has accumulated:

- **8,432** posts by **888** users
- Played **393,448** times by **1,524** users
- **101 hours** of speech data
- Among the most popular baangs are:
  - Songs
  - Religious poetry
  - Quranic recitation
  - Jokes, quotes etc.

Sawaal (سوال)
A voice-based community quiz for the low-literate

User places a missed call

Sawaal calls back

Record your Sawaal   **Attempt sawaals**   **Play your sawaals**

Record question   **Most popular**   **Most recent**   **Trending**

Record 3-5 answer choices

Mark one as correct

Attempt the question

- Like
- Dislike
- Forward to friends

Sawaal (سوال)

Within a month *Sawaal* accumulated:

- **8,907** calls by **575** users
- **2,700** valid questions by **160** users (overall 3,176 by 201 users)
- Were attempted **74,000** times by **400** users
- Forwarded **6,800** times to friends
- **38 hours** of speech data
- Categories
  - Sports
  - Religion
  - History
  - General knowledge.

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

For more details please visit

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

Thank you!

Analysis of User Behavior
(with Yibin Lin and Haohan Wang)

Does more experience using Polly lead to:

1. an improvement in users' interaction skills?
   a) Use of more advanced features,
   b) Fewer mistakes.

2. any change in usage preferences?

(Analyses are based on: **50,414** users, **292,951** calls, **934,742** menu interactions and **were controlled for user experience**)
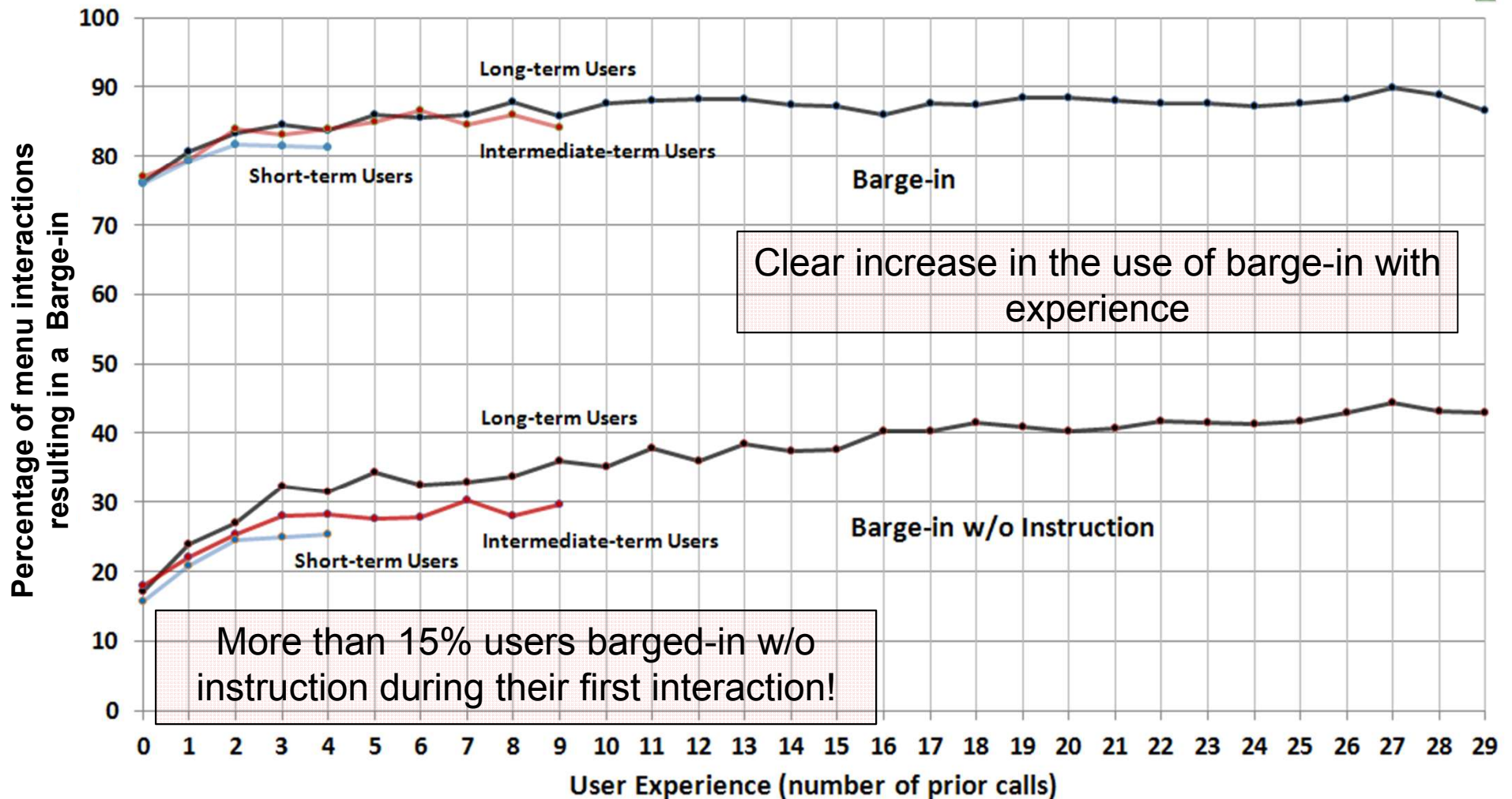
Barge-in Behavior in Main Menu

Barge-in: The user presses a key before the end of the voice prompt

Barge-in w/o Instruction: The user presses a key before the voice menu even instructs him about that option

Barge-in Behavior in Main Menu

Research Question

Reproducibility: Can our setup and results be reproduced in a different country?

