¿Masa o bandada?

"Flocksourcing" – un experimento digital para recolectar información sobre el transporte público en sistemas tradicionalmente análogos

Christopher Zegras

en base de trabajo de campo realizado por:
Albert Ching, MCP; Stephen Kennedy, MCP;
Muntasir Mamun y el equipo de Kewkradong

SMART Singapore-MIT Alliance for Research and Technology | FUTURE URBAN MOBILITY | Massachusetts Institute of Technology | KEWKRADONG go... | an initiative of the URBAN LAUNCHPAD

urbanización, información, iteración

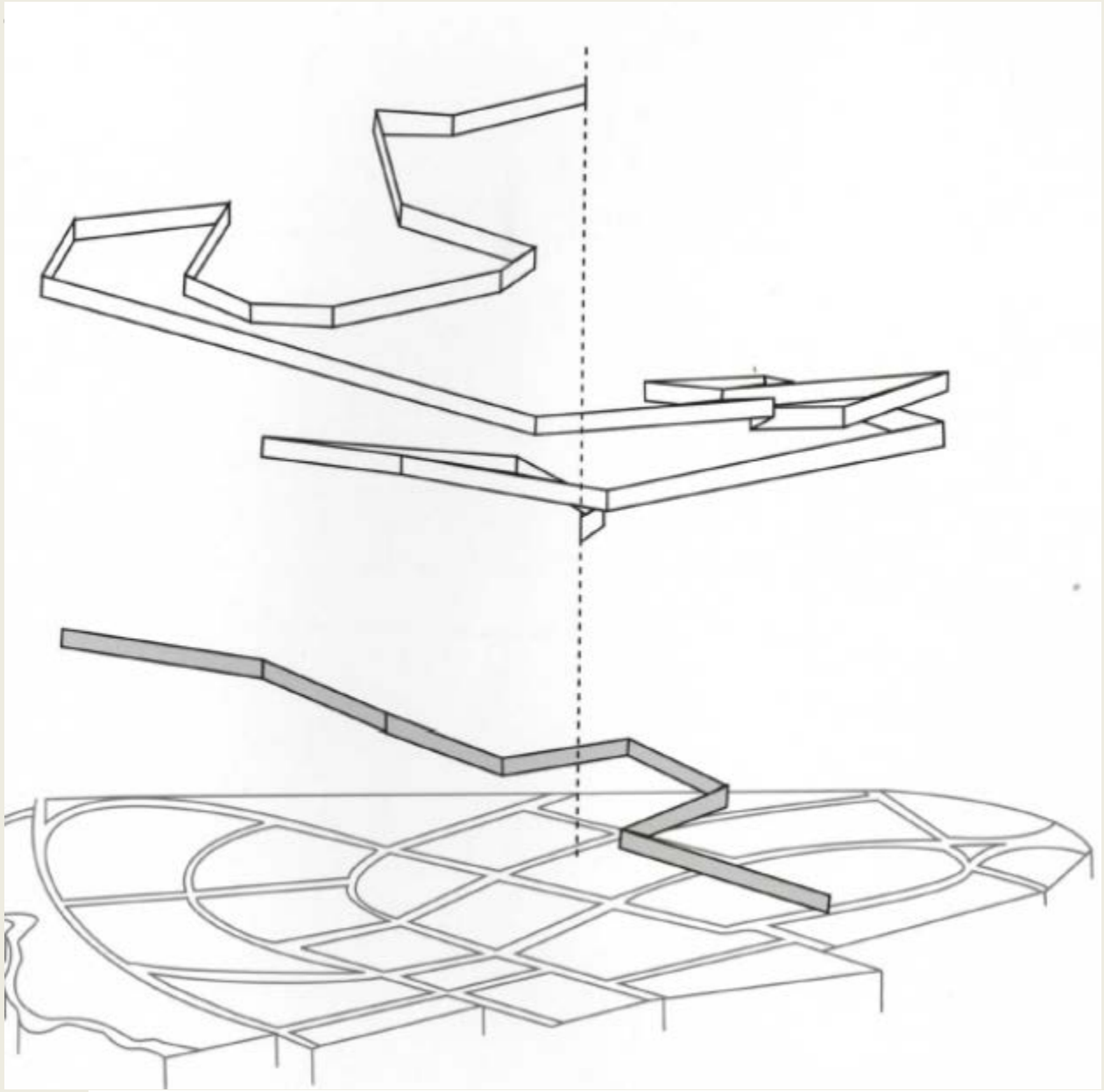
¿para quién?

