

# Facilitating Pervasive Community Policing on the Road with Mobile Roadwatch



**KHALIFA**  
UNIVERSITY

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# COMMUNITY POLICING



A strategy of policing that focuses on police building ties and working with members of the communities.

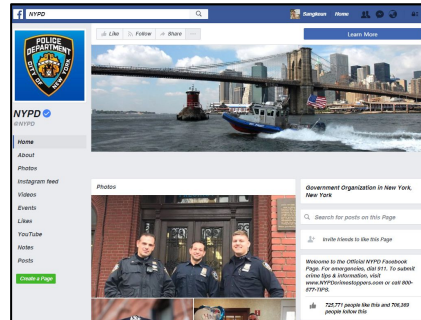
-Wikipedia-

# COMMUNITY POLICING WITH TECHNOLOGY

## Building Ties via Online Communities



***CLEARpath***, a website created by the Chicago police that provides information. [Lewis and Lewis, 2012]



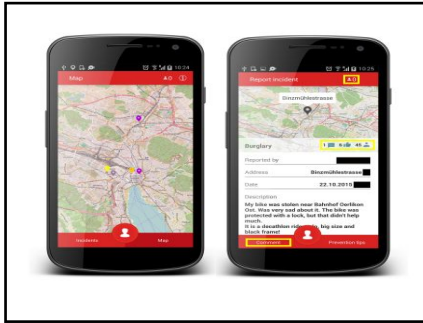
***Facebook Groups*** of Police department in US as a community policing platforms. [Huang et al. 2016]



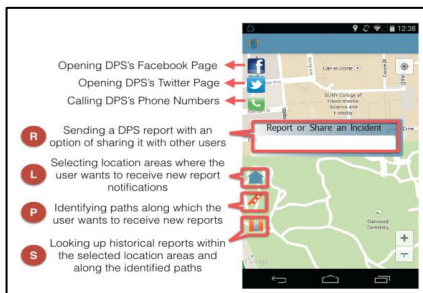
***Facebook Pages*** of Police department in India as a promising resource for police to connect with citizens for collective action. [Sachdeva, 2016]

# COMMUNITY POLICING WITH TECHNOLOGY

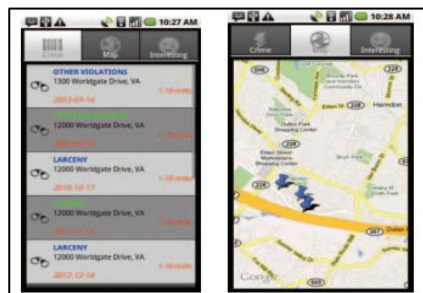
## Working with Community Members



**SALUS** visualizes crime related information (e.g., crime maps and safety tips) and allows users to report crimes in real time. [Kadar et al., 2016]

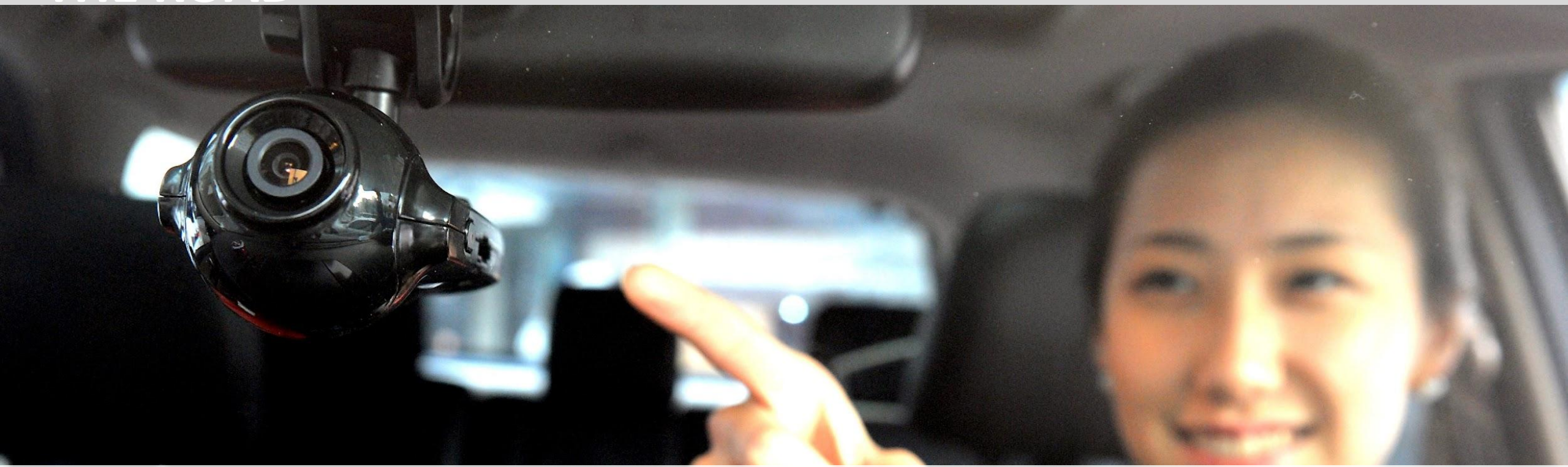


**S4S** supports incident reporting and personalized notification delivery (e.g., preferred paths and places) to promote campus safety. [Tan et al. 2015]



**ComfortZones** to mitigate fear at night in an urban context by allowing users to capture and share location based safety. [Blom et al. 2010]

