# Introducing Precautionary Behavior by Temporal Diversion of Voter Attention from Casting to Verifying their Vote

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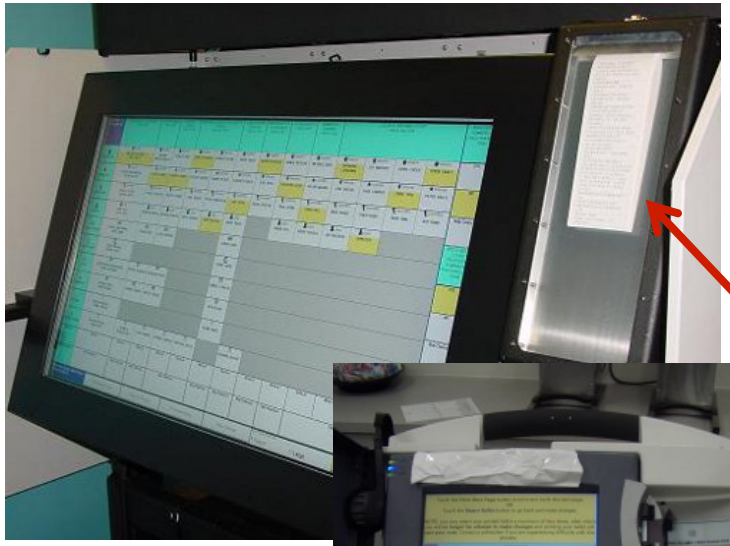
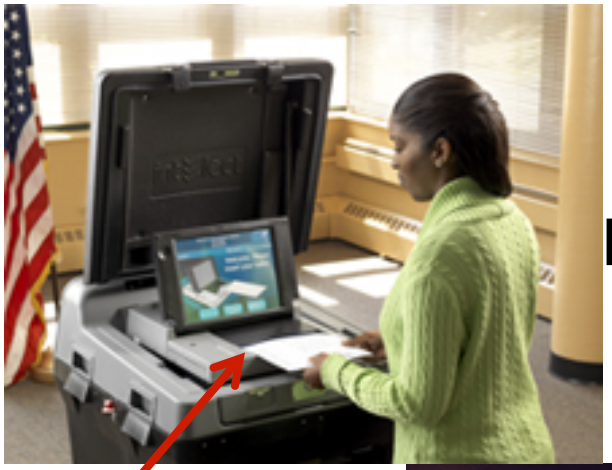
# Current e-voting systems

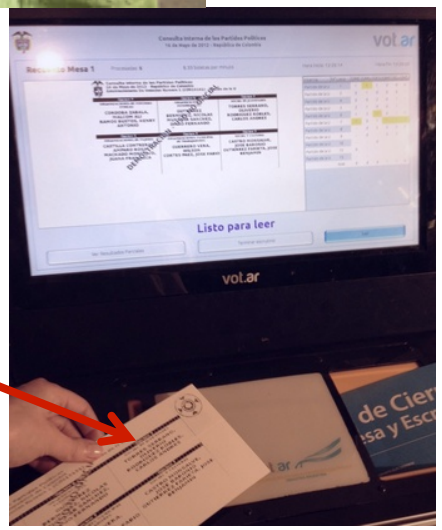


Automatic



Manually

Paper Audit Trails (PATs)



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# Security in theory and practice