The Babajob.com[1], MSRI[2] Collaboration

(Sean Blagsvedt[1], Maya Chandrasekaran[1], Bill Thies[2], Indrani Medhi[2], Spandana Gella[2], Bhiksha Raj, Rita Singh, Rajat Kulshreshtha)

Babajob.com: A job portal in Bangalore with an active listing of thousands of informal and entry level jobs

Goals

- Make Polly viral in Bangalore
- Advertise Babajob.com to low-literate job seekers through Polly

Setup

- A local phone number in Bangalore receives the "missed calls"

- Polly calls back from the US

- Supports:
  - Kannada (Archna) and Hindi (Rita) voice prompts
  - Call transfer to Babajob.com's IVR from Polly's main menu
  - A voice directory of previously-called friends

For almost a year Polly did not take off!

Call traffic did not die out either…

We made two changes to the interface based on user feedback…

and it abruptly became exponential:
- 10,349 calls
- 1,613 users
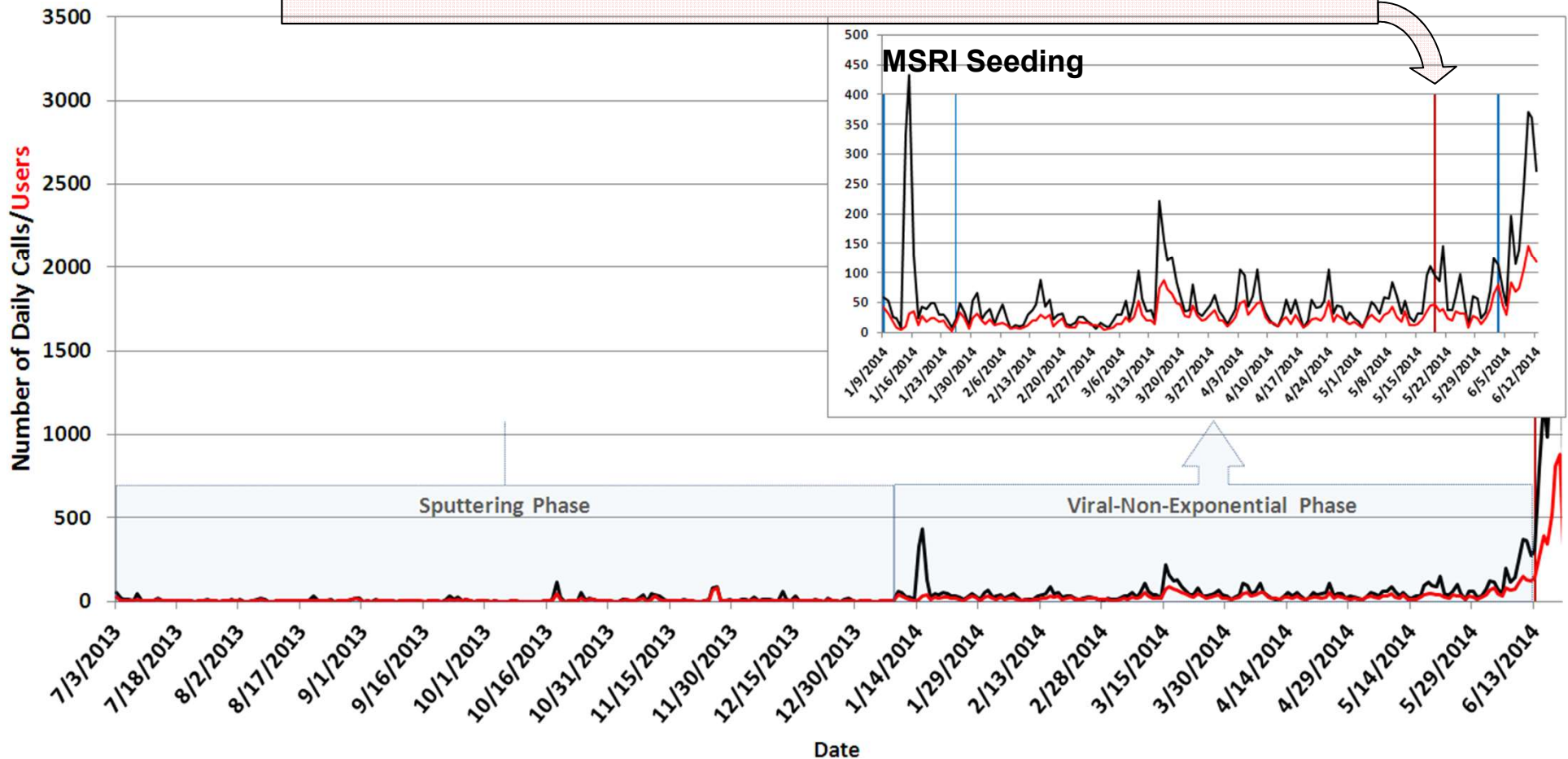- 7 days