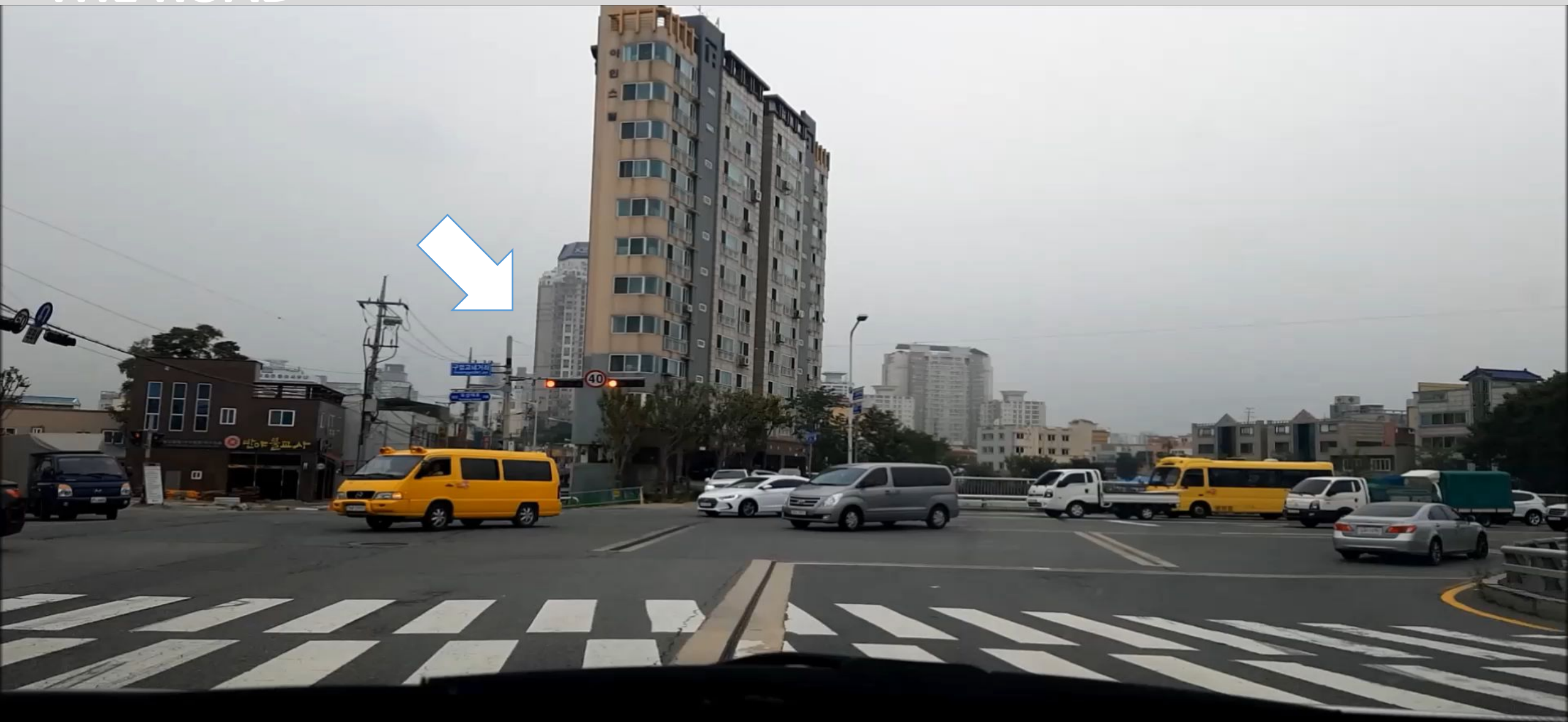
# COMMUNITY POLICING ON THE ROAD



## **Dashcam (Dashboard Camera, Blackbox):**

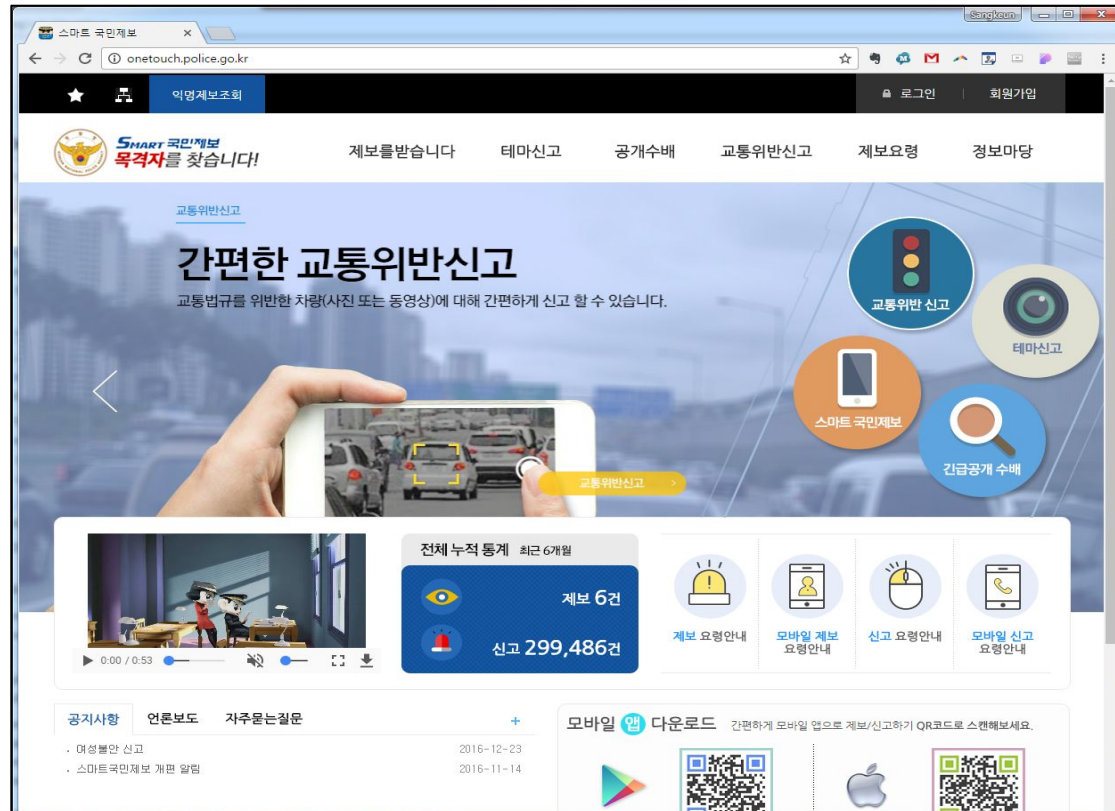
An onboard camera that continuously records the view (through a vehicle's windshield), audio.

