Transportation accounts for 1/3 of CO_2 emissions

Transportation accounts for 1/3 of CO_2 emissions

Transportation accounts for 1/3 of CO_2 emissions

reflect

ubigreen

Investigating a Mobile Tool for Tracking and Supporting Green Transportation Habits

Jon Froehlich[1], Tawanna Dillahunt[3], Pedja Klasnja[1], Jen Mankoff[3], Sunny Consolvo[1,2], Beverly Harrison[1,2], James Landay[1,2]

dub design: use: build:

[1] university of washington

[2] Intel Research, Seattle

[3] HCI Institute, CMU

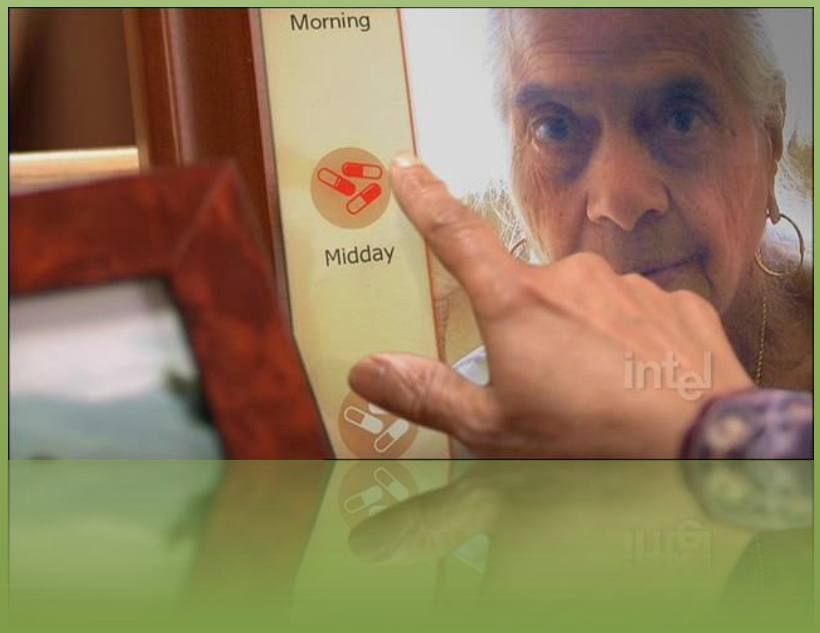
ubigreen
transportation display

design influences

1. activity-based computing
2. feedback literature
3. ubifit
4. formative studies
   - an online survey
   - an *in situ* (ESM) study

activity-based computing

- **long-lived activities in our everyday lives**
  - staying healthy, graceful aging, etc.
  - high-level, physical, dynamic, high-value
- **key elements**
  - social
  - natural interactions
  - always at hand



[Li and Landay, CHI2008]

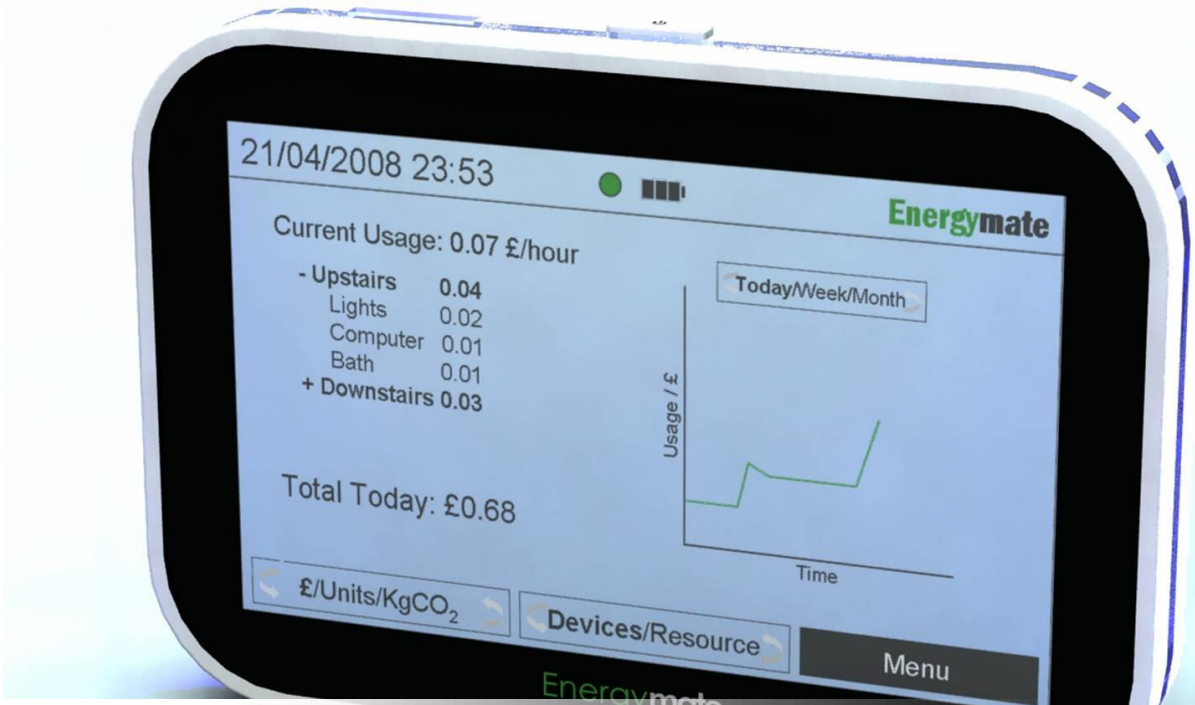
feedback

toyota prius

Energymate

Save Money Save Energy

Stuart James **Sharples**



feedback resulted in typical energy savings of between 5 and 12%

[Fischer, 2008]

ubifit

- fitness monitoring application
- automatically senses activity
- at-a-glance goal information

- 3-month study; **those with ambient display outperformed those without**

[Consolvo, CHI2008]