- Election frauds can be detected with PATs

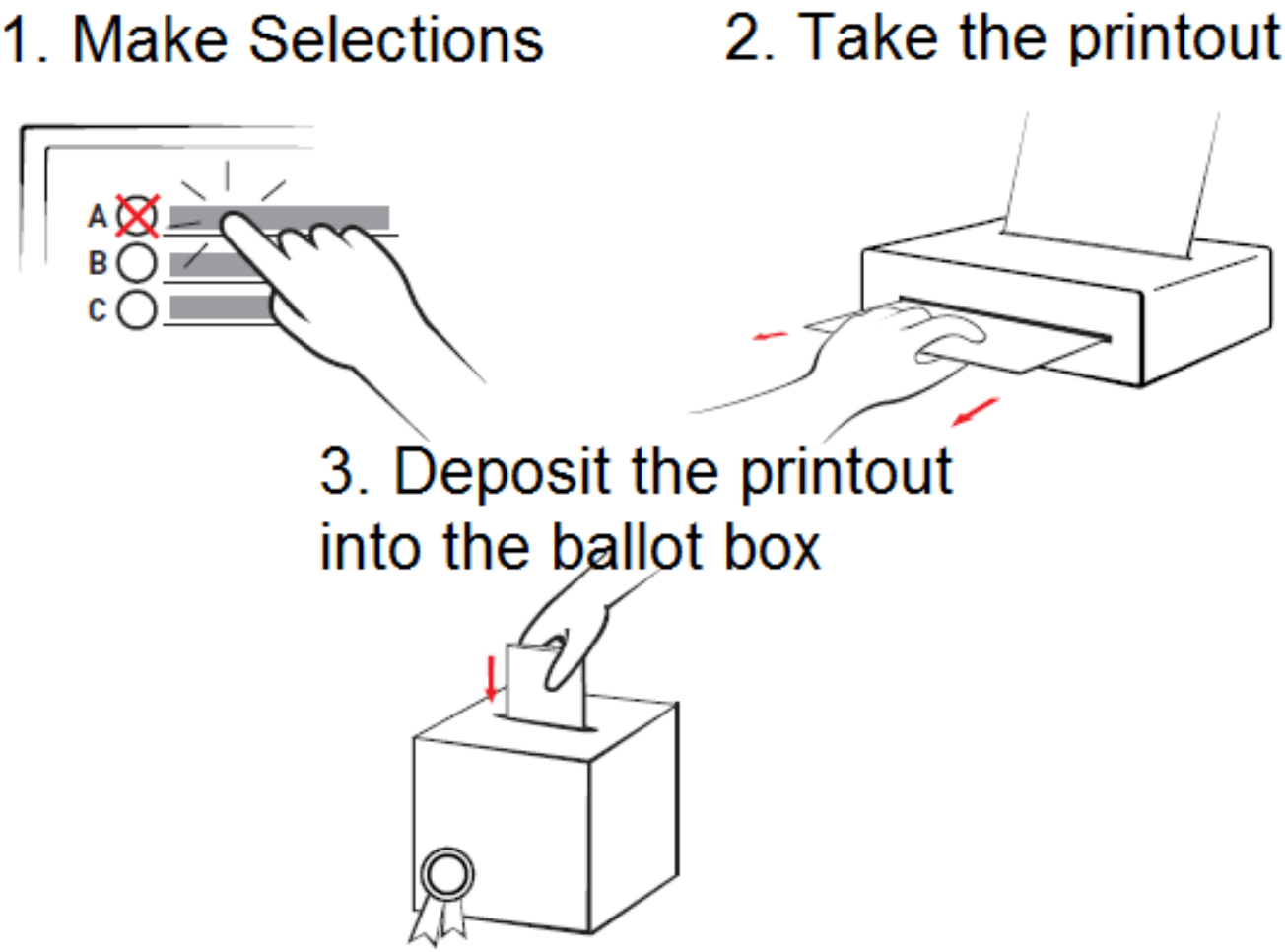
=> *Assumption:* Voters verify