# COMMUNITY POLICING ON THE ROAD



# COMMUNITY POLICING ON THE ROAD

## “Looking For the Witness”



(Web)



(App)

# PRELIMINARY STUDY: Online

## Survey

### Purpose

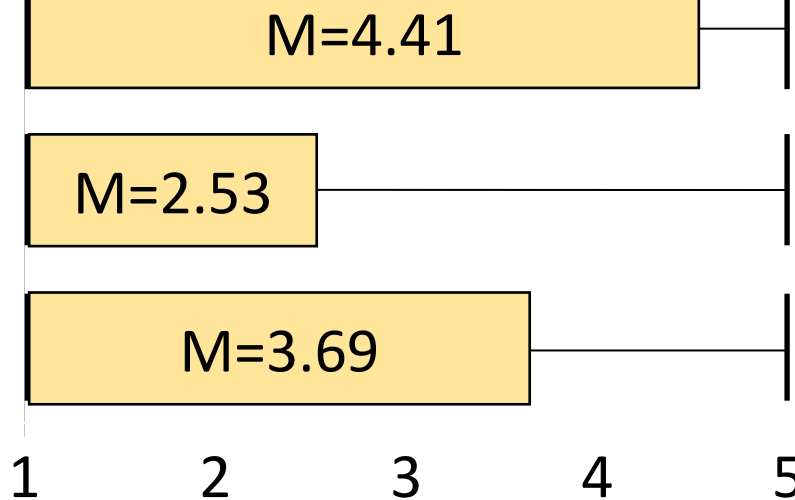
- To understand people's attitudes and concerns toward participating in community policing for traffic safety
- In the online survey, we asked,
  - 1. *Are you willing to participate in?***
  - 2. *What are the barriers to participate in?***
- A total of 150 participants responded (124 males, 26 females) from online car forums and Facebook groups



# PRELIMINARY STUDY: Online

## Survey

### Result 1: Are You Willing to Participate in?

- I think people should abide by the traffic law 

Statement	Mean Score (M)
I think people should abide by the traffic law	4.41
I think people obey traffic law well	2.53
I want to report when I witness a traffic violation	3.69
  - I think people obey traffic law well
  - I want to report when I witness a traffic violation
- Respondents primarily wanted to report
1. dangerous driving behaviors that **could lead to traffic accidents**
  2. dangerous driving behaviors that **cause inconvenience while driving**

### Result 2: What are the Barriers to Participate In?

- Only 30.0% of the respondents had actually reported traffic violations to the police.
- Primary reasons to not reporting
  1. Reporting complexity  
(e.g., to get memory card, to recall contextual info)
  2. Privacy concerns  
(e.g., private conversation in a car)

### Design Implications

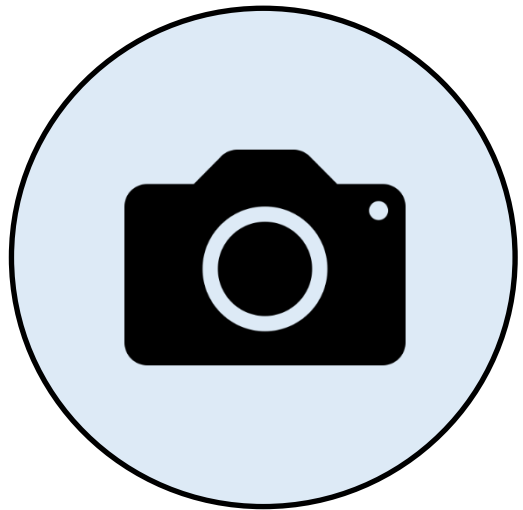


1. to reduce reporting complexity of capturing video footages and contextual information (e.g., time, location) and reviewing captured events.



2. to provide a privacy-preserving tool to mitigate privacy concerns (e.g., chopping relevant parts, muting audio).