Phases of Activity
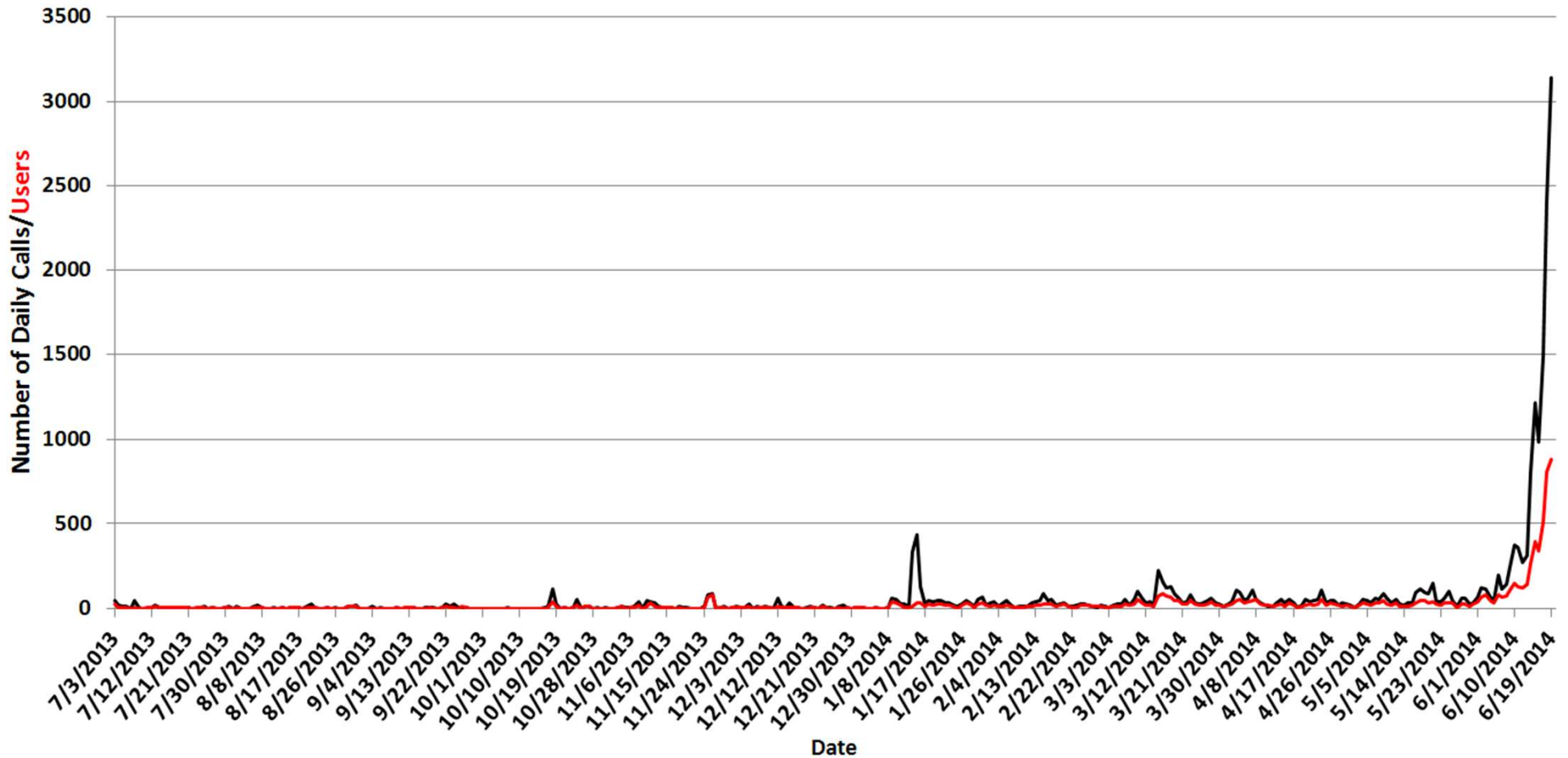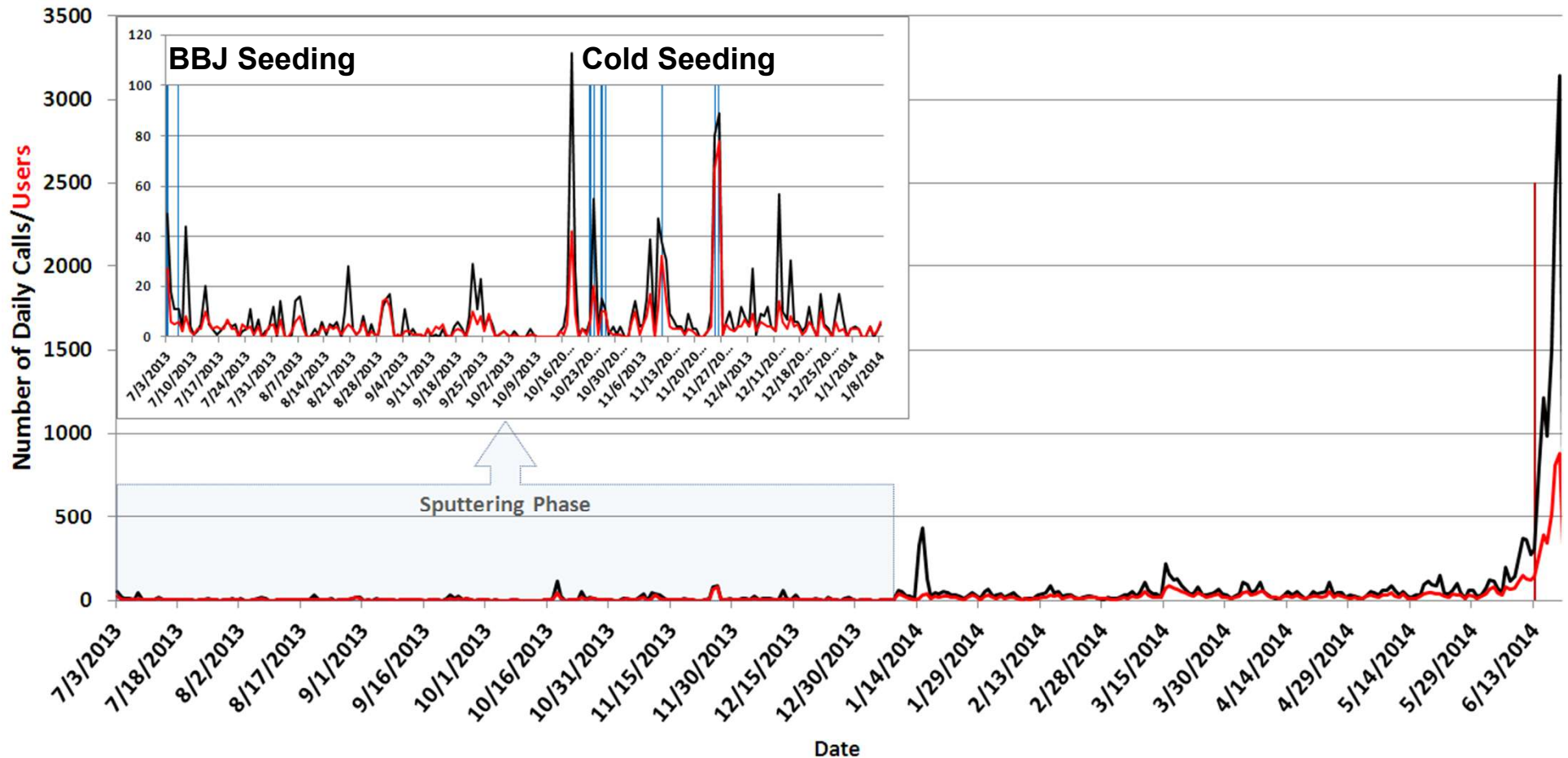
Phases of Activity