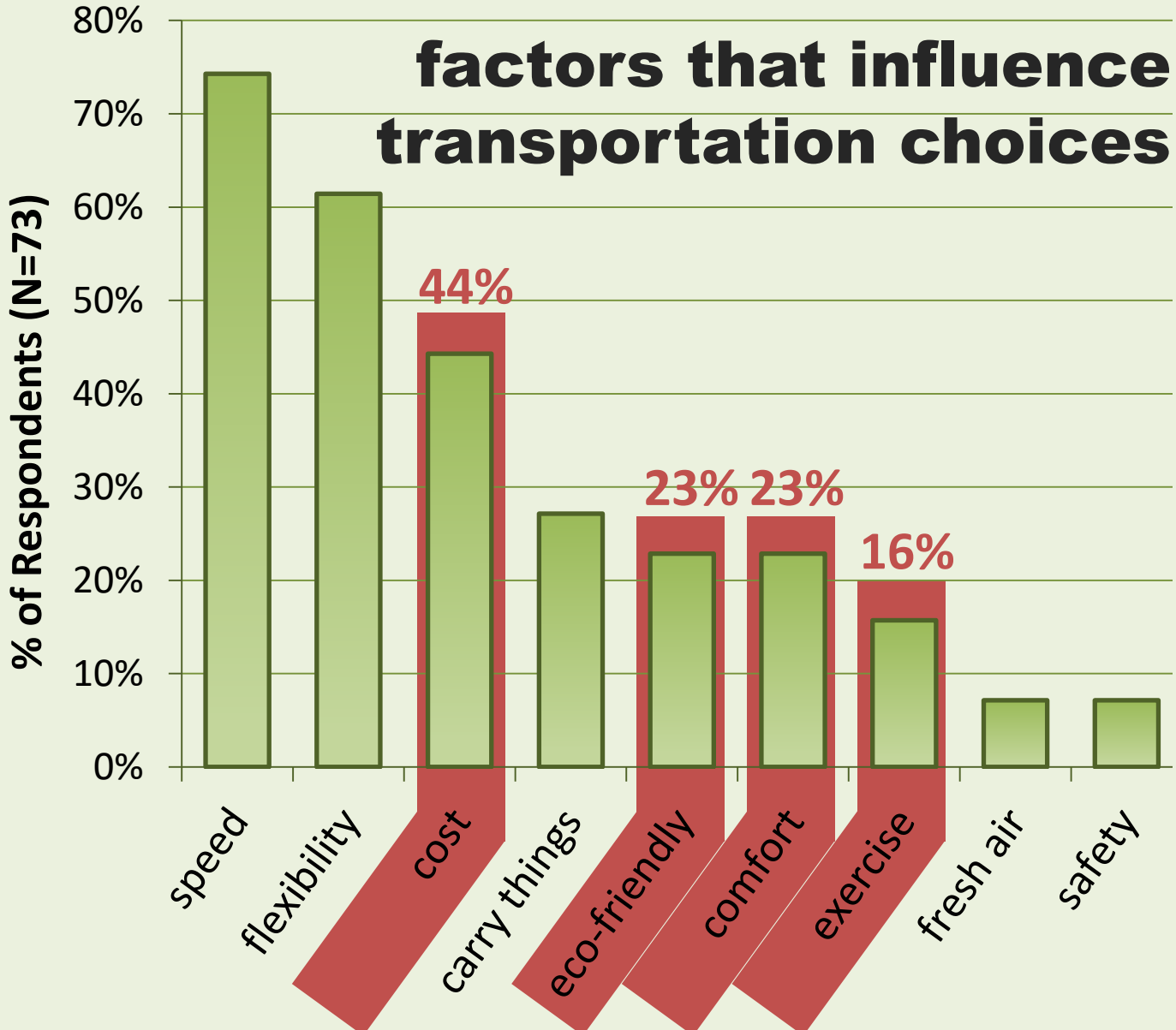
formative study #1

online survey

- **73 respondents**
- Determine people's **attitudes about transportation**
- Get **feedback** on **early design concepts**

formative study #1

online survey



formative study #2

experience sampling study

- **7 participants** over **7 days**
- explore **consistency of responses** w/**online survey**
- acquire ***in situ*** **data** on **num trips/week**
- get **additional feedback** on revised **visual designs**

formative study #2

experience sampling study

[Froehlich, MobiSys 2007]

formative study #2

experience sampling study

126 trips logged

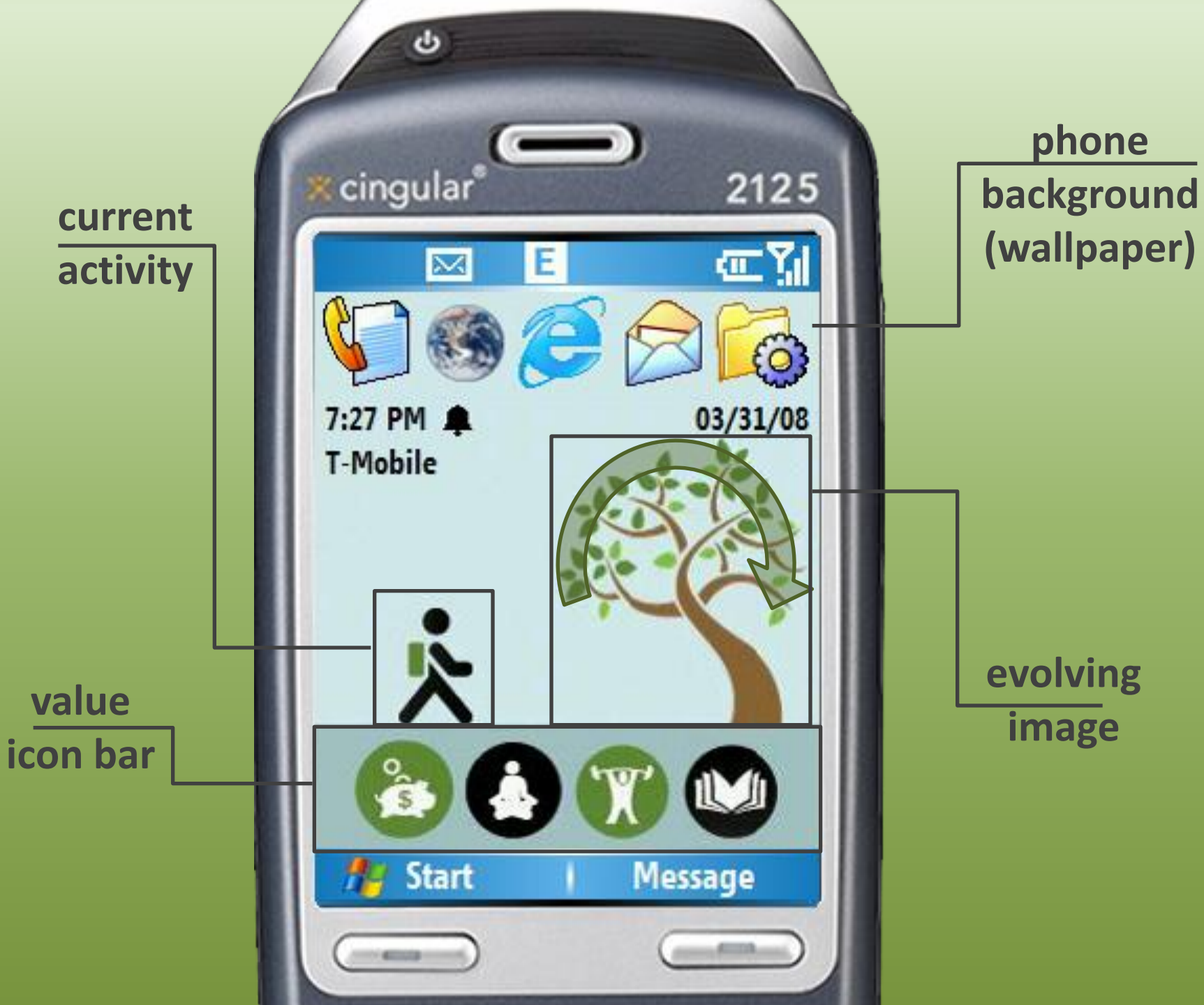
for 73% of car trips, participants indicated that **greener options existed**