Móviles, Movilidad, Ciudad, Ciudadanía

La Esperanza

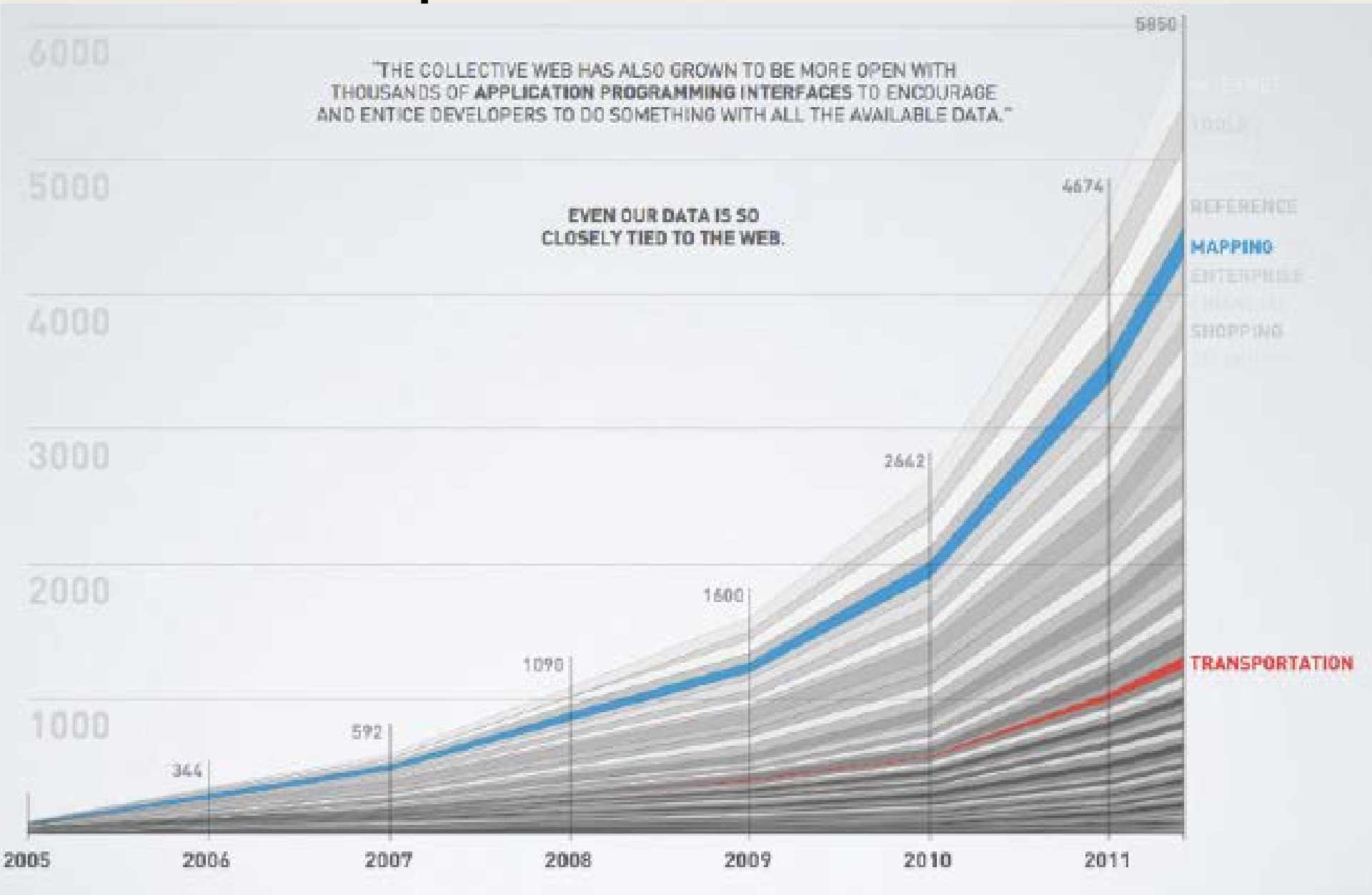
DINAMICA	INTERACTIVA	DISTRIBUIDA	PARTICIPATIVA
Tiempo-real	Busqueable	Multi-plataforma	User-Input
Actualizable	Filtrable	Movil	User-Feedback
Escalable	Multi-Nivelado	Barrato	Open-Source
Animable	Multi-Narrativable	Exportable	Transparente
	Funcionalidad		Accesibilidad

Convergencia espacio-temporal

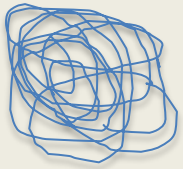


Lester & Scott's Paper Routes in Boylan Heights, from *Everything Sings* by Dennis Wood

Explosion de las API

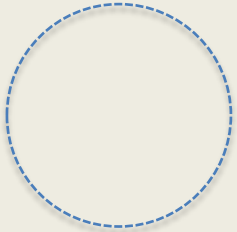


ACTIVIDADES



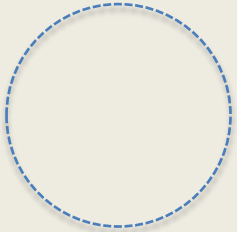
Movilidad
en el
sistema de buses

DATOS



Mediciones
De los buses,
las actividades
de
los usuarios,
Las percepciones
de
los usuarios