Fluctuating, intermittent activity

Phases of Activity

Unadvertised option to send unmodified voice

Sustained transmission but no exponential spread

Phases of Activity

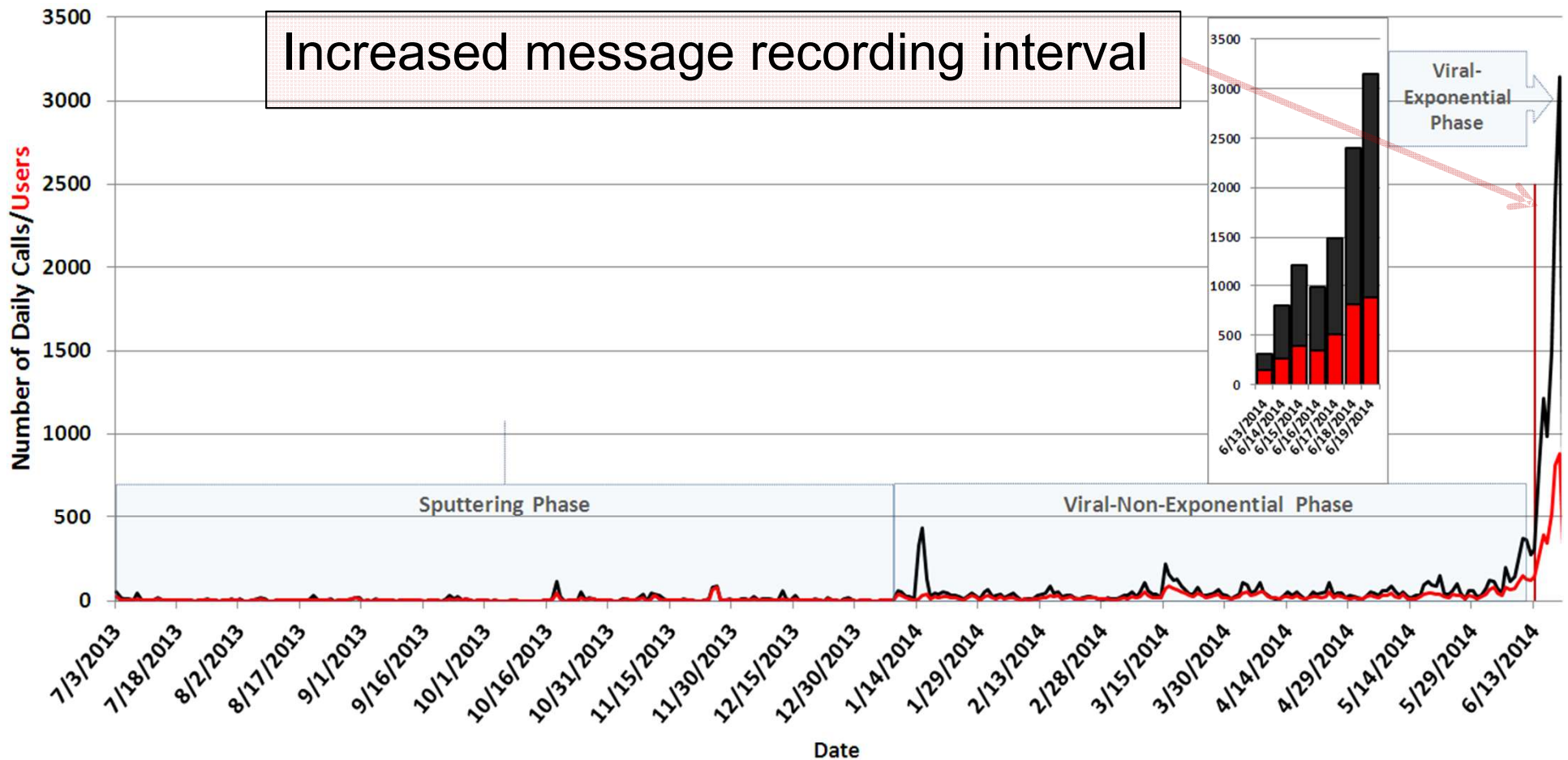Increased message recording interval
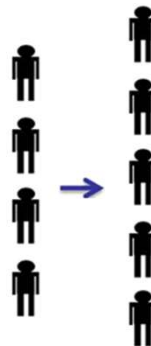
Abrupt exponential spread!
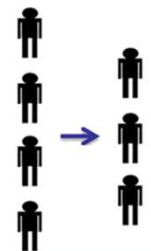
Virality and Exponential Spread