- But, voters are not likely to verify PAT according to previous user studies

=> *Challenge:* Motivate voters to verify PAT

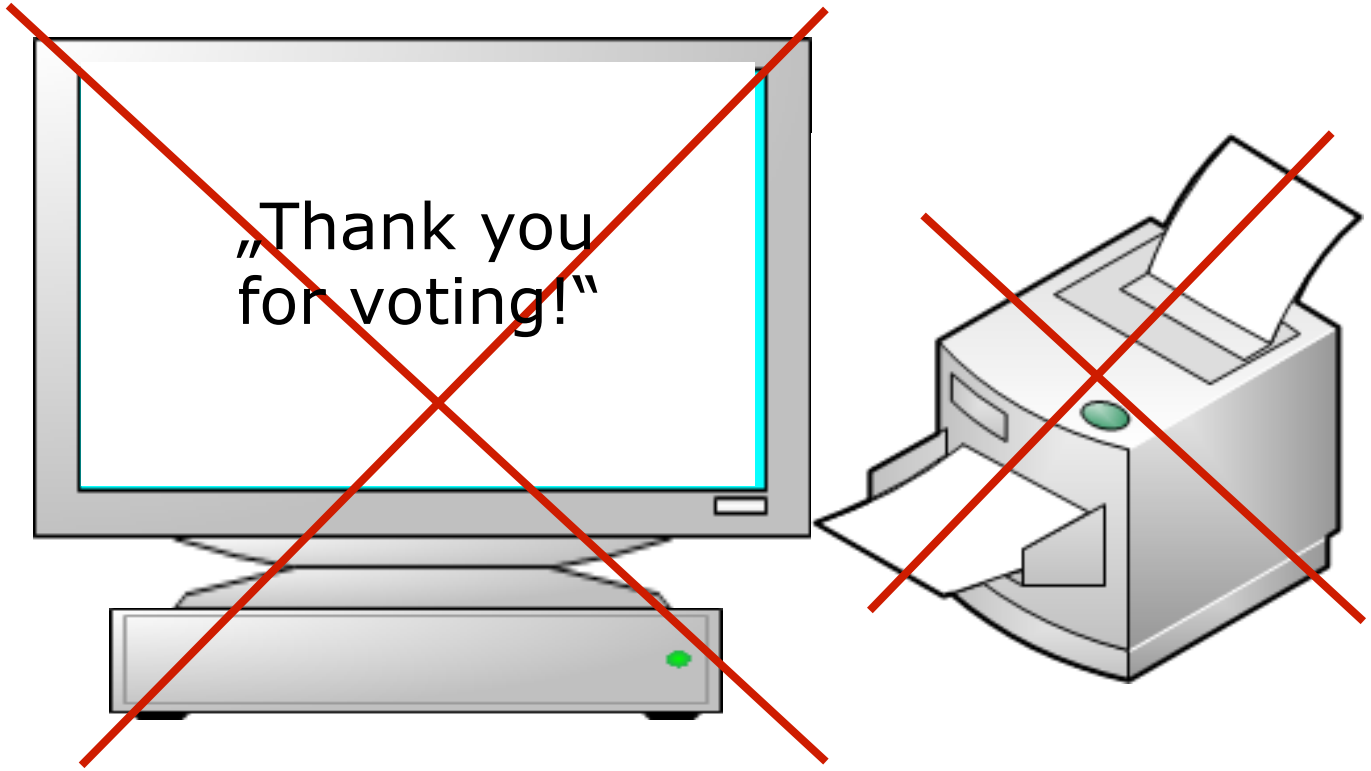
# Goal: Develope an adequate stimulus

# Focus: Manually depositing PAT

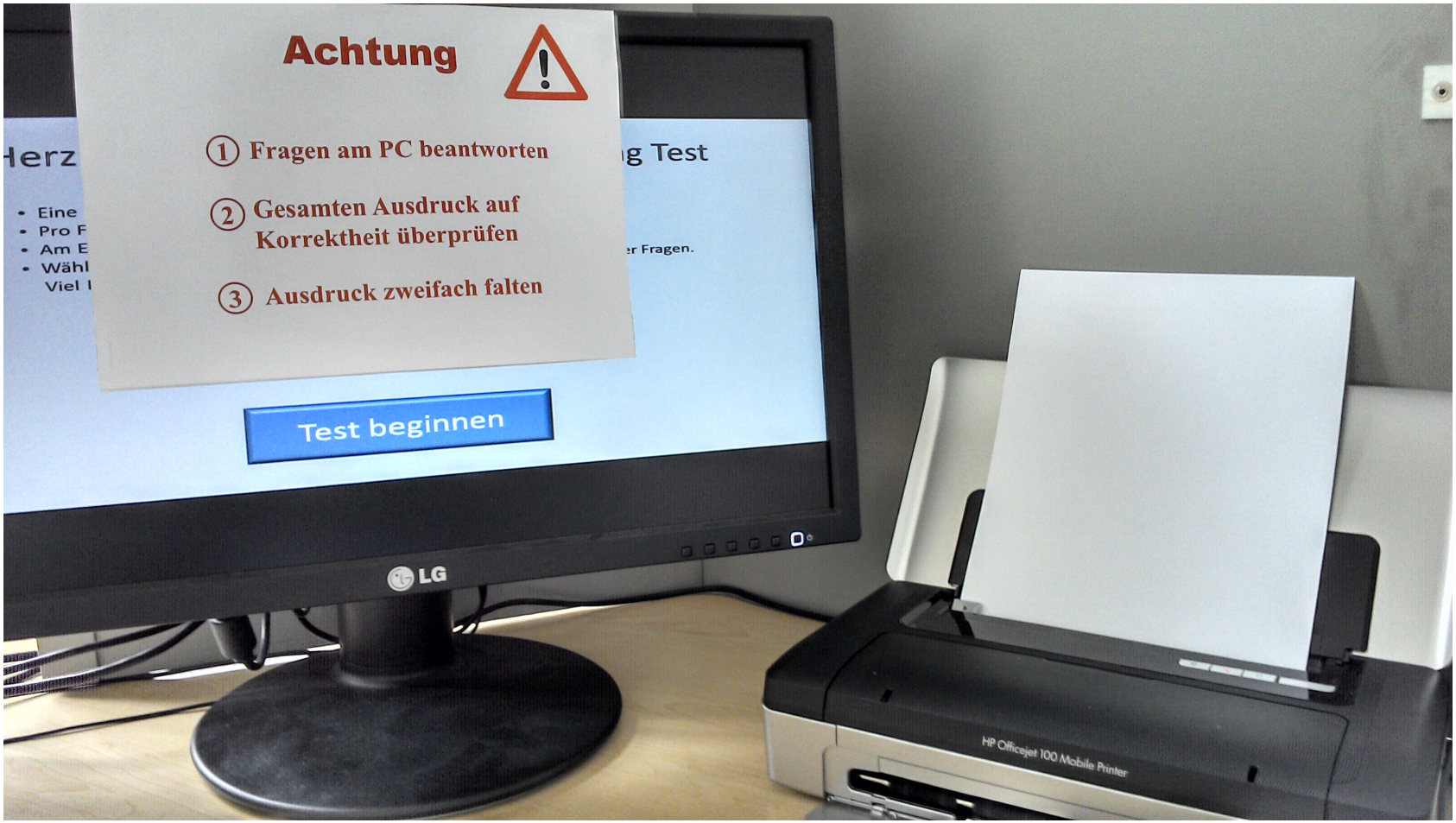