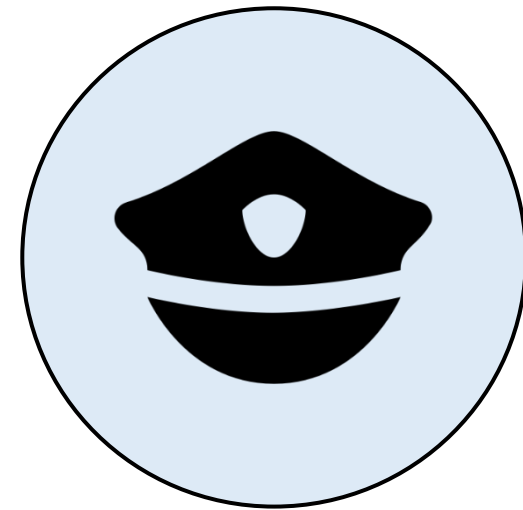
# Roadwatch DESIGN



Capturing  
events

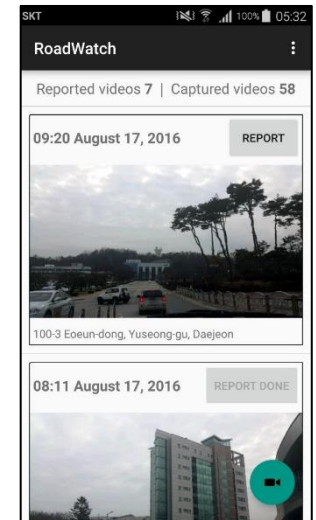
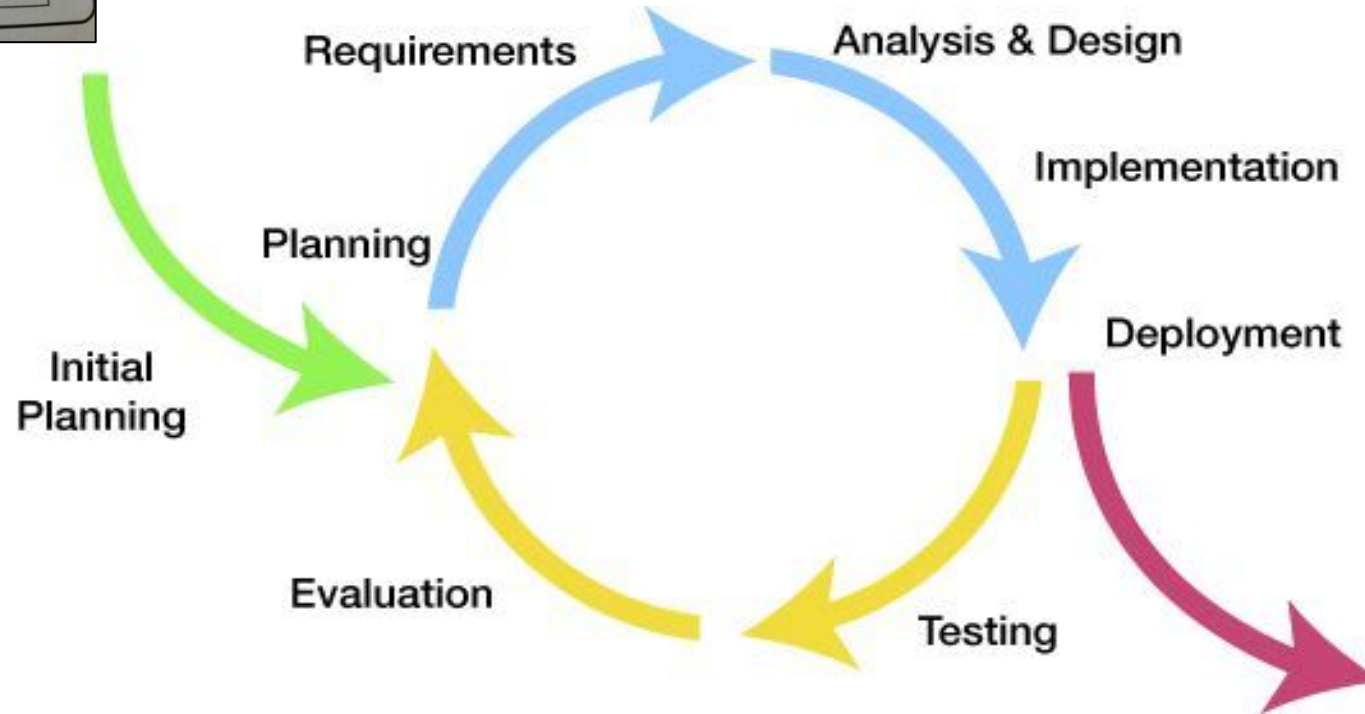
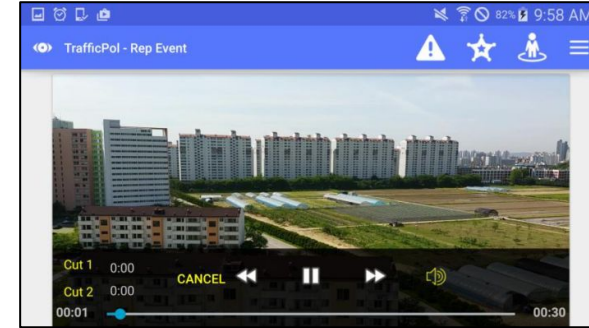
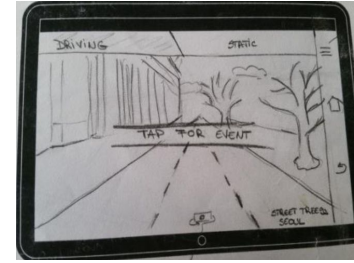
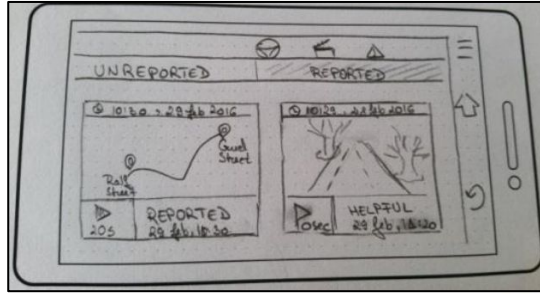


Reporting  
captured events



Getting feedback  
about reported  
events from police

# Roadwatch DESIGN – Iterative Prototyping



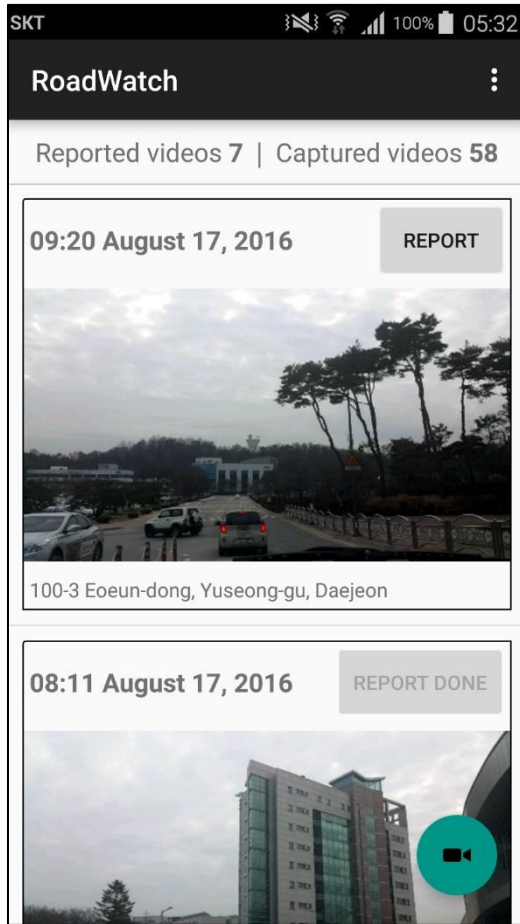
# Roadwatch DESIGN – 1)