INFORMACION



Transformacion
en informacion
comprensible
via la visualizacion

CONOCIMIENTO

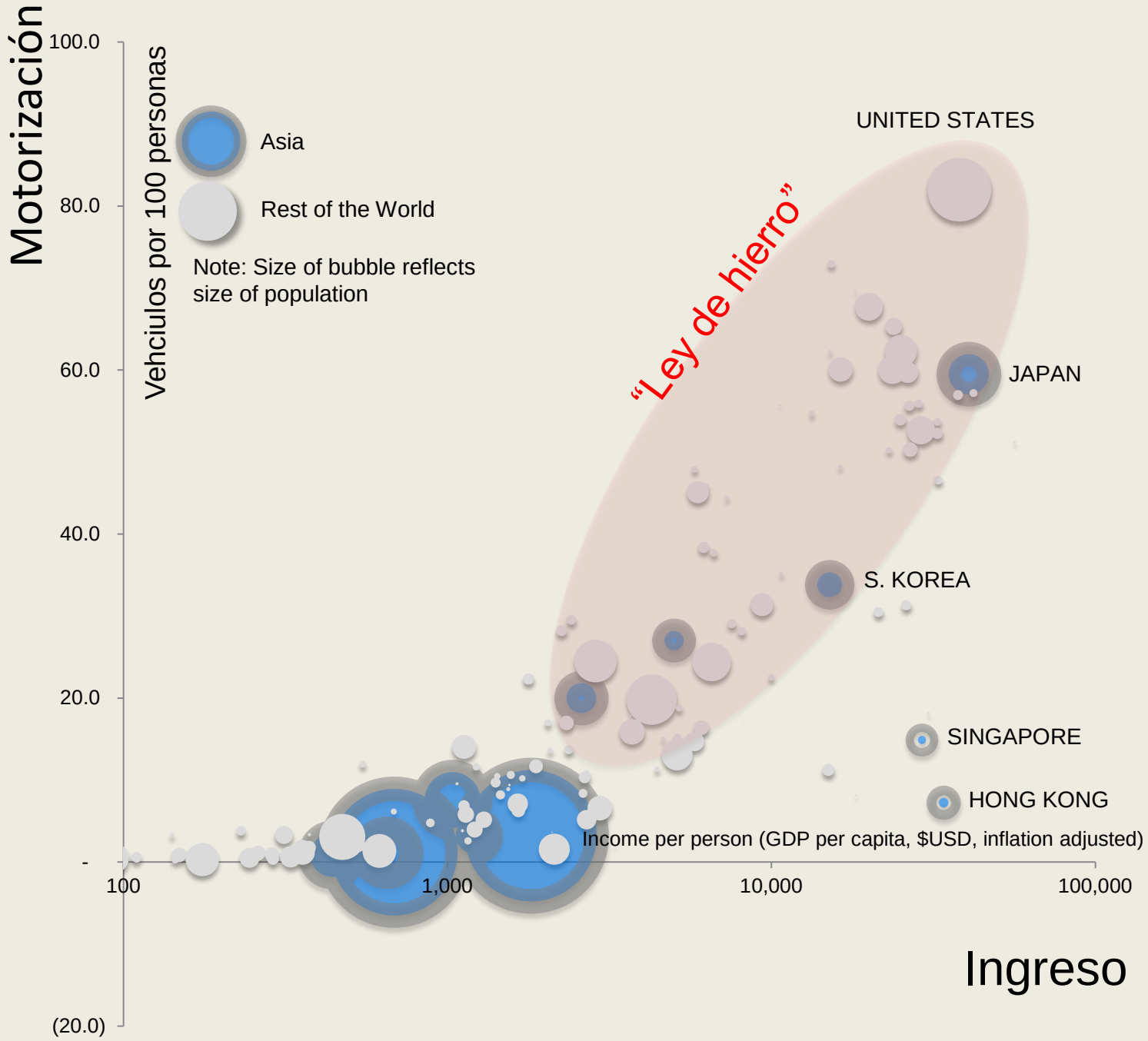
Accesible y
apropriado
para distribucion
y uso