# Design restrictions

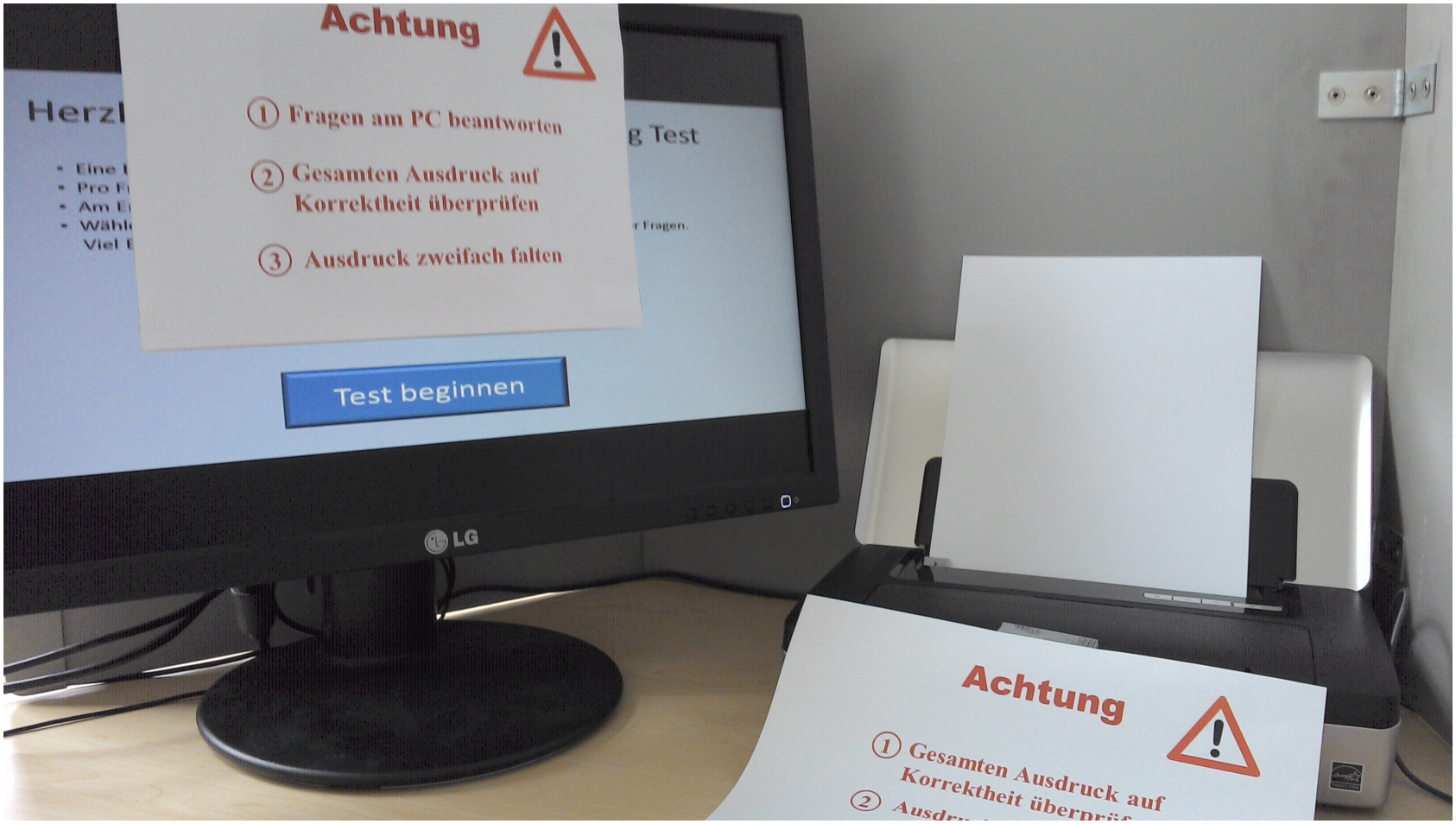
PATs as protection against malicious voting systems



