Behavior Analysis of Low-literate Users of a Viral Speech-based Telephone Service

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Project Polly

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

1. **Introduce** and **popularize** speech interfaces
2. Use Entertainment as a **Viral Conduit** for delivering core development services
3. Setup an **Experimental Testbed** for testing speech interface choices
4. Provide **Entertainment**
Polly

Polly is a telephone-based, voice-based application which allows users to make a short recording of their voice, modify it and send the modified version to friends.
2012-13 Large Scale Deployment

- Launched on May 09, 2012 in Lahore, Pakistan:
  - Seeded with **5 low-literate people**
- After 1 year:
  - **636,000 calls**
  - **165,000 users**
  - At its peak it was 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 **34,000 times to their friends.**
This Talk: Analysis of User Behavior

1. Do users fall into naturally distinct groups if they are clustered based on their activity profile?

Does more experience using Polly lead to:
2. an improvement in users’ interaction skills?
3. any change in usage preferences?
User Clustering

• **63,023** users who had at least one active interaction with the system.

• Each user is represented by features based on:
  • types of calls and initial interaction
  • perseverance
  • preferred time-of-day
  • choices made during the calls
  • pattern of social connectivity
User Clustering

- 63,023 active users
- 2 clusters
- Result: No clear separation

Results:
- Most informative feature: avg. time of day of calls
- Mid-day vs. evening users
- Midday users are more active, more connected.
Improvement in users’ interaction skill

We focus on users’ interactions with the first (main) menu of Polly.

– There may be none to several menu-interactions within one call.

We track the prevalence of:

1. Barge-in (pressing button before end of instructions)
2. Invalid button presses
3. Unsuccessful forwarding attempts.

50,414 users, 292,951 calls, 934,742 menu interactions.
Barge-in Behavior

Number of times user previously encountered this menu

Fraction of barge-in

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8
0 50 100 150 200

Barge-in in Behavior
Invalid Button Pressed

fraction of button presses that were invalid

Number of times user previously encountered main menu

0 0.005 0.01 0.015 0.02 0.025

0 50 100 150 200
Caveat: Confounding User Types

- This analysis lumps together long-term and short-term users.
- Hence, it confounds true learning by any one user with differences between the different user types.
- Long-term users may be more adept at using IVR systems to start with.
Changes in User Preferences: (now controlling for user type)

We define 3 user sets and explore changes in their usage patterns as a function of their experience (number of prior Polly calls):

- **Short-term users**: 2,701 users who interacted with Polly exactly 5 times.
- **Intermediate-term users**: 1,862 users who interacted with Polly exactly 10 or 11 times.
- **Long-term users**: 1,523 users who interacted with Polly 30+ times.
Menu Choices vs. Experience
Short-term Users (made exactly 5 calls each)

![Graph showing the relationship between menu choices and user experience](image-url)
Menu Choices vs. Experience
Intermediate-term Users (made exactly 10 or 11 calls)

Compared to short-term users; activity starts at a higher level and climbs higher!
Menu Choices vs. Experience

Long-term Users (made 30+ calls)

Compared to intermediate-term users; activity starts at a higher level and climbs higher!
Common Trends among all user sets

- The Tendency to:
  1. Press 2 (forward) starts off at a high value and stabilizes
     - “Back Channel”
     - System’s popular image as a messaging system
  2. Press 3 (next effect) increases with experience
     - System Exploration
     - Hunting for an effect of choice
  3. Press 0 (re-record) and 1 (repeat) decreases with experience
     - Adapting to 15 seconds recording limit
     - Playing with the system, alone or with friends

- Invalid button presses are rare
Early Differences in Call Complexity

Can be used to predict user retention!
Main Findings

1. Users don’t fall into neat groups. Rather, form a continuum.
   Significant evidence for learning:
   • Increased use of barge-in
   • Decreased frequency of failed forwards

2. Significant difference in usage choices between long-term users and (short, intermediate)-term users.

3. Early differences in call complexity among the different user types
Current Work

• Re-launch Polly in Pakistan to serve as a clearinghouse for jobs and skill-training opportunities

• Make Polly viral in India with better mechanisms of populating Job Ads and tracking employment outcomes

• Much more analysis to be done
  • Detailed logs, audio recordings,…
  • Collaborators welcome!

Thank you!
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Goal: Using *Viral Entertainment* as a vehicle for disseminating *Development* related telephone based services

**Polly:** A telephone-based, voice-based entertainment service that became viral among low-literate users in Pakistan

- Seeded with 5
- It reached **165,000 users**, who took part in **636,000 calls**

This talk
1. Do users fall into naturally distinct groups if they are clustered based on their activity profile?
2. Does more experience using Polly lead to:
   2. an improvement in users’ interaction skills?
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