## Capture



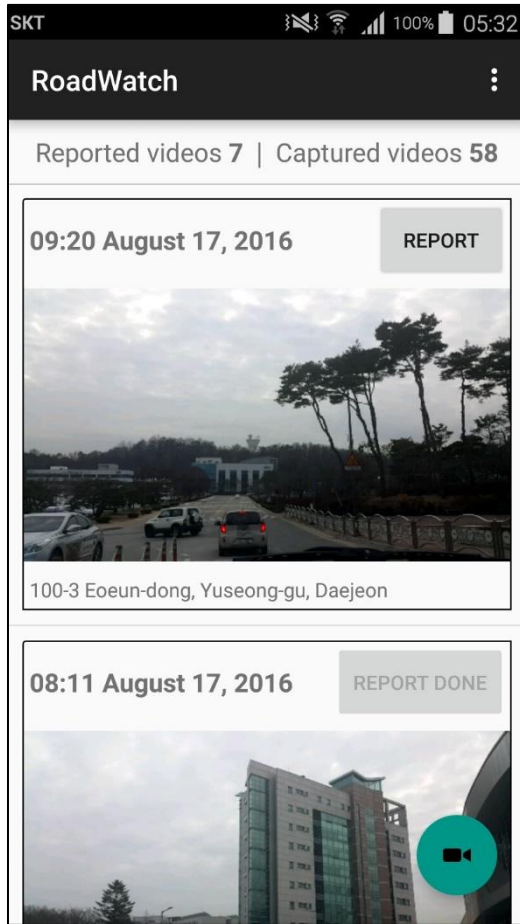
- Roadwatch support continuous recording.
- When driver touch the screen to capture an event, it saves a 30 seconds-long video file ( $\pm 15$  seconds).