visual design

transit activities

Drive Alone | Train | Carpool | Bus | Walk | Bike

"not-green" | "green"


current activity
phone background (wallpaper)
value icon bar
evolving image
cingular
2125
7:27 PM
03/31/08
T-Mobile
Start
Message

value icon bar

money savings | relaxation | exercise | do other things

everything resets on sunday

implementation

architecture

wearable sensor
(intel msp)

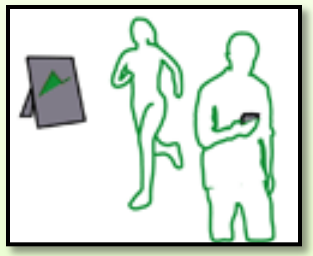
activity data
sent via BT

ubigreen running as an
extension of the
myexperience tool

study data

transit data
(sent over gprs)

sql server mobile
2005 on phone



activityserver

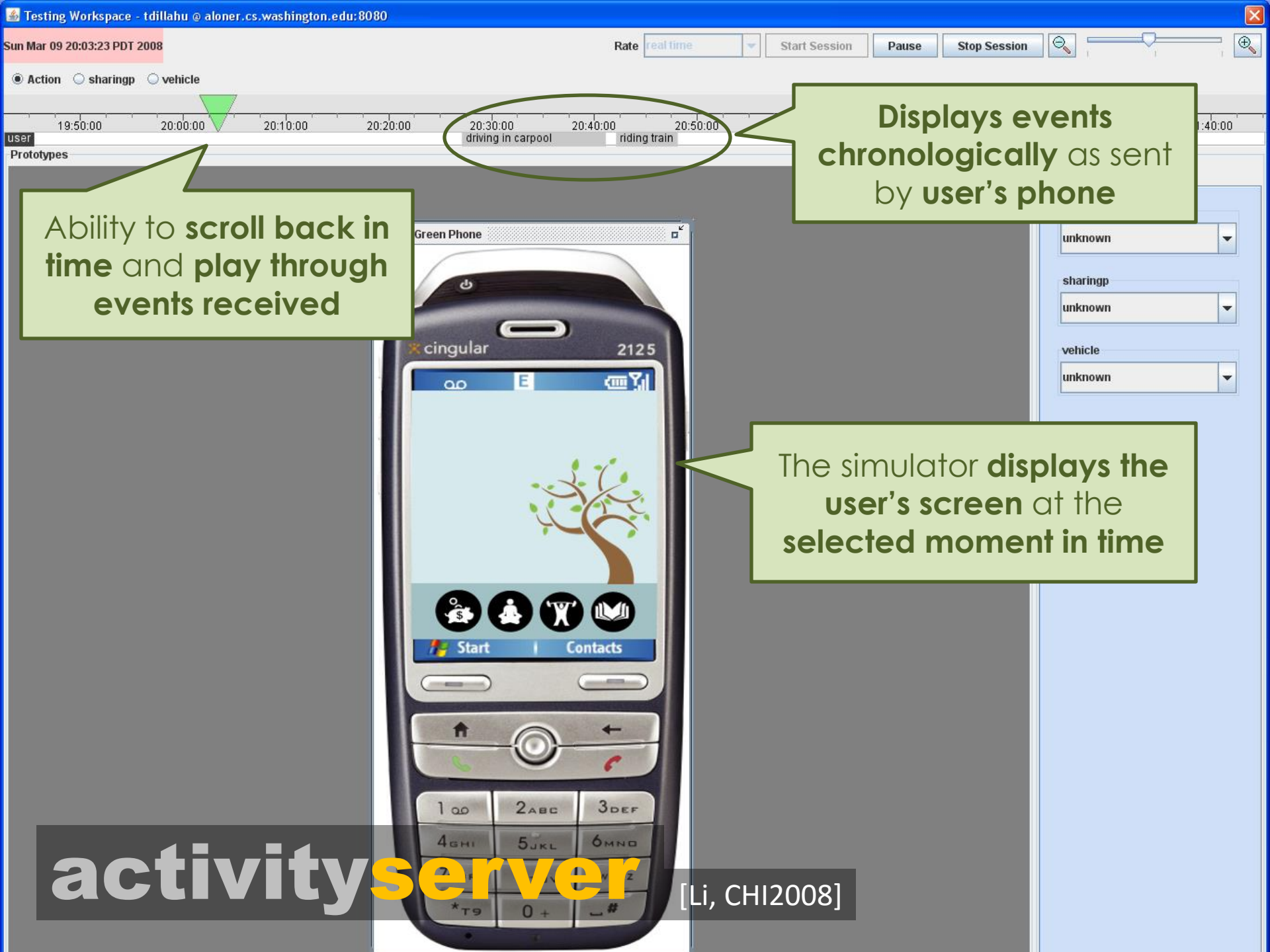
logic
applied

next screen
generated

new screen
sent back
to phone

activitydesigner

[Li, CHI2008]