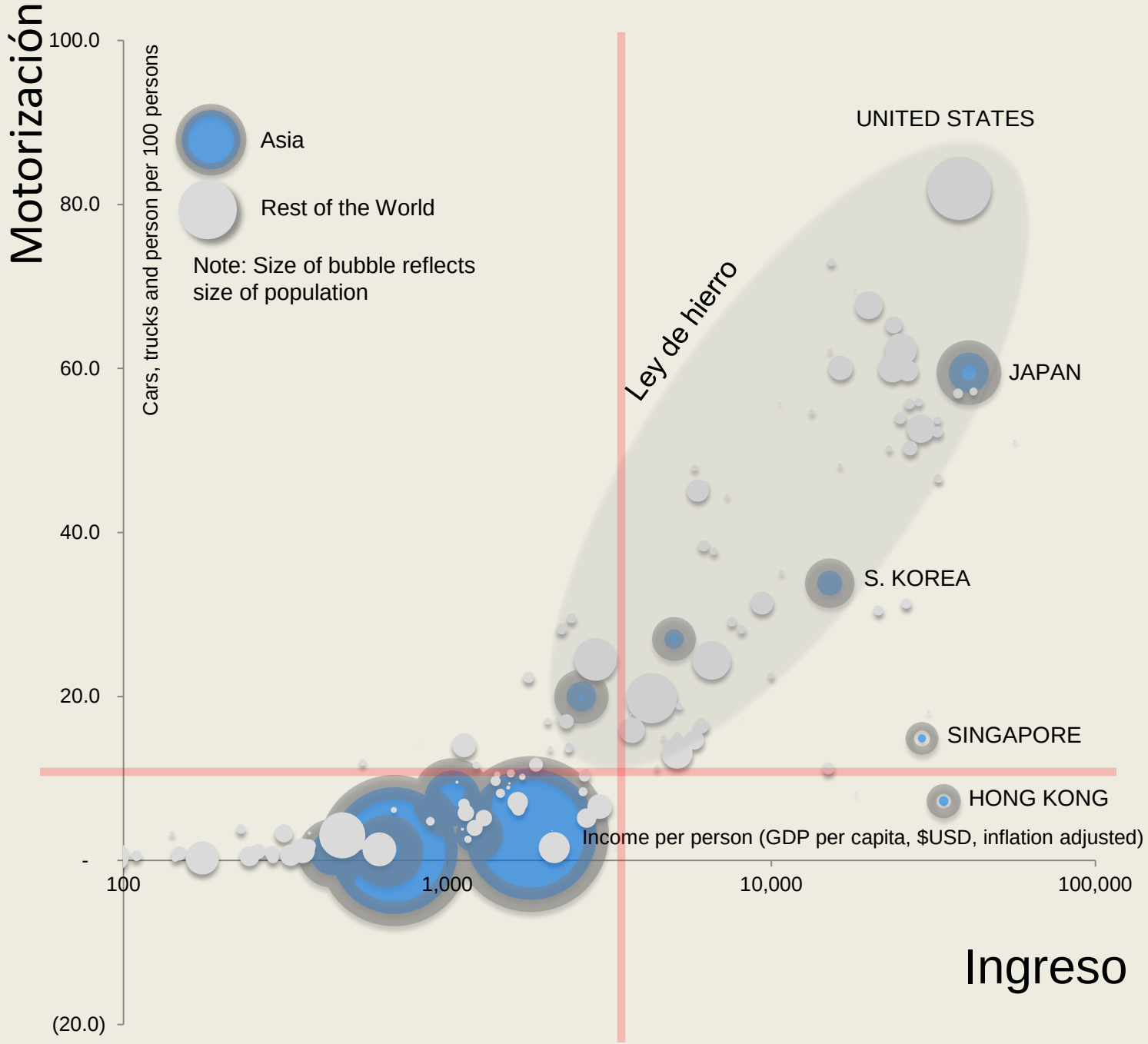
SOLUCIONES