# Roadwatch DESIGN – 2) Report

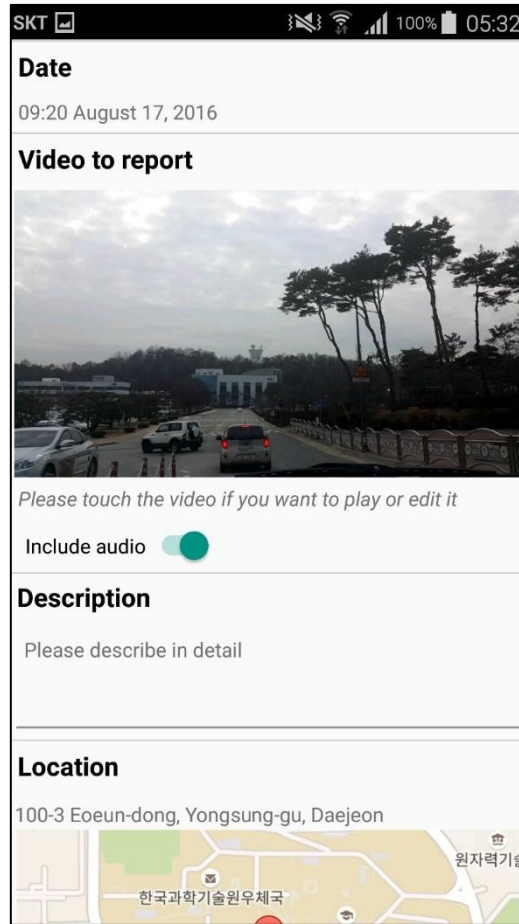


**(a) Reviewing captured video**

# Roadwatch DESIGN – 2) Report



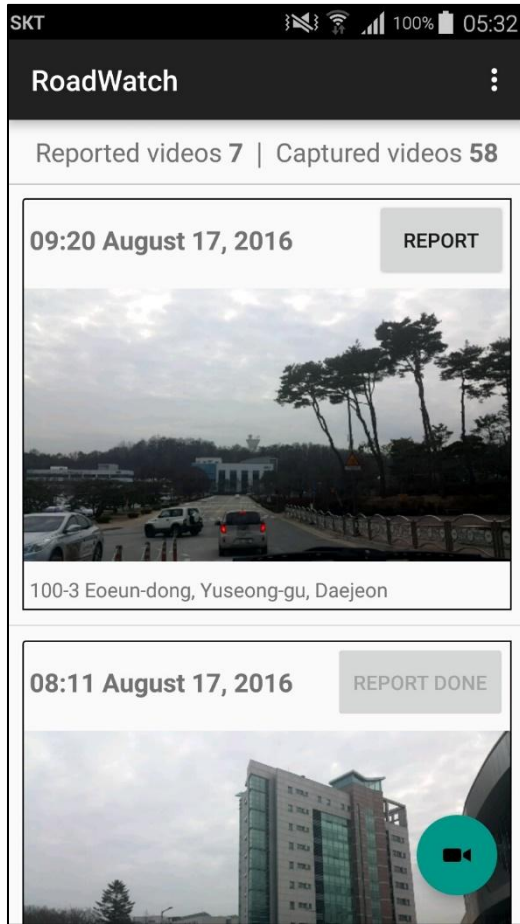
(a) Reviewing captured video



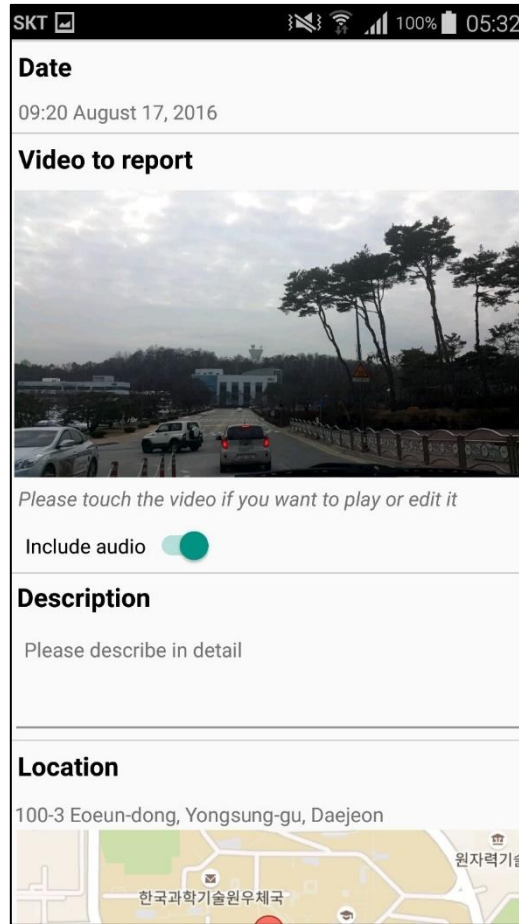
(b) Reporting form



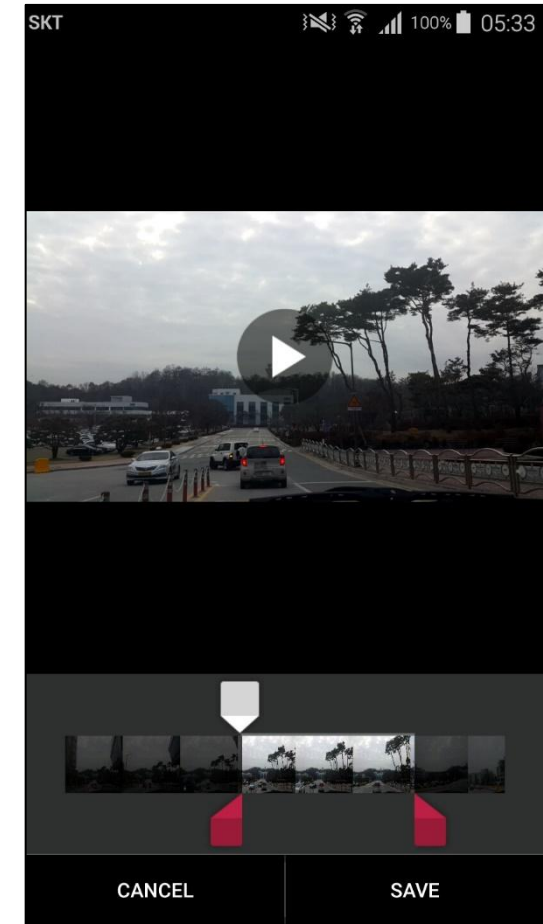
# Roadwatch DESIGN – 2) Report



(a) Reviewing captured video

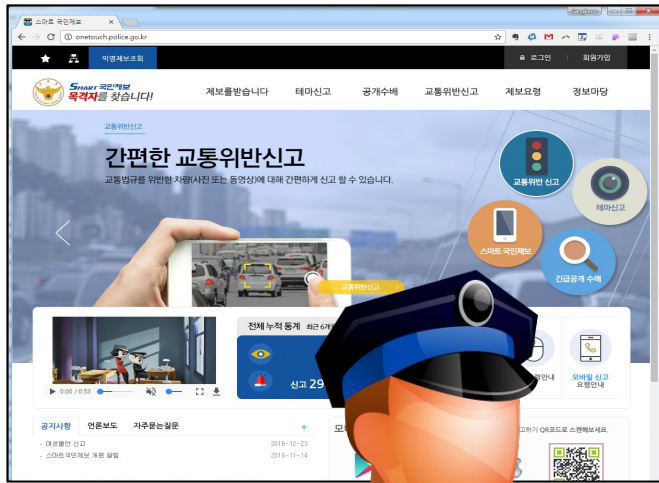


(b) Reporting form

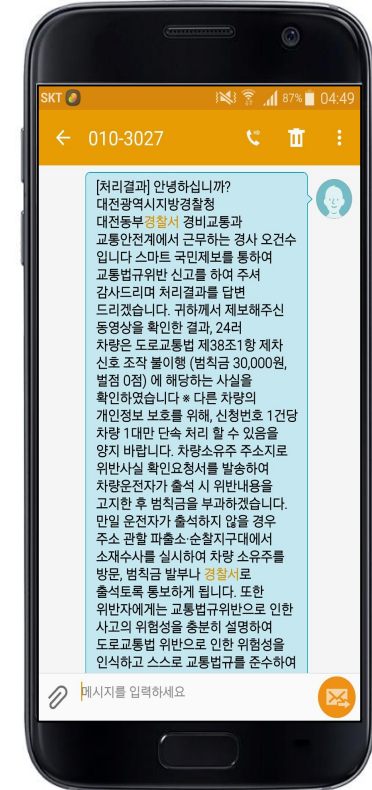


(c) Video cropping

# Roadwatch DESIGN – 3) Feedback



SMS / EMAIL



**Feedback about how the report was handled by police  
(e.g., Fine, Penalty point)**

# RESEARCH QUESTIONS

1. What safety risks do people capture and report via Roadwatch?
2. Does Roadwatch help lessen the burden of securing evidence and preserving privacy?
3. What did people learn while participating in pervasive community policing via Roadwatch?