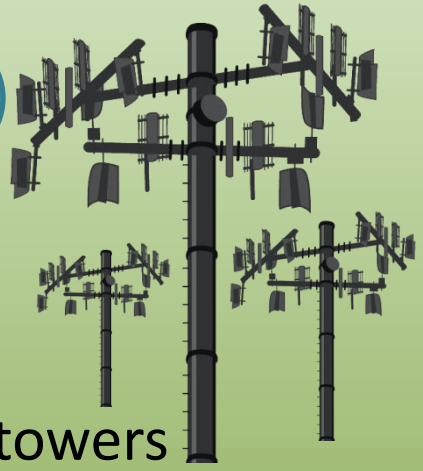

Testing Workspace - tdillahu @ aloner.cs.washington.edu:8080
Sun Mar 09 20:03:23 PDT 2008
Rate
real time
Start Session
Pause
Stop Session
Action
sharingp
vehicle
19:50:00
20:00:00
20:10:00
20:20:00
20:30:00
20:40:00
20:50:00
user
driving in carpool
riding train
Prototypes
Displays events chronologically as sent by user's phone
Ability to scroll back in time and play through events received
Green Phone
cingular
2125
Start
Contacts
unknown
sharingp
unknown
vehicle
unknown
The simulator displays the user's screen at the selected moment in time
activityserver
[Li, CHI2008]