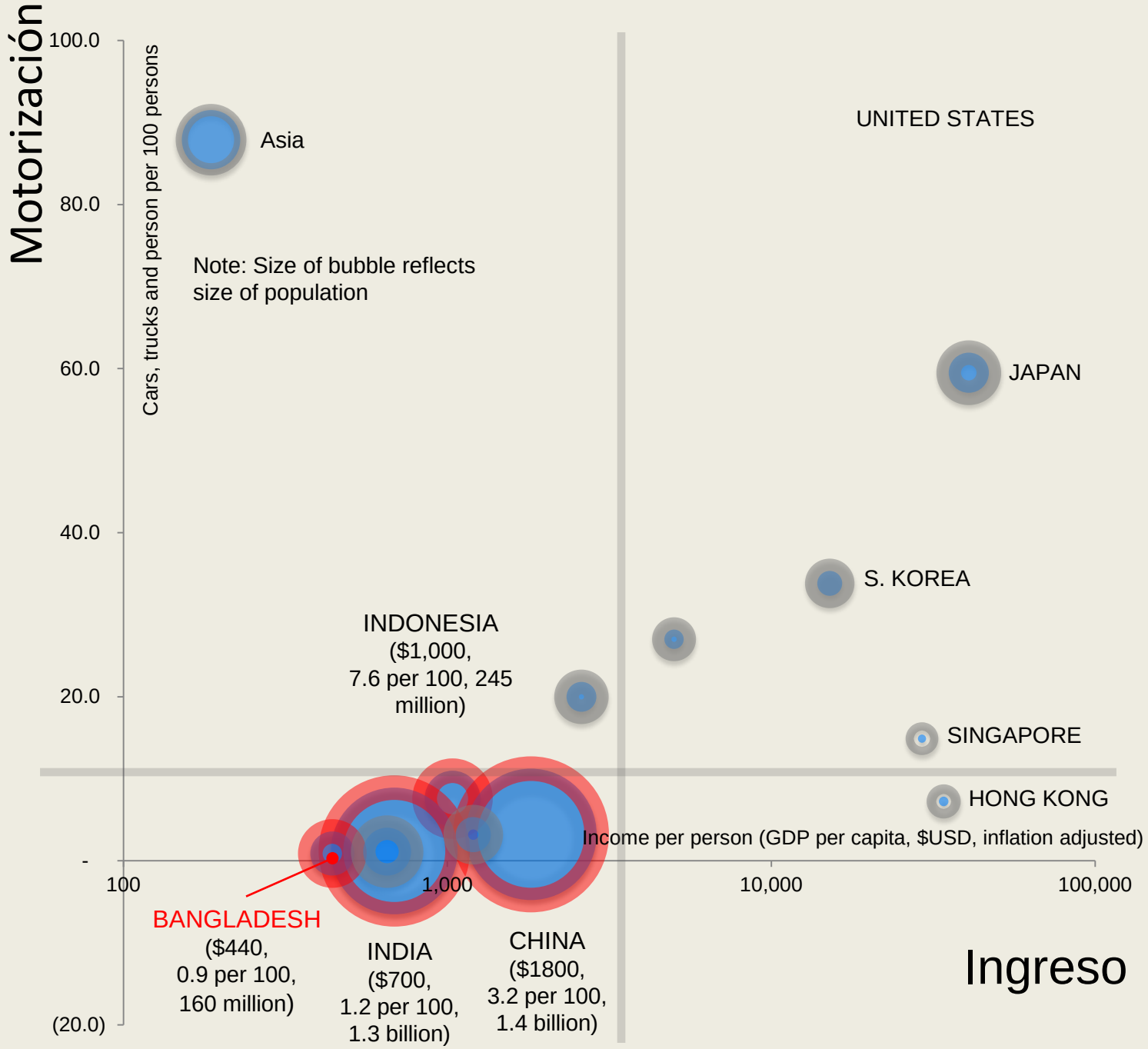
Respuestas y
productos
desde actores
multiples