# ROADWATCH EVOLUTION

## Recruitment

- Recruited 23 participants (11 males; age:  $M = 31.17$ )
- Two-week real world field study in August 2016
- Instructed the participants how to use our app
- Asked them to use Roadwatch for two weeks whenever they drive if possible

# ROADWATCH EVOLUTION

## Data Collection

- Roadwatch app usage log data
- Timestamped capture history with location data (GPS)
- Reporting description including videos

## Post-survey and Interview

- Questions about usability, privacy concerns
- Feeling about participation
- Usage pattern (e.g., when they used, why captured/reported)

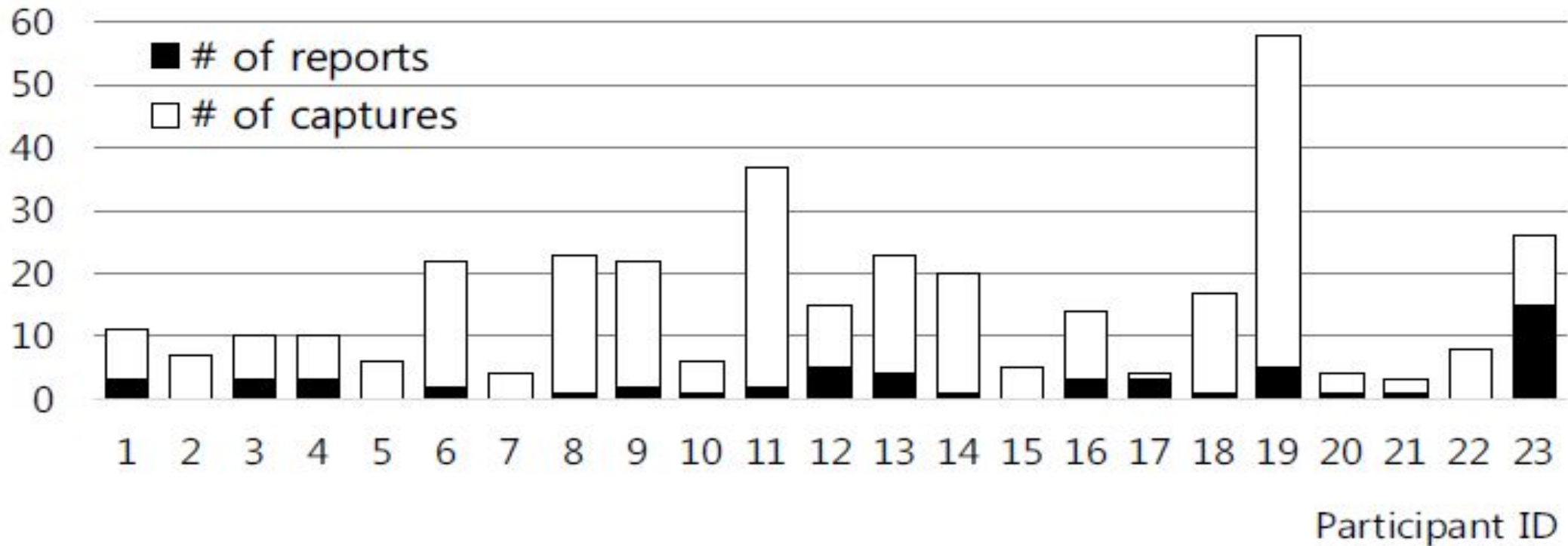
# RESEARCH QUESTIONS

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# RESEARCH QUESTION 1

## What Events were Captured and Reported?

- Captured: 354 events (M = 29.50, SD = 12.90) by 23 participants
- Reported: 56 events (15.8% of captured events) by 18 participants



# RESEARCH QUESTION 1

## **Types of Reported Safety Risks on the Road?**

- Mostly about moving violations (e.g., traffic signal violations and illegal U-turns) (n = 49).
- Parking violations (n = 4).
- Requests for resolving illegal parking in their areas (n = 2).
- Request for removing an obstacle on the road (n = 1).



# RESEARCH QUESTION 1

## **The Criteria of Making a Decision to *Capture & Report***

1. **Personal Involvement:**
  - whether they were involved in the violation
2. **Perceived Seriousness:**
  - whether the violation might cause an accident

# RESEARCH QUESTION 1

## The Criteria of Making a Decision to ‘*Capture*’

- Many participants (n = 15) **attempted to capture all violations** even where the violation did not affect them and was not serious.

		Involvement	
		All violations	Only involved violations
Seriousness	All violations	<b>15 participants</b>	3 participants
	Only serious violations	2 participants	3 participants

# RESEARCH QUESTION 1

## The Criteria of Making a Decision to *'Report'*

- The participants tended to report although they are not involved to the violations.
- **The participants tended to report serious violations.**

		Involvement	
		All violations	Only involved violations
Seriousness	All violations	5 participants	1 participants
	Only serious violations	<b>8 participants</b>	4 participants

# RESEARCH QUESTION 1

## Summary

- Participants actively used *Roadwatch* to capture violations and most frequently reported events were moving violations.
- Participants tended to capture all violations regardless of involvement and seriousness, but they were more likely to report serious violations.