three data sources

1

msp

2



cell towers

3

user

Drive Alone

Walk Bike

Train

Carpool

Bus

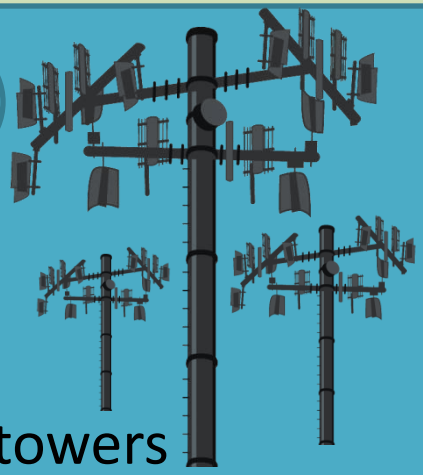
minimum activity duration: 7 minutes

three data sources

1

msp

2



cell towers

3

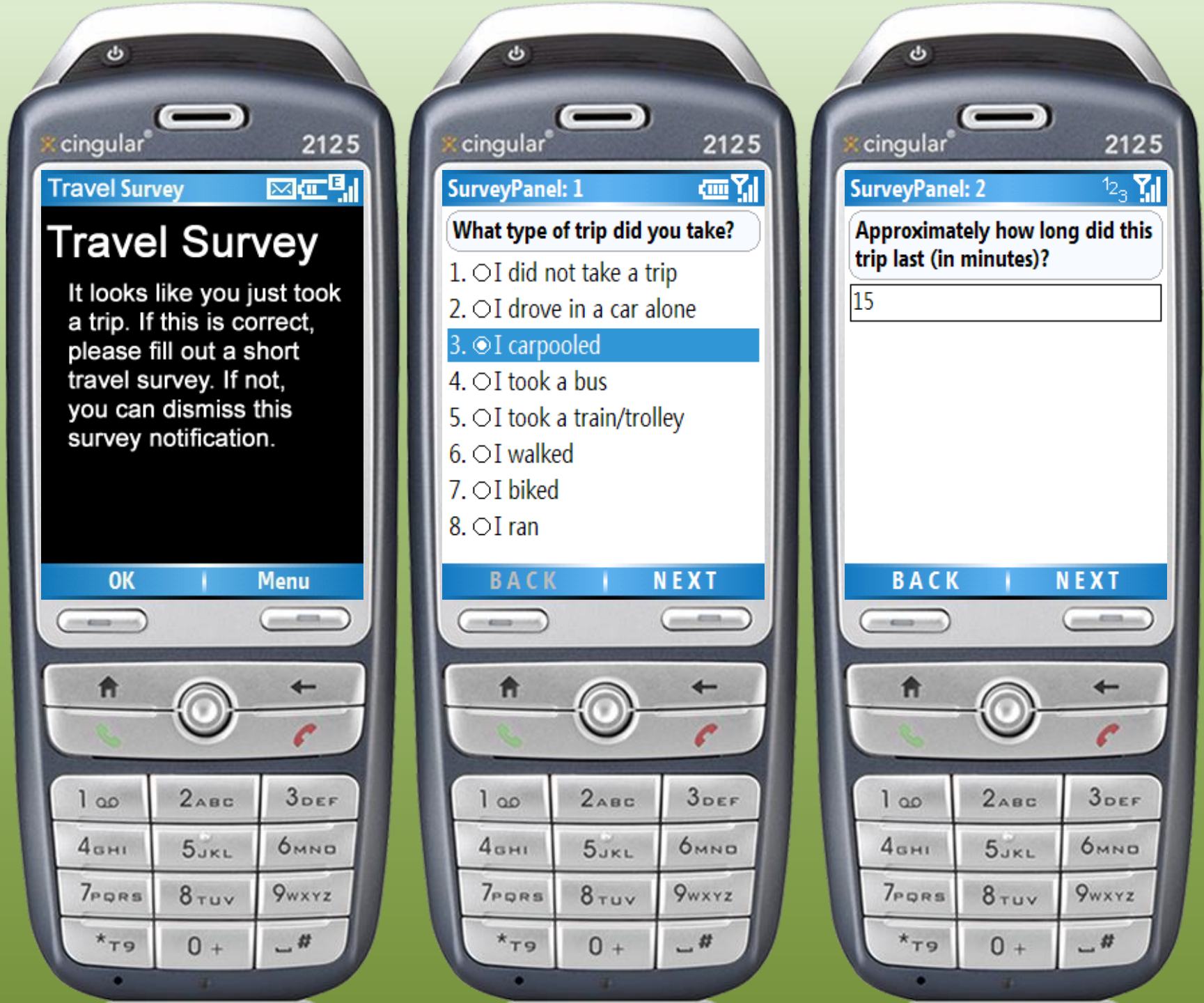
user

Drive Alone

Walk Bike

Train Carpool Bus

minimum activity duration: 7 minutes

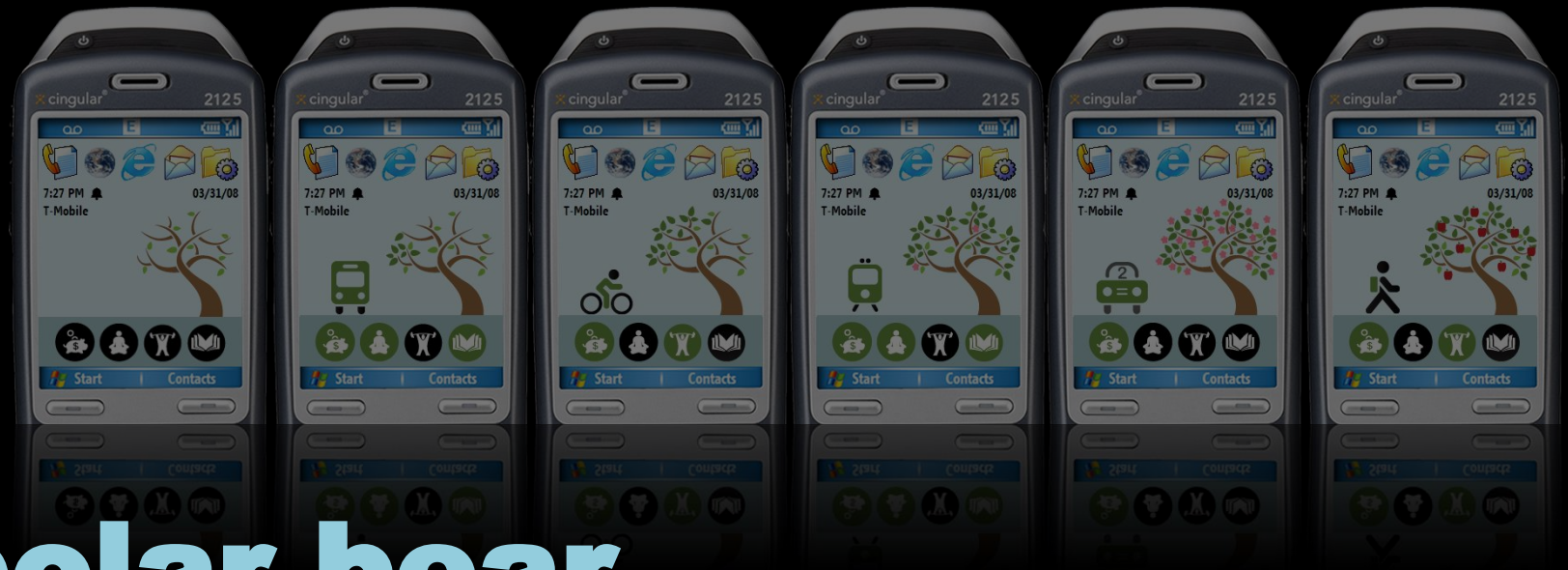

cingular
2125
Travel Survey
Travel Survey
It looks like you just took a trip. If this is correct, please fill out a short travel survey. If not, you can dismiss this survey notification.
OK
Menu
cingular
2125
SurveyPanel: 1
What type of trip did you take?
1. I did not take a trip
2. I drove in a car alone
3. I carpooled
4. I took a bus
5. I took a train/trolley
6. I walked
7. I biked
8. I ran
BACK
NEXT
cingular
2125
SurveyPanel: 2
Approximately how long did this trip last (in minutes)?
15
BACK
NEXT

study

3-week field study

- obtain **preliminary feedback** on prototype
- **evaluate sensing algorithms** for recording transit activities

tree



polar bear

N=6

- office admin: 4 weeks
- consultant: 3
- program manager: 3
- programmer: 4
- consultant: 4
- student: 1

N=7

- sales clerk: 4 weeks
- law enforcement: 3
- student: 1
- engineer: 3
- student: 2
- student: 2
- student: 1

- Level of environmental concern lower in Pittsburgh
- Range of professions
- Participation: 1-4 weeks
- Compensation: $100-300

study timeline

time →

Study Begins
- dispense equipment
- application training
- pre-study questionnaire

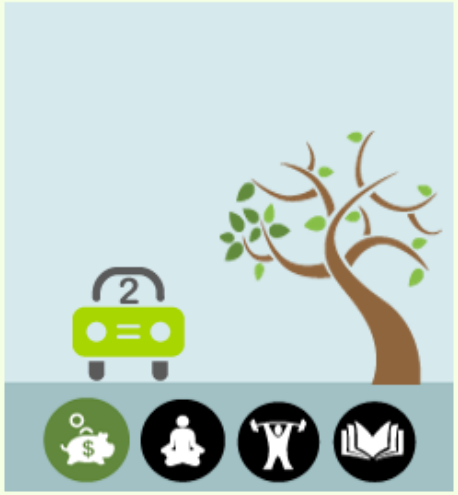
One Week Checkup
- small software update
- equipment check

Study Ends
- post-study questionnaire
- post-study interview
- equipment returned