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.
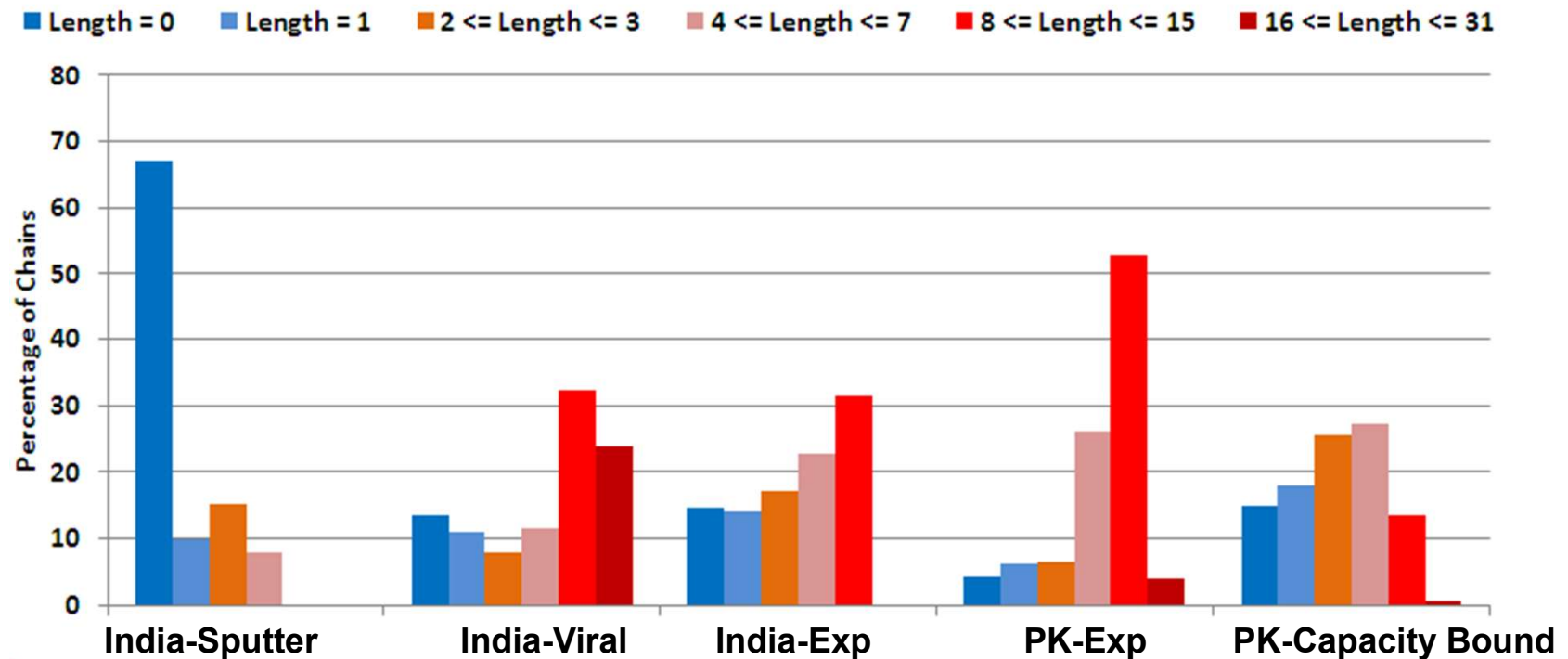
$R_0 > 1$, exponential spread