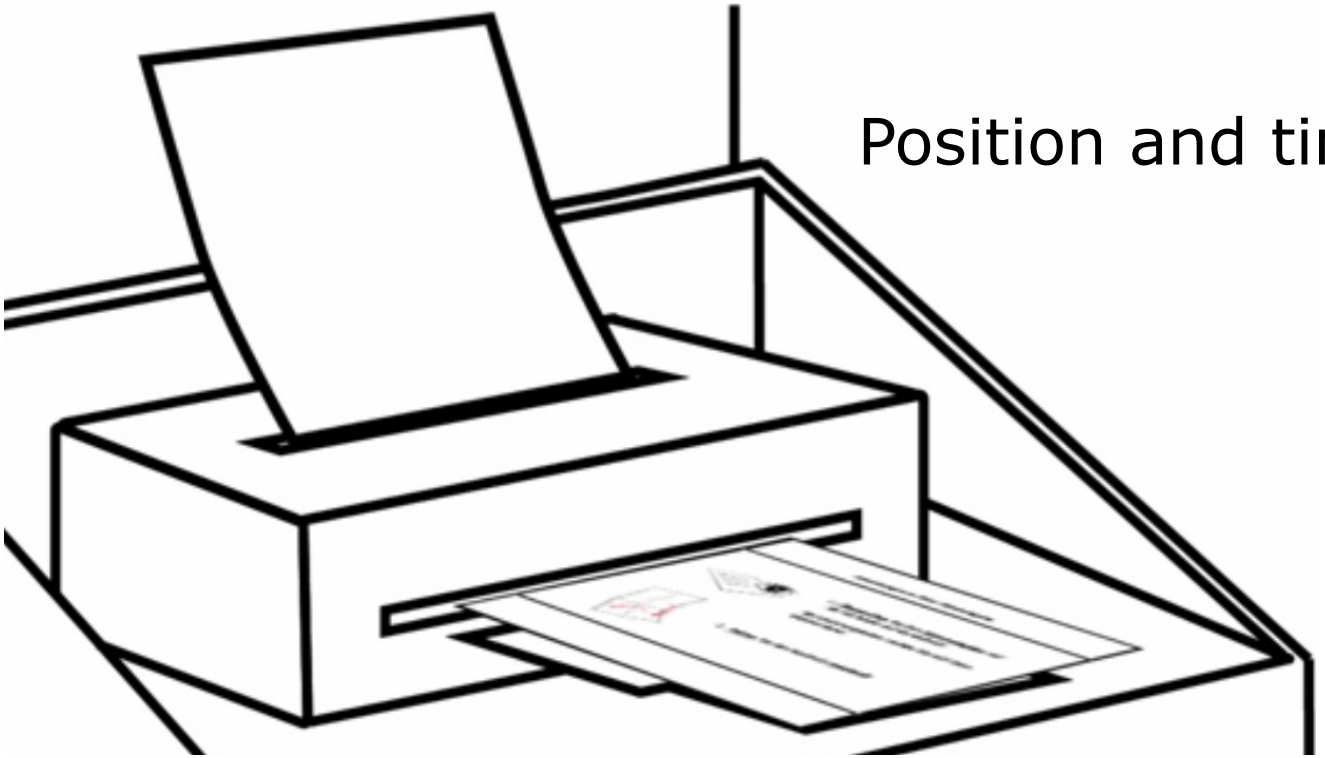
# Stimulus: Failed example 1



# Stimulus: Failed example 2



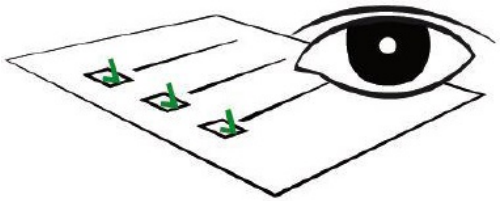
# Stimulus



Position and timing

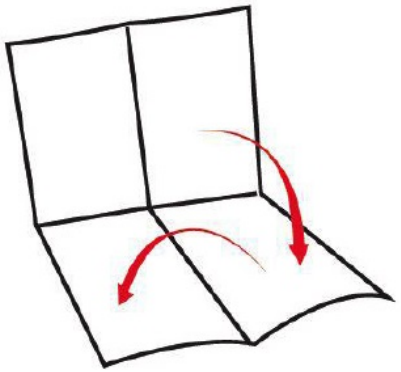
Pre-printed instructions

# Pre-printed instructions



1. **Verify** the correctness of **all selections** on the backside.

   In case of mistakes please contact the poll worker.



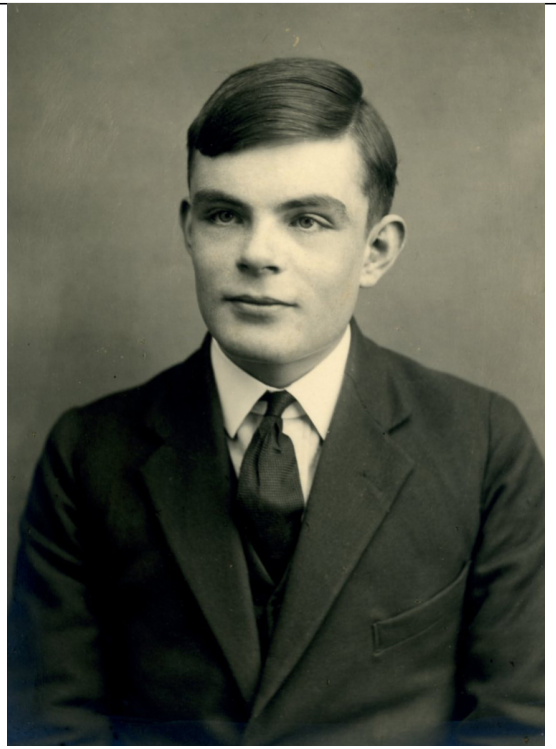
2. **Fold** the printout **twice**.