current ubigreen phone images

march 2008 field study

RESEARCH PARTICIPANTS

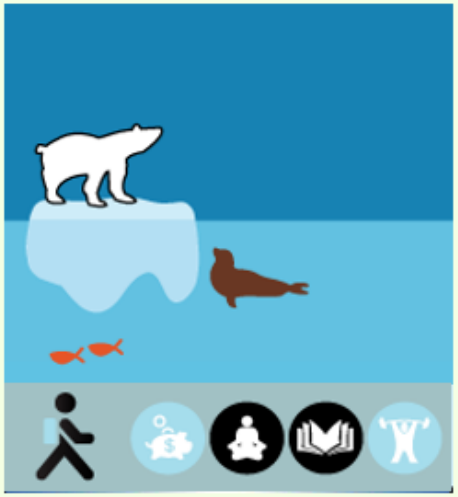


ubiqreen1

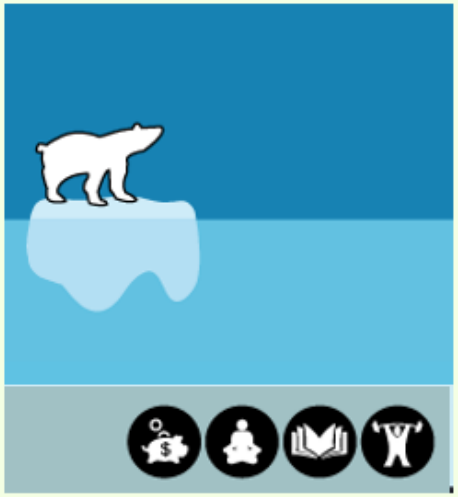
ubiqreen2

ubiqreen3

ubiqreen4

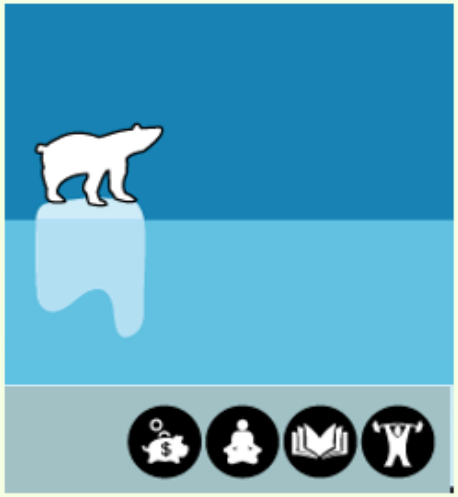


ubiqreen5



ubiqreen6

ubiqreen7



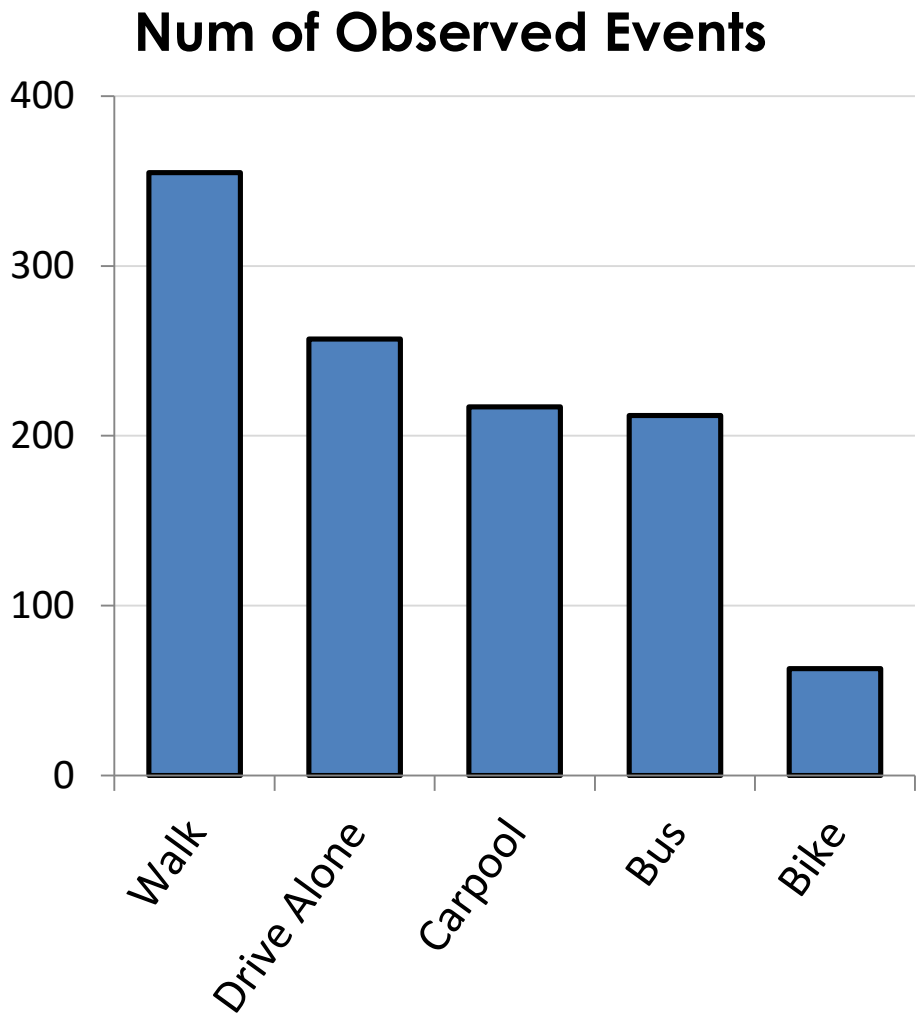
ubiqreen8

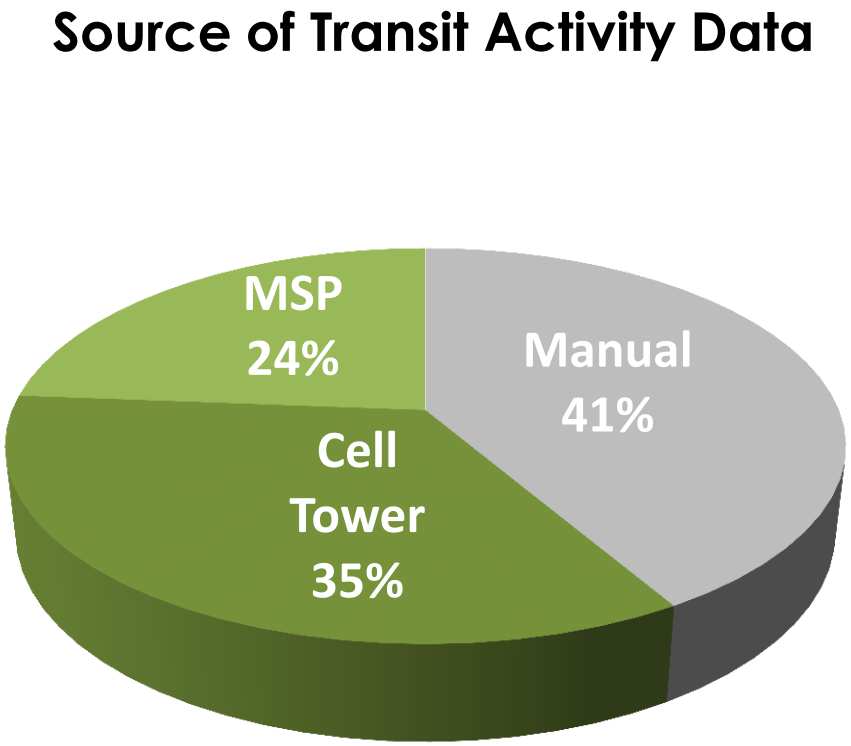
results

mobile data

- Over **8 million sensor events**
- Over **1,000 travel events** (72% green)
  - 4 travel events/day
- **18 minute trips** on average
  - **green trips** 5 minutes longer

observed transit





qualitative results

visual design

images revealed progress

I **liked the tree** because it was, to my mind, a **pretty progress bar.** I could tell the difference **at a glance**.

- Participant 11

need for quantitative data

I would **like to see some graph** or raw data.

- Participant 13

I would like **more information about carbon emission savings**.