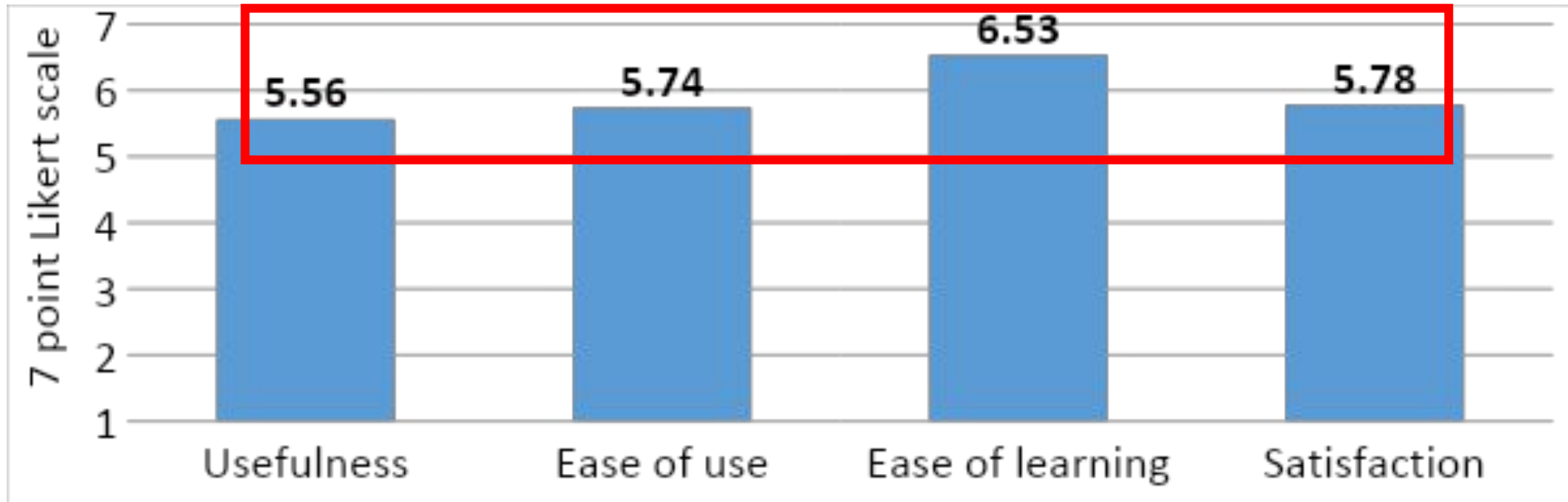
# RESEARCH QUESTIONS

1. What safety risks do people capture and report via Roadwatch?
- 2. Does Roadwatch help lessen the burden of securing evidence and preserving privacy?**
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# RESEARCH QUESTION 2

## ***Roadwatch* achieved High Usability**

- High scores in four constructs (usefulness, ease of use, ease of learning, and satisfaction) in USE Questionnaire.



# RESEARCH QUESTION 2

## Dealing with Privacy Concerns

- **Audio muting:** 33 muted videos (58.9%) by 14 participants
  - Their primary reason was to remove their spoken words such as singing and swearing in the car.
- **Video cropping:** 17 cropped videos (30.4%) by 9 participants
  - Surprisingly, none of our participants used video cropping due to low privacy concerns of captured scenes
  - Instead, they mainly used it to deliver only the key scenes to police

# RESEARCH QUESTION 2

## Summary

- Roadwatch had high usability in terms of usefulness, ease of use, ease of learning, and satisfaction.
- Participant used our privacy preserving tools **to remove spoken words** such as singing and swearing in the car, and **to deliver only key scenes to police.**



# RESEARCH QUESTIONS

1. What safety risks do people capture and report via Roadwatch?
2. Does Roadwatch help lessen the burden of securing evidence and preserving privacy?
3. **What did people learn while participating in pervasive community policing via Roadwatch?**

# RESEARCH QUESTION 3

## What are the Lessons Learned?

- Participants drove safely as they became more law-abiding
  - 1) **to be as fair as they could be** while confidently capturing others' violations.

“*I was more careful in my own driving . . . because I was reporting others, I could not violate (traffic laws) myself.*” (P01) ”

## RESEARCH QUESTION 3

### What are the Lessons Learned?

- Participants drove safely as they became more law-abiding  
2) due to the awareness that **others can report their violations.**

“*Someone could capture my violations, so I thought I should obey the traffic rules as much as I can.*” (P15) ”

## RESEARCH QUESTION 3

### How Did They Feel About the Results of the Report?

- Felt **very good about their contribution** to traffic safety



“ *I felt great (because) I thought I contributed to traffic safety by doing this. (P06)*

”

## RESEARCH QUESTION 3

### How Did They Feel About the Results of the Report?

- Felt **pleased to know the results**, because they thought the offenders deserved to be punished



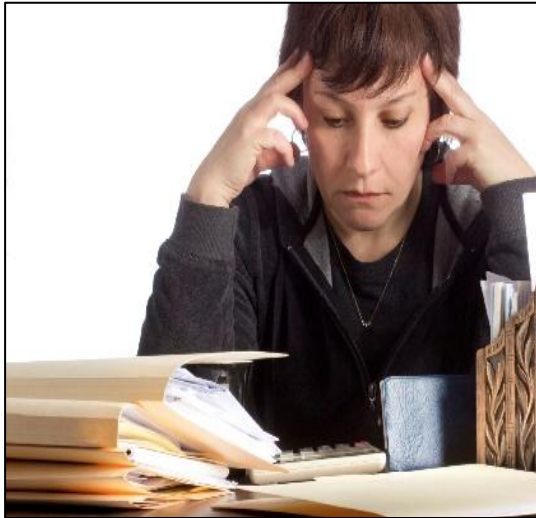
“ *I felt pleased, you are so busted!*  
*(P12)*

”

## RESEARCH QUESTION 3

### How Did They Feel About the Results of the Report?

- Felt **sorry for the punishment** such as traffic ticket and penalty points



“ *I felt really sorry. The driver might ordinarily be a good driver. It might only have been a mistake. (P19)*

”

# RESEARCH QUESTION 3

## Summary

- Participants drove safely as they **became more law-abiding**
- When they received feedback from police, participants felt *good* (*contribution to traffic safety, punishment*). However, some participants also felt *sorry* at the same time.

# DISCUSSION

## Online Community Fostering



- People can share information such as traffic laws.
- People can be aware that other people are actively participating in.



# DISCUSSION

## Enabling New Features with Computational Support



- Computer vision technique can enable automatic video capturing of safety related risks (e.g., dangerous driving, potholes, obstacles).

# THANK YOU

## Facilitating Pervasive Community Policing on the Road with Mobile Roadwatch

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### Contributions

- Found key factors affecting people to participate community policing for traffic safety.
- Built mobile app Roadwatch based on the findings.
- Conducted real-world field study.
- Confirmed that Roadwatch can possibly improve awareness to contribute community policing for traffic safety.