# Preliminaries for user study

- Hide goal of the study to not bias participants
- Manipulate PAT to identify actual verification behavior
- No legally binding elections because of manipulation
- No election simulation to not violate vote secrecy
- No election with voting agenda because PAT should have personal relevance

# Cover story

- Communicated study goal:
  - Memory test
  - Identify information that people can better remember



- Candidate selection ~ Answer questions on PC
- Auditing ~ Verify printed answers on the PAT
- Depositing ~ Handover PAT to the experimenter

# Type of „PAT“ manipulation

- Not easy to find

  => Question 7

- As easy to notice, as changing candidate‘s name

  => 1845 printed as birthday (1910, 1911, 1912)

# Group differences

- Reading guidelines
  - Control group: Pre-printed instructions
  - Study group: no instructions

- Verifying printout (paper audit trail)
  - Control group confronted with blank printout
  - Study group confronted with the stimulus

# Participants

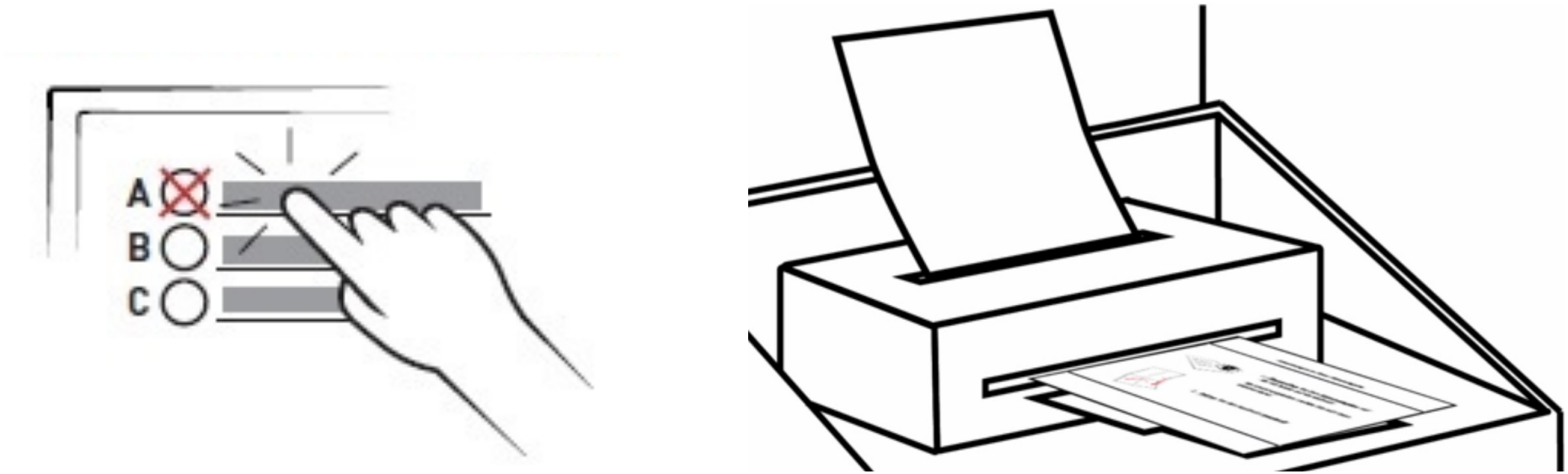
- Recruiting: E-Mail and personal contact
- Sample
  - 65 participants (34F, 31M), between 19-59 years old
  - 40 students, 25 employees (academics, civil servants, freelancers, administrative technical staff members, caretakers, and event managers)
- Compensation: CPs for psych. students, rest 20€ Amazon voucher

# Results

| Variable | Control group | Study group | $\chi^2$-Test | MW-Test |
|---|---|---|---|---|
| Detected | 5 out of 26 (19%) | 30 out of 39 (77%) | Diff. highly significant | - |
| Awareness (Likert scale) | - | - | - | Significant difference |
| Compensation | 8 psych. students | 13 psych. students | No significant difference within group and between both groups | - |
| False positive (self-reports) | 21 out of 26 | 9 out of 39 | - | - |

# Conclusion

The developed stimulus is a promising solution towards motivating voters to verify PATs




THANK YOU FOR YOUR ATTENTION!

# Backup - Slides

# References


- [Cohen, 2005] S. B. Cohen, "Auditing Technology for Electronic Voting Machines", master thesis, MIT, Media Lab, 2005.
- [Herrnson et al., 2005] P. S. Herrnson, R. G. Niemi, M. J. Hanmer, P. L. Francia, B. B. Bederson, F. Conrad, and M. Traugott, "The promise and pitfalls of electronic voting: results from a usability field test", 2005.
- [Selker et al., 2006] T. Selker and A. Pandolfo, "A methodology for testing voting systems", Journal of Usability Studies, vol. 2, no. 1, pp. 7–21, 2006.
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