- Participant 15

increased awareness

It's **omnipresent**

- Participant 9

It definitely **keeps you more aware** of it [personal transportation] every single day. **You use your phone every single day** so you know.

- Participant 6

engagement

anticipation

I liked that **we didn't know what it was going to do**. Like when your phone turned from leaves into flowers and then apples.

- Participant 15

sustaining anticipation

I want to have **different stories every week** … to maintain curiosity in the app.

- Participant 8

If you opened it up, **people would generate their themes online** and **share them**. It would be cool.

-Participant 10

social engagement

Some **people at work knew about the polar bear** and every day they asked me about it. '**Did you get a seal today?**'

- Participant 14

I would show my friends, 'look at my tree, isn't it cool, look at the flowers…' They thought it was pretty cool.

- Participant 9

Leverage online social networks to tap into social influence [Mankoff, HICSS 2007]

concept of gaming

our real-world interactions as input to games

I want to **see the final stage** I can get to…

- Participant 7

One participant stated that when a trip hadn't been automatically recorded, "I felt like **I was being cheated out** of my 'points'"

- Participant 15

Future designs could incorporate **more overt gaming models**

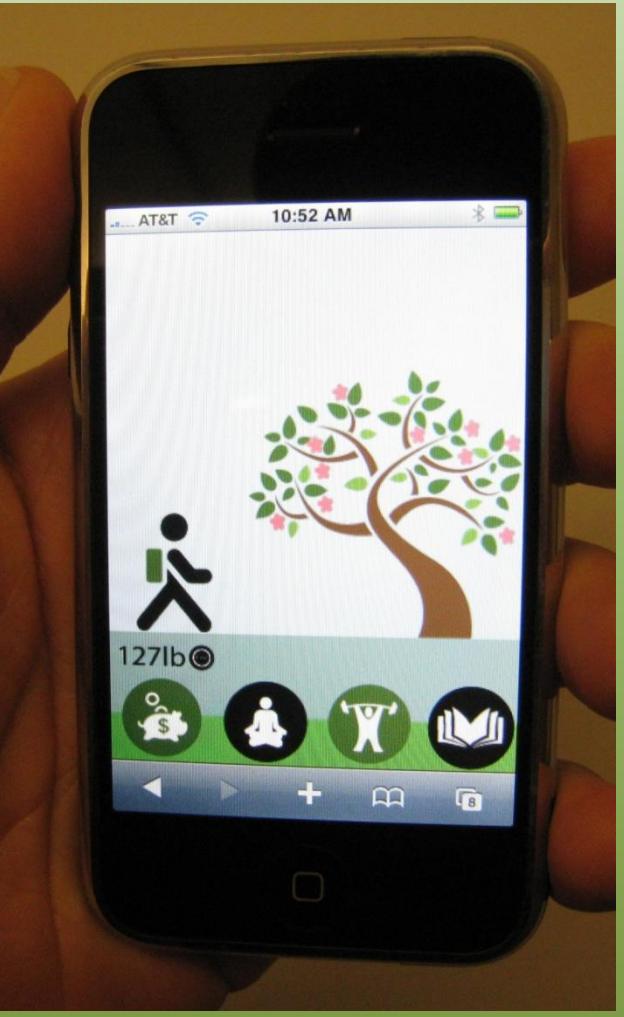
ubigreen

transportation display

contributions

1. ubigreen prototype
2. semi-automatic transit detection
3. visual design capable of raising awareness and engaging users
4. implications for the design of future green applications based on 3-week field study

future work



- **longitudinal** deployment
- **social** sharing
- **real-time** recommendations
- quantitative **carbon-tracking**
- **home resource** usage
- **eliminate** sensing device

[Saponas, UW TR 2008]

Sightline
INSTITUTE
What if the 76 people in these cars…

…rode buses

thankyou!

This research was sponsored by **Intel Research** and **NSF grants** IIS-0205644 and IIS-0803733. Jon Froehlich is funded by a **Microsoft Research** fellowship. We thank designer **Beth Corry** for helping with the tree and polar bear designs.

http://dub.washington.edu/projects/ubigreen

dub **design:**
use:
build:

university of washington | CSE, UW | Intel Research, Seattle | iSchool, UW | HCI Institute, CMU

How many generations in all of human history have had the opportunity to rise to a challenge that is worthy of our best efforts. A challenge that can pull from us more than we think we can do.