15-18 mns personas
100,000 autos
<1% vehiculos per 100 pers
Dhaka


9 mns personas
9 mns motos
3 mns autos
>100 vehiculos por 100 pers
Jakarta

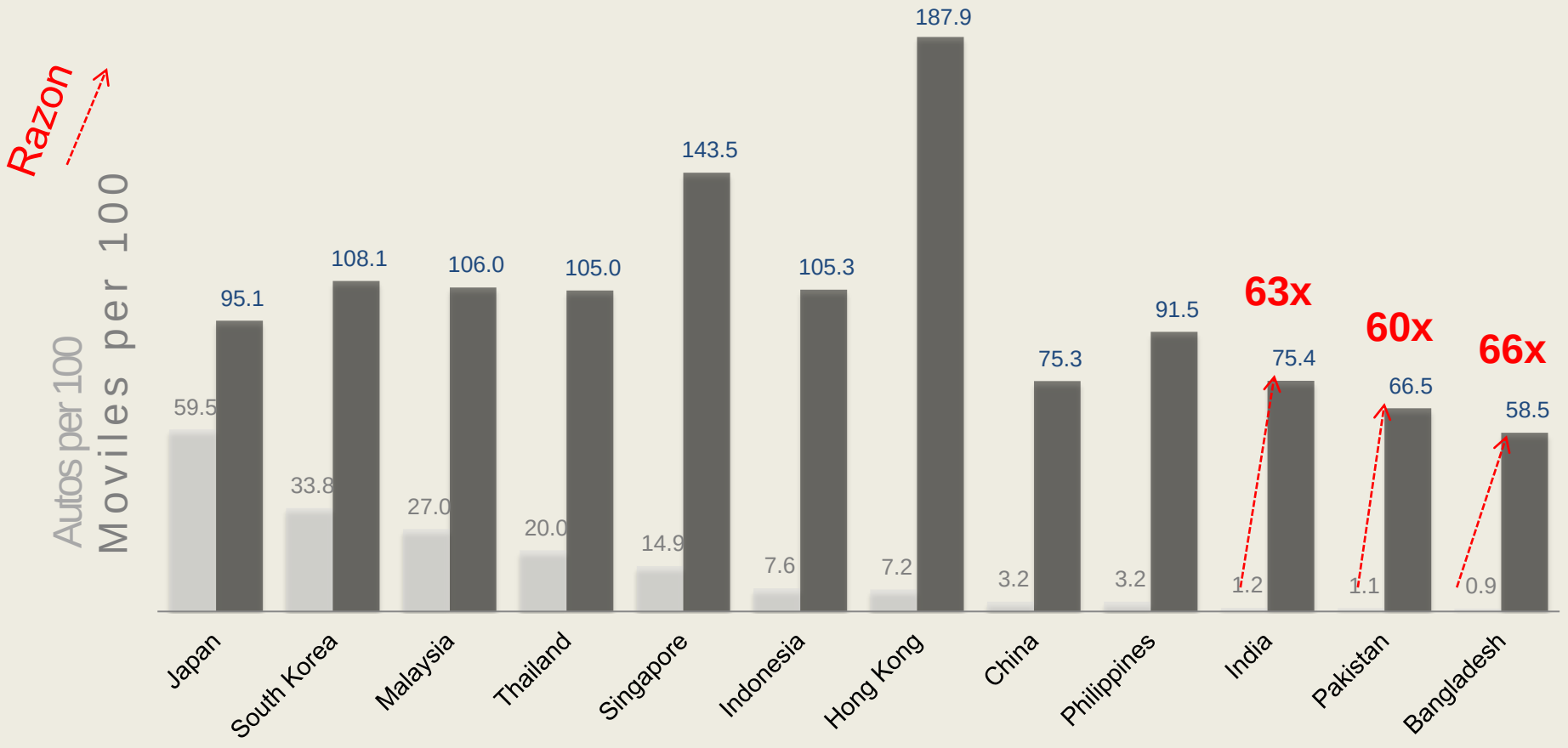

Motorización
Vehciulos por 100 personas
100.0
80.0
60.0
40.0
20.0
-
(20.0)
Asia
Rest of the World
Note: Size of bubble reflects size of population
UNITED STATES
"Ley de hierro"
JAPAN
S. KOREA
SINGAPORE
HONG KONG
100
1,000
10,000
100,000
Income per person (GDP per capita, $USD, inflation adjusted)
Ingreso


Motorización
Cars, trucks and person per 100 persons
100.0
80.0
60.0
40.0
20.0
-
(20.0)
Asia
Rest of the World
Note: Size of bubble reflects size of population
UNITED STATES
JAPAN
S. KOREA
SINGAPORE
HONG KONG
Ley de hierro
100
1,000
10,000
100,000
Income per person (GDP per capita, $USD, inflation adjusted)
Ingreso


Motorización
Cars, trucks and person per 100 persons
100.0
80.0
60.0
40.0
20.0
-
(20.0)
Asia
Note: Size of bubble reflects size of population
UNITED STATES
JAPAN
S. KOREA
SINGAPORE
HONG KONG
INDONESIA ($1,000, 7.6 per 100, 245 million)
BANGLADESH ($440, 0.9 per 100, 160 million)
INDIA ($700, 1.2 per 100, 1.3 billion)
CHINA ($1800, 3.2 per 100, 1.4 billion)
100
1,000
10,000
100,000
Income per person (GDP per capita, $USD, inflation adjusted)
Ingreso

Mobile rickshaw wallah in India

Autos versus móviles



Users

Operators

Regulators

1
Marketing

Cars ≠ aspiration

2
Servicios al usuario (tiempo real)

Information can improve accessibility to, comfort and safety of shared vehicles

3
Servicios Operadores (tiempo real)

Information can improve efficiency, management and profitability of shared fleets

4
Planificacion y Regulacion

Information can help monitor and evaluate city performance in a more precise and timely manner than ever before

