Use of Distributed Labor Technology to Measure Compliance with a Smoke-Free Signage Regulation

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BACKGROUND

- Monitoring smoke-free laws in large cities can be labor-intensive and expensive.

- New online distributed labor tools may reduce time and cost.

- Bogor City passed Indonesia's first comprehensive smoke-free law in 2009.

- One part of the law requires the city's 3,412 mini-buses to display a smoke-free sticker.

- We used photos from 128 mini-bus doors for a proof-of-concept test of using Amazon Mechanical Turk (AMT) for compliance monitoring.

AIMS

1. Measure compliance with Bogor City's smoke-free sticker regulation for mini-buses.

2. Explore use of AMT as a low-cost, quick-turnaround research and monitoring tool.

THE SMOKE-FREE STICKER

By law, Kawasan Tanpa Rokok ("Area Without Smoke") stickers must be placed on the rear passenger door of all public mini-buses.

WHAT IS AMAZON MECHANICAL TURK?

AMT is an Internet-based service (www.mturk.com) where small tasks are quickly completed by AMT workers worldwide, and sent back to the requester for approval. Common tasks include coding, sorting, transcribing, quality control, and surveys. Payment is flexible, generally ~$0.05 for a simple 30-second task, equating to $6.00 per hour. Most AMT workers live in the US or India. Work can be restricted to particular countries or skill sets if desired.

METHODS

Data collection

In Fall 2012 we photographed passing mini-buses at a busy intersection in Bogor City, Indonesia for 30 minutes.

Data preparation

After removing 17 unusable or duplicate photos, 128 remained. These were cropped to remove any images of people.

Data analysis

- Created photo-coding task webpage on AMT using HTML code and built-in tools.
- Split project into 2 tasks:
    1. Coding for the presence or absence of the smoke-free sticker.
    2. Indicating whether at least 75% of the sticker is visible, and whether the sticker is torn, faded, and/or covered.
- Selected experienced AMT workers (500 approved tasks, 98% acceptance).
- Selected 5 repetitions (i.e., 5 different workers to code each picture).
- MJB also coded the photos as an expert coder.

Statistical analysis

Using Stata/SE 13.0, calculated the intraclass correlation coefficient (ICC) between the AMT workers' answers and the expert coder's answers.

PROBLEMS FOUND WITH SMOKE-FREE SIGNAGE

Missing   Torn   Covered over   Faded

The smoke-free stickers are applied in periodic campaigns by the Bogor City Health Department. Over time, due to the heavy use and wear of the vehicles and their frequent washing, the stickers are often missing, damaged, or covered by other stickers.

RESULTS: COMPLIANCE

Task 1, Q1. Can you see any of the KTR sticker in the photo?
Yes: **29.7%** (38/128)
No: **65.6%** (84/128)
I can't tell from the picture: **4.7%** (6/128)

Task 2, Q.1. Does it look like at least 75% of the sticker is on the door?
Yes: **86.8%** (33/38)
No: **13.2%** (5/38)

The 38 photos in which the smoke-free sticker was visible were then used in Task 2:

**Task 2, Q2. Do you see any of the following problems with the sticker?**
Torn: **18.4%** (7/38)
Covered: **18.4%** (7/38)
Faded: **10.5%** (4/38)
No problems: **63.2%** (24/38)

For Task 2, total is >100% because some stickers have multiple attributes. For Task 1.Q1 and Task 2.Q.1, the majority answer from 5 AMT workers was counted. For Task 2.Q2. three or more workers coding the same answer was counted.

RESULTS: USE OF AMAZON TURK

Accuracy: How many AMT workers are need to get accurate answers?
Using data from Task 1, we found that having 5 AMT workers code each photo provided high accuracy (>99%), even higher than the expert coder coding the photos once. (For our purposes, the definition of accuracy was two passes by the expert coder).
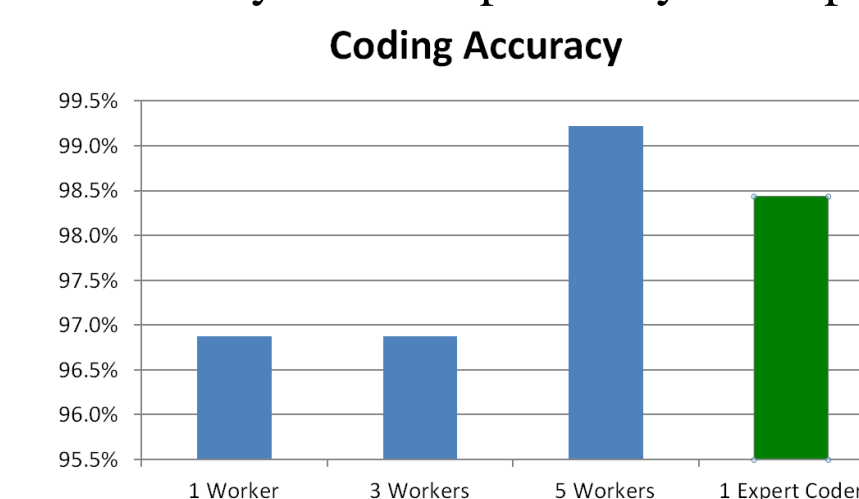
Task 1 accuracy levels of using majority answer of 1, 3, or 5 AMT workers or 1 expert coder.

Correlation: How did AMT workers' answers correlate with expert coder's answers?
The intraclass correlation coefficients were highest for simple tasks and lowest for tasks requiring more judgment, such as whether 75% of the sticker was visible or not.

		ICC	95% CI
Task 1	Presence	0.959	(0.942, 0.971)
Task 2	75% Visible	0.549	(0.284, 0.736)
	Torn	0.690	(0.481, 0.826)
	Covered	0.829	(0.697, 0.907)
	Faded	0.534	(0.270, 0.729)

PROJECT COST AND TIME

Task 1
Time for AMT work: 1 hr 23 min
Cost: 128 questions x $0.05 ea. x 5 workers + 10% Amazon fee = **$35.20**

Task 2
Time for AMT work: 1 hr 11 min
Cost: 38 question x $0.07 ea. x 5 workers + 10% Amazon fee = **$14.63**

Total Time: 2 hrs 34 min   **Total Cost: $49.83**

DISCUSSION

CONCLUSIONS

1. Only 19% of the photographed public transportation mini-buses had visible, useful smoke-free stickers. Most buses (65.6%) had no sticker at all, and in an additional 10.9% of cases stickers were torn, faded, or covered over by other stickers. In 4.7% of the photos, AMT workers could not determine if the mini-bus had the sticker.

2. For AMT to work effectively and efficiently, coding criteria and instructions need to be clear and pre-tested. Researchers also need to plan appropriate time for photo preparation, checking work quality, and final data analysis.

3. AMT, as a low-cost, quick method for basic photograph coding tasks, can be useful for compliance research and monitoring. This tool may be especially helpful for large projects (i.e., thousands of photos) or routine monitoring.

LIMITATIONS

1. The mini-buses photographed in our small sample may not be representative of all of the mini-buses in Bogor City.

2. It was not logistically possible to get photos of every passing mini-bus, and some photographs did not show the bus doors clearly enough for analysis.

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