-Al Gore

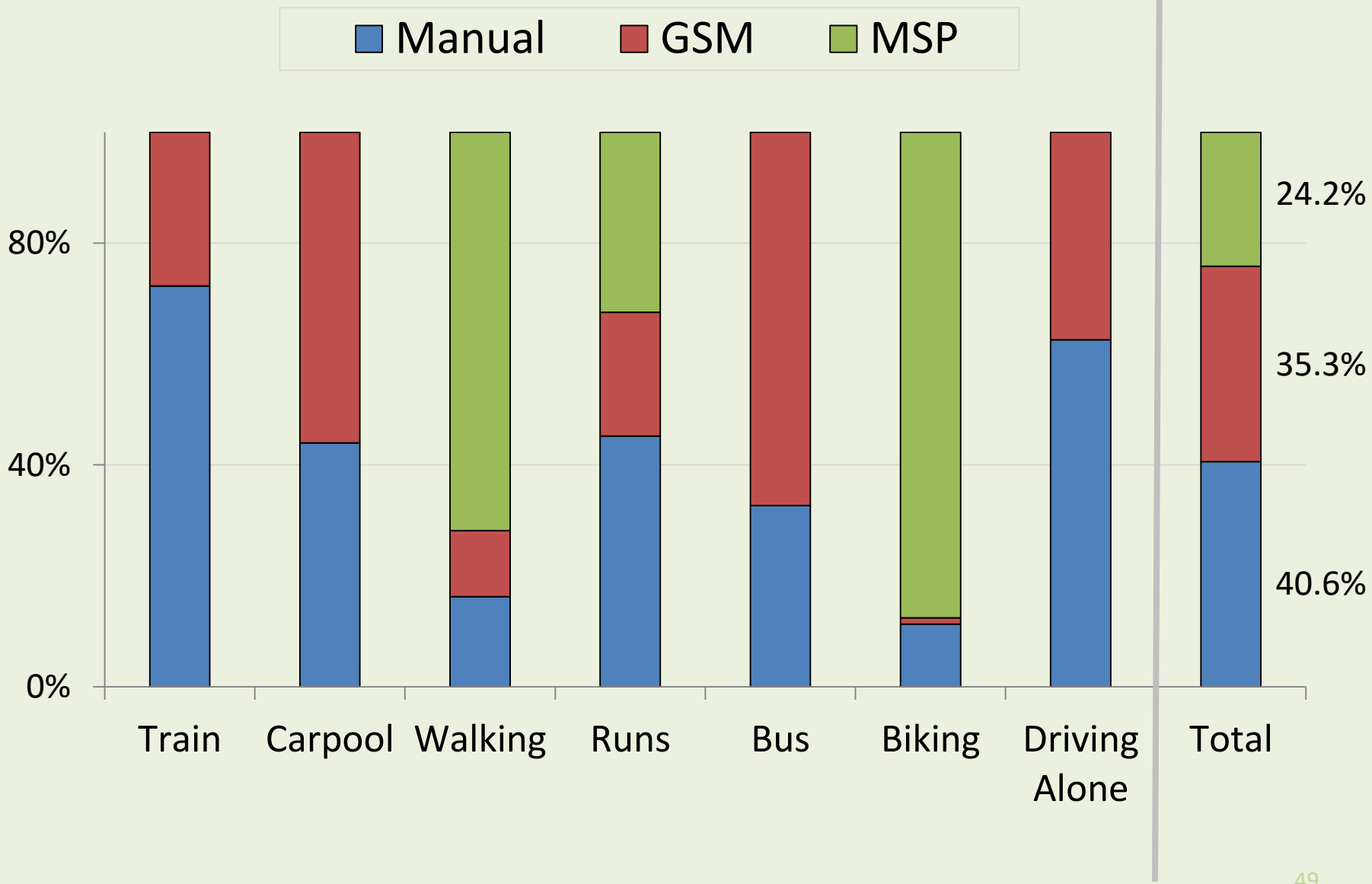
TED Conference, March 2008

ecorio

After installation, Ecorio runs in the background on your phone, keeping track of when you're moving in a car or a bus and tallies up the trips that you take each day.

When you first start Ecorio, you will see a summary of your activity and the current trip that Ecorio is tracking.

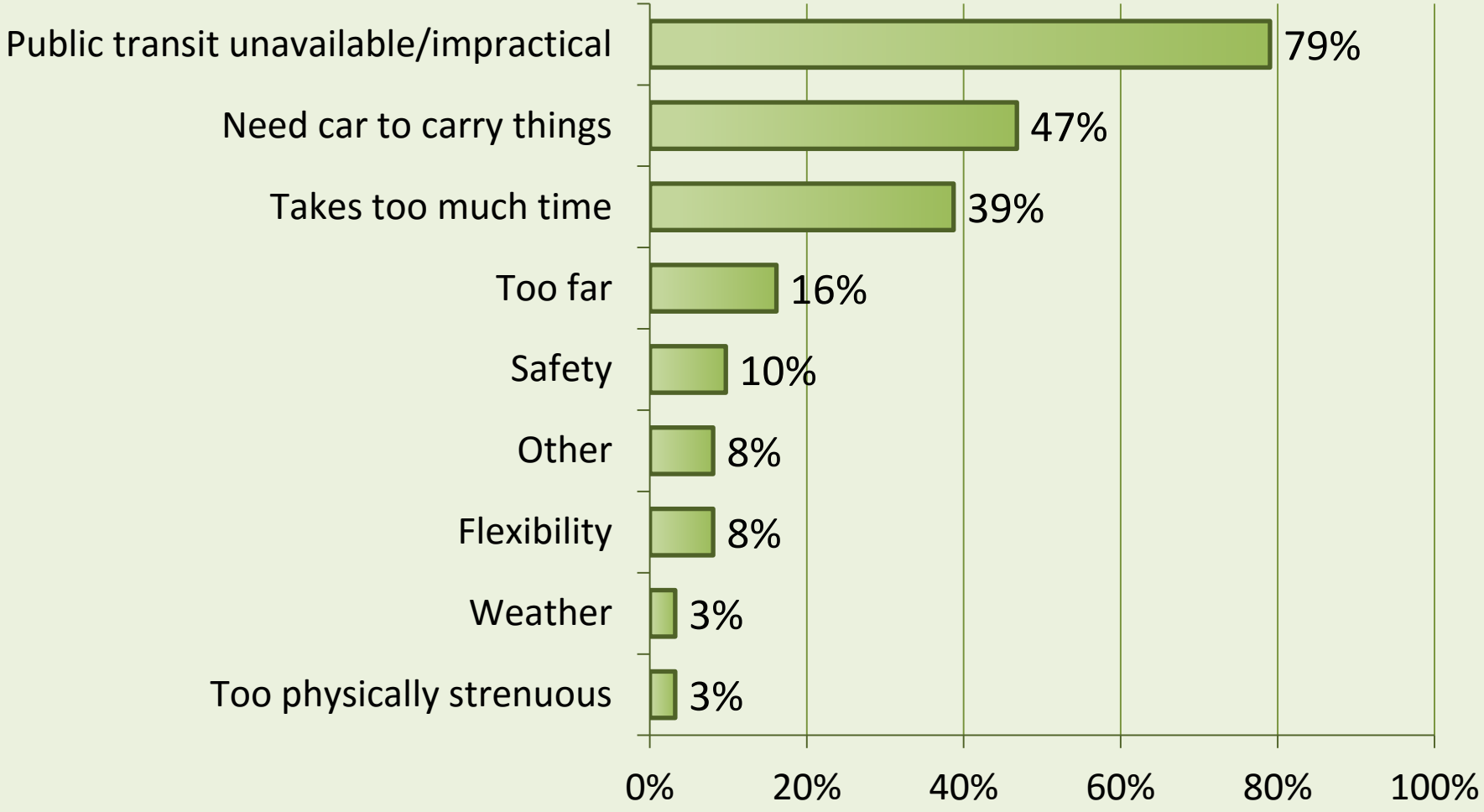
source of data



formative study #1

online survey results

reasons why people drive



cingular
2125
12:15 PM
11/05/08
Start
Contacts

potential for behavior change

"The motivation for me is more of the tracking and kind of seeing how I am doing and just the reminder factor of it. "

- Participant 11

"It really encourages you to analyze your own performance"

- Participant 8

"I feel I already travel in a relatively eco-friendly way and the study did not change that"

- Participant 15

"This can be connected with government incentives somehow… For example, government could encourage people with tax refund."

- Participant 7