$R_0 < 1$, exponential decay

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

Legend: ■ Length = 0 ■ Length = 1 ■ 2 <= Length <= 3 ■ 4 <= Length <= 7 ■ 8 <= Length <= 15 ■ 16 <= Length <= 31
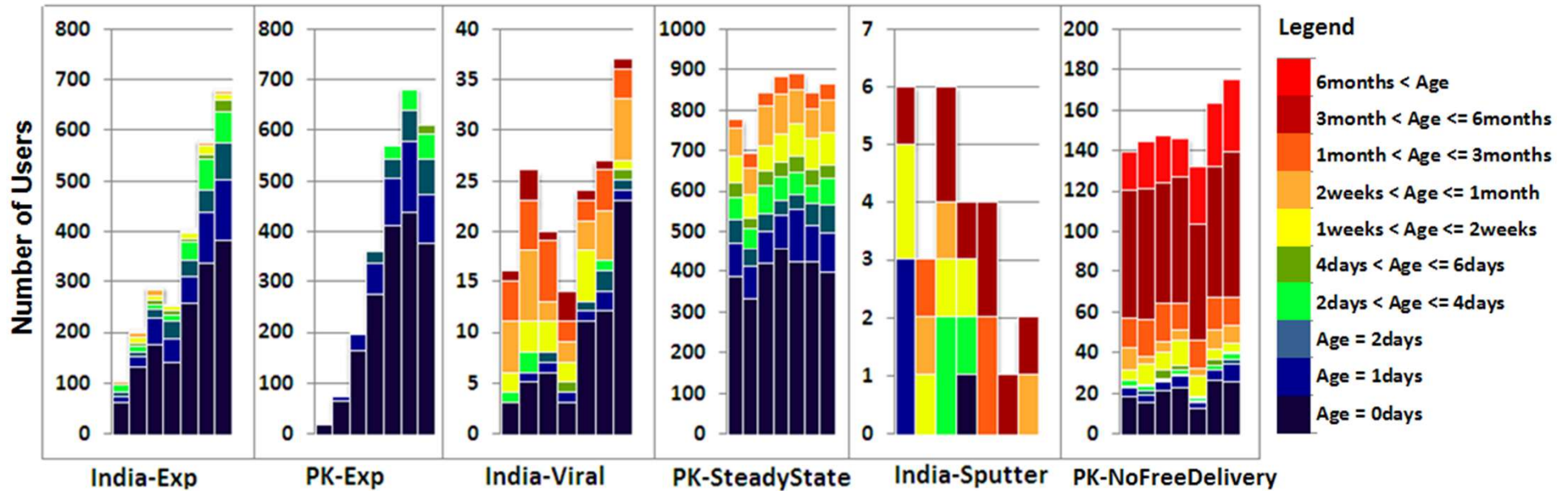
- **During the non-exponential phases: Why didn't the traffic fizzle?**

- **Why did Polly eventually attain exponential spread?**

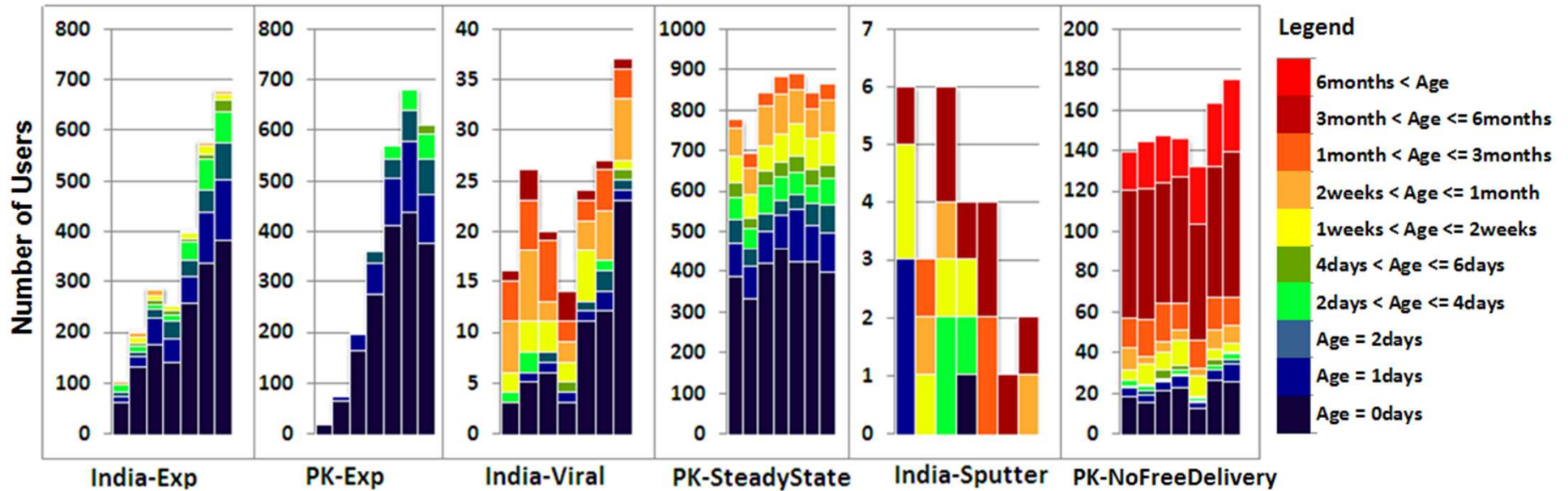- **Why didn't Polly take-off immediately in India as it did in Pakistan?**

Distribution of Daily Users by their Polly Age
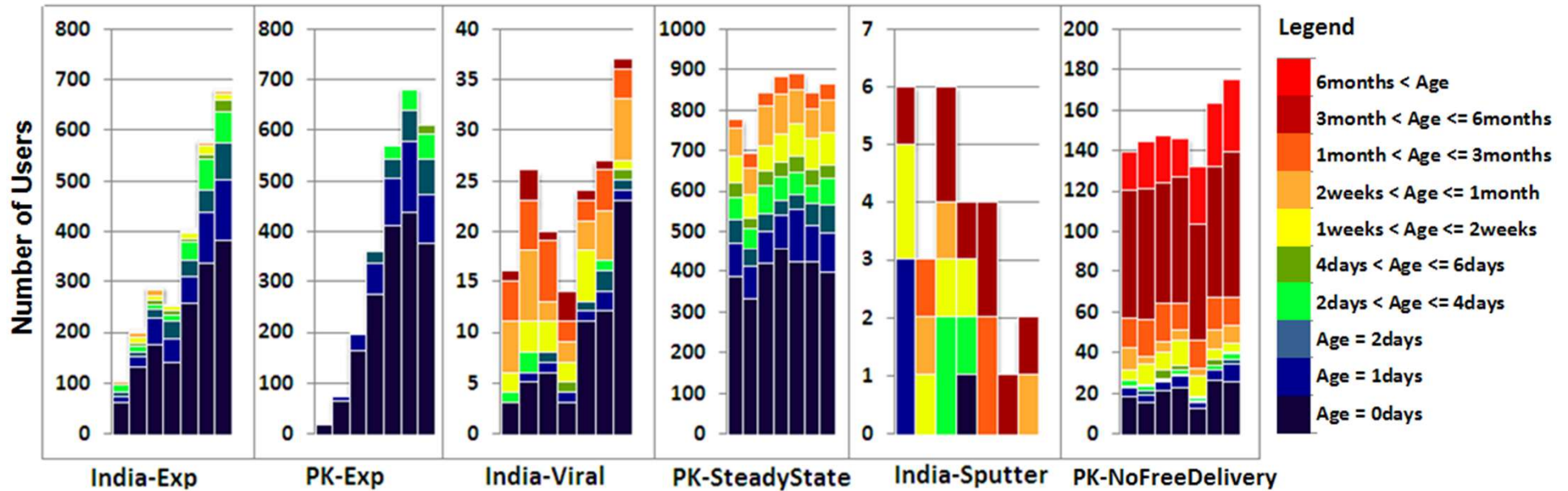