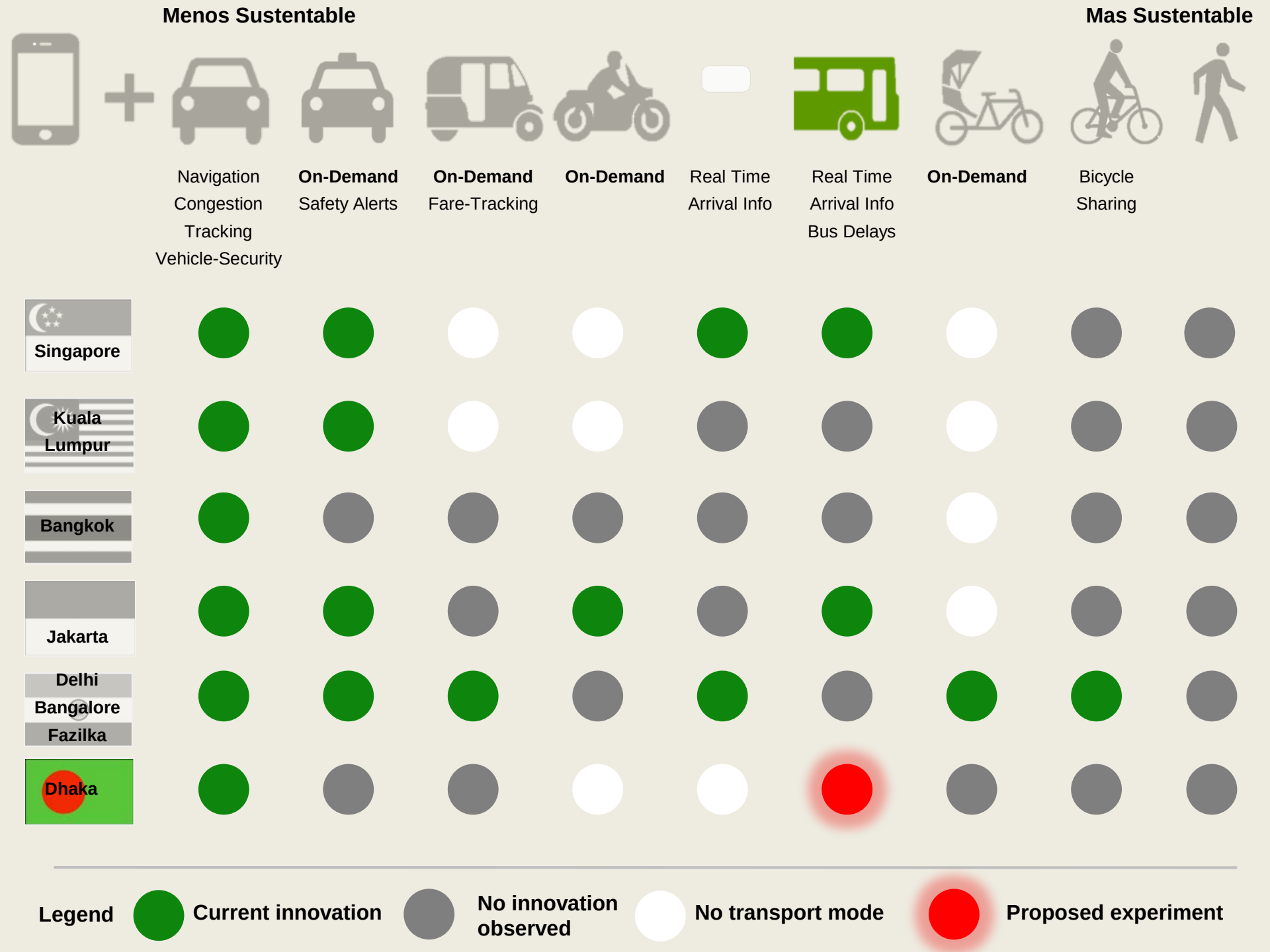

PGC 135
Welcome to Patiala GreenCABS
Raj Kumar Bishan Dass
8699352432 H.no.1321/299
Chotti Baradari PGC 135 HBR
2009
SBOP Sai Market Patiala
Dial-A-Rickshaw 01752057333
Email:
thepatialafoundation@gmail.
Format QR_CODE
Type TEXT
Time 7/15/11 3:51 PM
Metadata Q
1
Marketing


2
(Real-Time)
User Services


FAZILKA
ECOCABS
अतिथि देवो भवः
Dial-A-Rickshaw
FAZILKA (North) भूमि का स्टेट
Jyani Natural Farm
बाला जी टी स्टाल
2
(Real-Time)
User Services


track.nts.com.bd/ntrack/php/historyswf.php
3
(Real-Time)
Operator
Services


IDEOPHONE
MYTEKSI
GO JEK
Fazlka
ECOCABS


Menos Sustentable
Mas Sustentable
Navigation
Congestion
Tracking
Vehicle-Security
On-Demand
Safety Alerts
On-Demand
Fare-Tracking
On-Demand
Real Time
Arrival Info
Real Time
Arrival Info
Bus Delays
On-Demand
Bicycle
Sharing
Singapore
Kuala
Lumpur
Bangkok
Jakarta
Delhi
Bangalore
Fazilka
Dhaka
Legend
Current innovation
No innovation
observed
No transport mode
Proposed experiment

The potential

Dimension	Rides	Surveys
Spatial	lat / long coordinates, destinations	home / work locations
Temporal	time-stamps	weekly ridership, average commute times
Compositional	generalized routes, directionality, seating capacity	gender, age
Conditional	speed, availability of seats	income, phone ownership
Behavioral	ridership counts, female ridership	surveys
Experiential		happiness, comfort, safety

