Man versus Machine: Evaluating IVR versus a Live Operator for Phone Surveys in India

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## Live operator versus IVR

<table>
<thead>
<tr>
<th></th>
<th>Live</th>
<th>IVR</th>
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<tbody>
<tr>
<td>Set-up required</td>
<td>None</td>
<td>More</td>
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<tr>
<td>Personal and real conversation</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Script</td>
<td>Flexible</td>
<td>Fixed</td>
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<tr>
<td>Personnel required</td>
<td>More</td>
<td>Less</td>
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<tr>
<td>Scalability</td>
<td>Difficult</td>
<td>Easy</td>
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<tr>
<td>Flexibility of Timings</td>
<td>Less</td>
<td>More</td>
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<tr>
<td>Accuracy and cost</td>
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What’s Known about IVR Accuracy?

- Lerer et al [DEV 2010] measured task completion through phone surveys in rural Uganda
  - Does not measure IVR entry accuracy
- Measuring accuracy of SMS, electronic forms, live operator [Patnaik et al]
- Spoken versus typed input [Patel et al] [Grover et al] [Sherwani et al] [Mehdi et al.]
- Measuring bias in IVR surveys [Dillman et al] [Kreuter et al] [Schroder et al]
- Systems for building IVR [Freedom Fone] [Awaaz.De] [IVR Junction] [SpokenWeb]
What’s Known about IVR Cost?

“…handling a call through the IVR is cheaper than handling one with a live agent by a factor of 10…”

-- Buckstaff et al, *Benchmarking Customer Service Results from the 2007 APPA Survey*, USA

But what about in low-resource environment?
- Users have less education – can they use IVR?
- Labour costs are lower – is IVR a big savings?
Our Study

• Goal: evaluate accuracy & cost of IVR relative to live operator for conducting a job interview
  • Accuracy: *consistency* of IVR relative to live human conversation (ground truth unknown)

• Methodology:
  • Contact known job seekers over the phone
  • Administer the same questionnaire *twice*:
    • IVR (with live operator introduction)
    • Live operator
  • Compare reported values for discrepancies
Focus on Drivers

- Accessible population
- More tech savvy
- Developed job questionnaire with input from:
  - Babajob
  - Online classified ads
  - Office transportation manager
<table>
<thead>
<tr>
<th>Personal Info</th>
<th>Professional Info</th>
<th>Language proficiency and ability to handle crises</th>
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<tbody>
<tr>
<td>Age</td>
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<td>Marital Status</td>
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<td>Education</td>
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<td>Owns a commercial permit</td>
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<td>Years as a driver and years driving with a licence</td>
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<td>Daily work hours</td>
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<td>Night-shifts</td>
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<td>Part-time/ short-time jobs</td>
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<td>Latest and expected monthly salaries</td>
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<td>Personal mobile phone and vehicle</td>
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<td>Posting outside home town</td>
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<td>Wear uniform</td>
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<td>Drive a foreigner</td>
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<td>Free response</td>
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| Age | Marital Status | Education | Owns a commercial permit | Years as a driver and years driving with a licence | Daily work hours | Night-shifts | Part-time/ short-time jobs | Latest and expected monthly salaries | Personal mobile phone and vehicle | Local traffic knowledge (one-way) | Local traffic knowledge (landmark) | Posting outside home town | Wear uniform | Drive a foreigner | Do odd jobs in addition | Traffic tickets | Smoking and drinking habits | Languages comfortable in | How would one locate an unknown place |
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Iterative Prototyping

- Stage one: Wizard-of-Oz with 3 known drivers
- Stage two: IVR system with 6 referred drivers
- Lessons learned:
  - Multi-digit answers are confusing; give examples
  - Enable skipping sensitive questions
  - Insert speed breakers for users answering before the question
Experimental Protocol

- Within-subjects design with two cases: IVR and live operator
  - Given twice in rapid succession (order balanced)
- Live introduction for both cases
  - Explain study, obtain consent
  - Explain how to use the IVR
- Paid Rs. 50 ($1) in prepaid talktime for participation and referrals
Participants

• Contacted 31 drivers in West Bengal
  • Babajob (21); click.in (1); Snowball sampling (9)
• All native Bengali speakers*, many looking for jobs
• Average demographics:
  • 31 years old
  • Usually <10 years education
  • Earning Rs. 8300 ($160) / mo.
  • Usually owned feature phones and had used IVR before

* Because the interviewer spoke Bengali
Results: Task Completion

- Completed (20)
- Incomplete, unrelated to IVR (5)
- Incomplete, related to IVR (6)
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- 5: did not know how to answer (e.g., due to background noise)
- 1: Could not bring up numeric pad on touchscreen phone
Results: Accuracy

- **Overall error rate using IVR:** 4.0%
- On average, 1 question wrong per survey
Results: Source of Errors

Types of errors:
- Lapse of Hearing / Understanding
- Retyped Example
- Known Accident

Percent of Responses

- Multi-Digit
- MCQ
- Yes/No
- Free Response

(no errors)
Confirmation prompts reduced errors in multi-digit responses by a factor of 1.6.
- IVR ~2.5x slower on the first interview
- IVR prompts have slow pace: take 12:20 to play
Results: Cost

• Components of cost:
  • Phone calls
  • Interviewer
  • Technical setup
  • Technical maintenance

*Operator paid Rs. 8,000 / mo.; phone calls 60p / minute
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Today in India, a live operator costs about 3x as much as a phone call (per minute)*

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Discussion

- Choose IVR if:
  - Need fast scale-up (parallel calls, flexible hours of operation, multiple languages)
  - Able and willing to set up the IVR and undertake periodic maintenance
  - Tolerant of some errors (~4.0%) in the data
- Choose live operator if:
  - Willing to hire and manage more personnel
  - Want maximum flexibility and robustness for users
  - Less need for rapid scale / have a small client-base
Conclusions

• It is viable to conduct IVR interview with low-income users
  • Using a live operator for the introduction
  • 77% of users complete the call
  • 4.0% error rate in ecologically-valid setting

• Future avenues for improving IVR
  • More combinations of human and IVR
  • Dedicated undo button?
  • Automated assistant (or help key) for users stuck