Majority of users are new

Distribution of Daily Users by their Polly Age

A Significant number of old users

Legend
- 6months < Age
- 3month < Age <= 6months
- 1month < Age <= 3months
- 2weeks < Age <= 1month
- 1weeks < Age <= 2weeks
- 4days < Age <= 6days
- 2days < Age <= 4days
- Age = 2days
- Age = 1days
- Age = 0days

Distribution of Daily Users by their Polly Age

Legend:
- 6months < Age
- 3month < Age <= 6months
- 1month < Age <= 3months
- 2weeks < Age <= 1month
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- Age = 1days
- Age = 0days

Majority of users are old

Distribution of Daily Users by their Polly Age
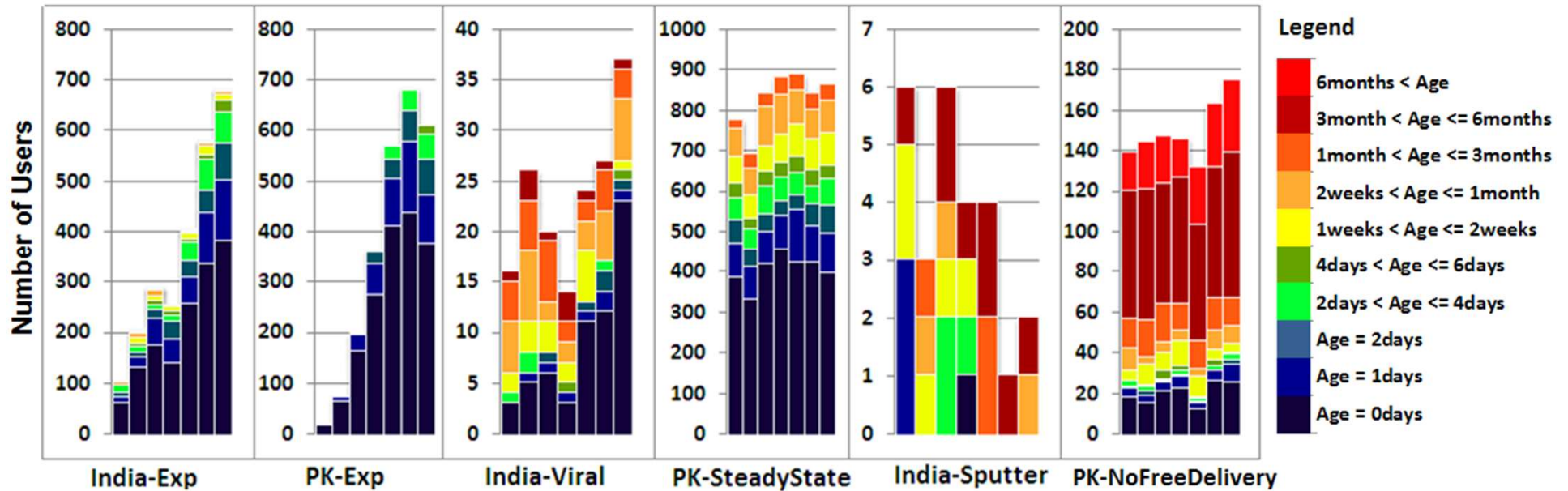
During non-exponential periods, activity mostly due to Long-term & Utility Oriented users!

- **During the non-exponential phases: Why didn't the traffic fizzle?**

- **Why did Polly eventually attain exponential spread?**

- **Why didn't Polly take-off immediately in India as it did in Pakistan?**

User Requests

(from 87 survey calls during the viral-non exponential phase)

- **Send messages without modifying the voice: 55%**

- **Increase message recording interval: 32%**

- **Make Polly available in Bangla:19%**

- Improve Job ads service: 32%

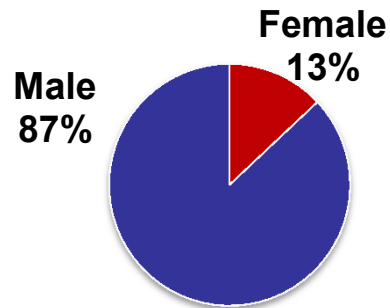- Improve audio quality: 22%

Also learned from the surveys:

- Although seeded with undergraduate students, Polly was largely being used by low-SES users!

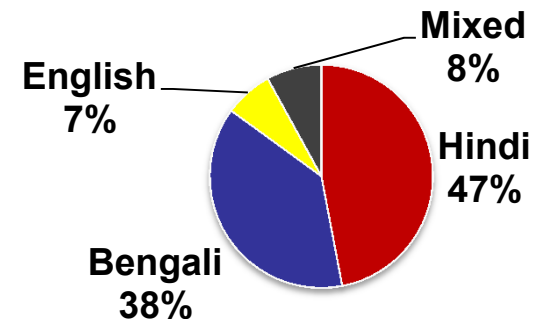- Used by a group of blind users at a training institute.

User Feedback through Polly

Gender (based on 419 recordings)

Female 13%
Male 87%

Language (based on 376 recordings)

Mixed 8%
English 7%
Hindi 47%
Bengali 38%

Complaints & Suggestions (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%**
- Job service related feedback: 6%
- Improve audio quality: 21%

- Keys not being recognized correctly: 10%
- More voice modifications: 9%

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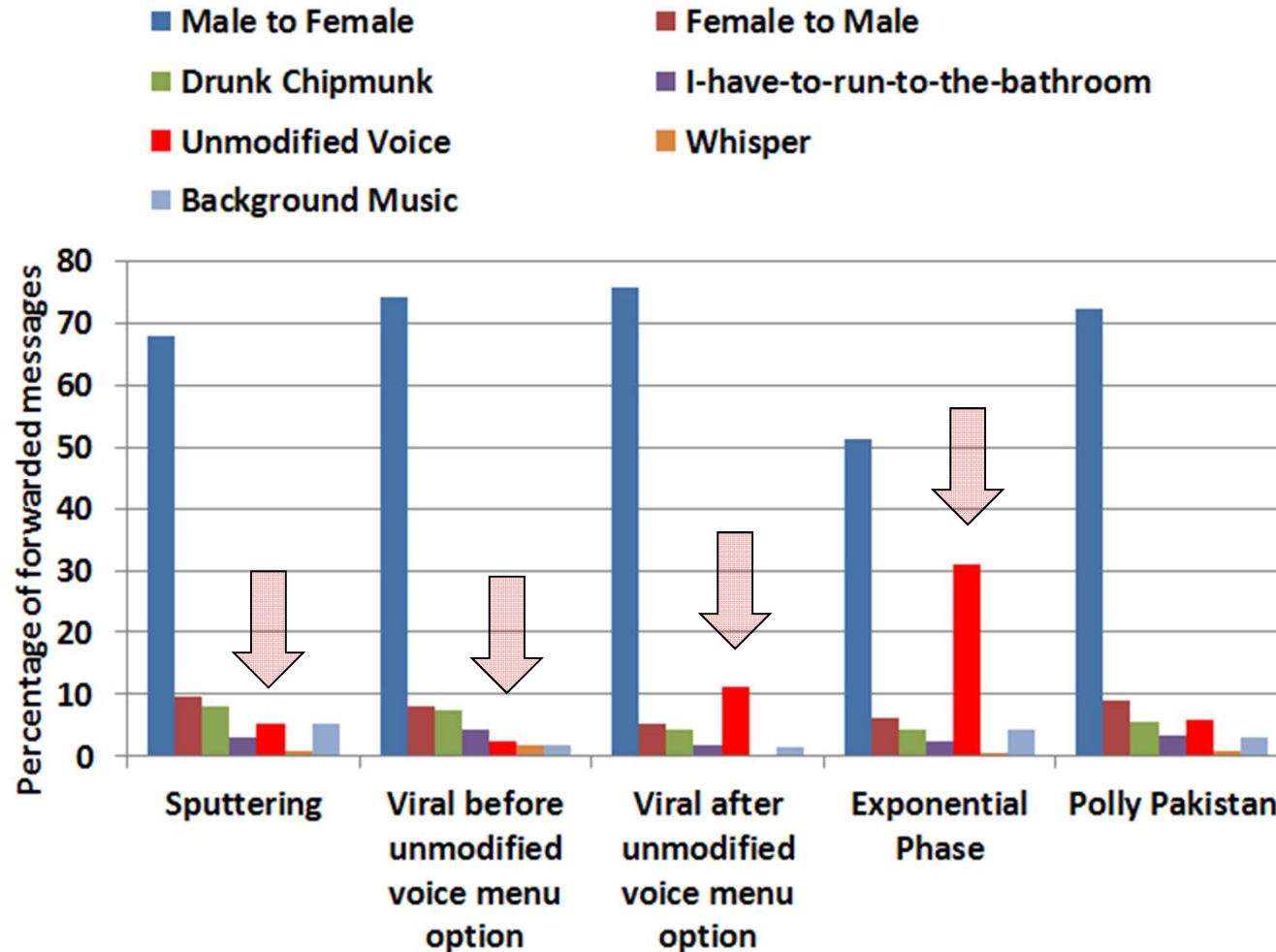
The use of unmodified voice increased significantly after the menu option and increased recording interval.

Q: Why did Polly eventually attain exponential spread?

A: Because we modified it to match users' needs:

- Users in India were more interested in voice messaging as compared to voice modifications

    - Explicit option to send unmodified voice messages

    - Increased recording interval

- **During the non-exponential phases: Why didn't the traffic fizzle?**

- **Why did Polly eventually attain exponential spread?**

- **Why didn't Polly take-off immediately in India as it did in Pakistan?**

Hypothesized Explanation

- Initial seeding attempts proved ineffective

- Initial voice prompts were inappropriate

- In India users were:

  - more interested in voice messaging

  - exposed to more voice spam and frauds