Developing world
(examples from Dhaka)

Automated

Requires user input

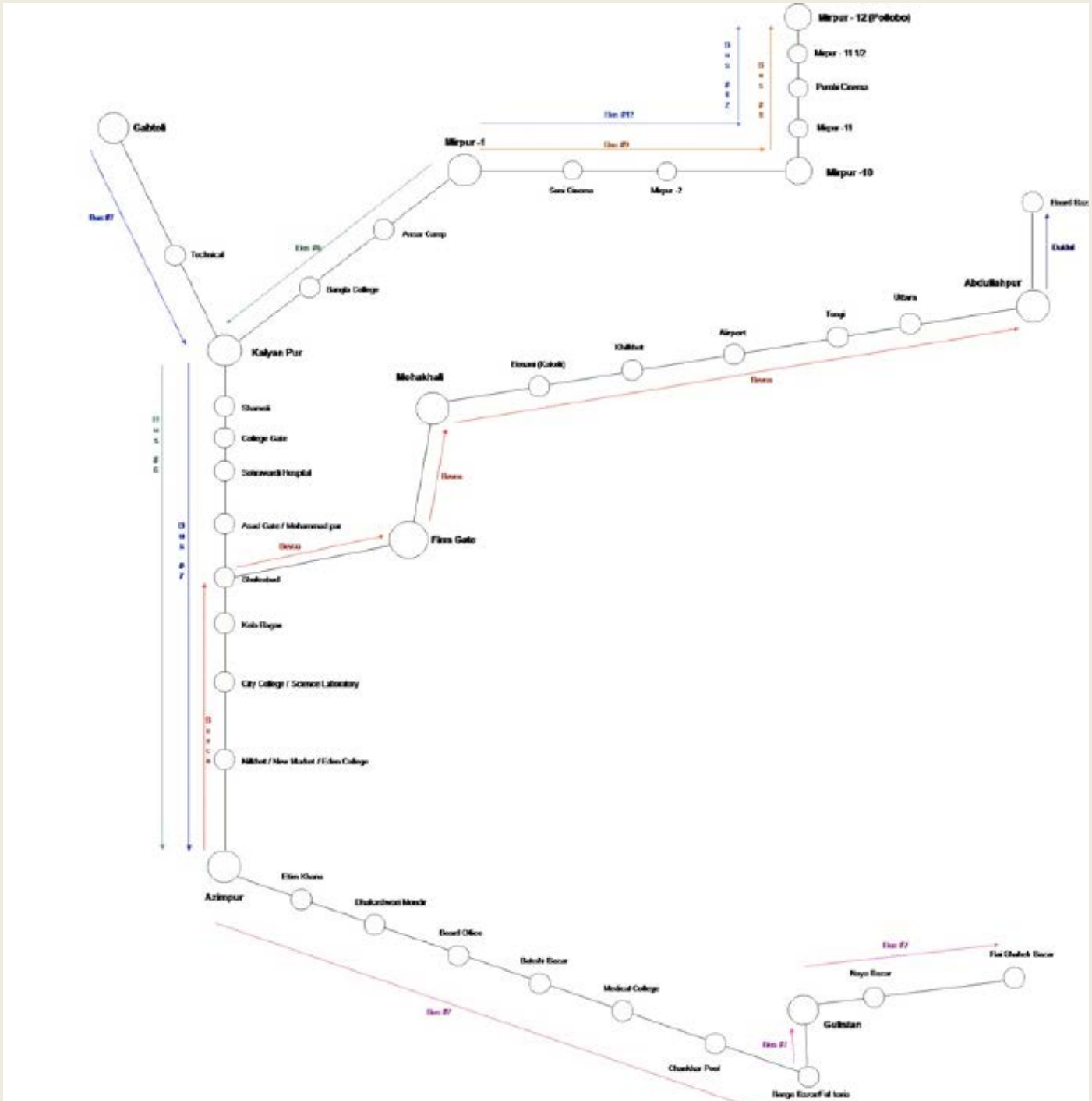
Data type	Speed	Collection tool	Public accessibility	Gap
(1) Time Travel time, wait time, road speed	Real-Time	**Analog+** (Hasnine 2011)	**Ad Hoc**	Increase precision + coverage significantly
(2) Space Mapping, directions	(Almost) Real-Time	**None**	**Unavailable**	There is no bus map (online or offline) of Dhaka
(3) Conditions Crowding, service disruptions, safety alerts	(Almost) Real-Time	**Analog+** (Katz and Rahman 2010)	**Ad Hoc**	Increase coverage significantly
(4) Perception Satisfaction, commute time by age, gender, income	Slower Time	**Analog**	**Ad Hoc**	Increase frequency + coverage significantly

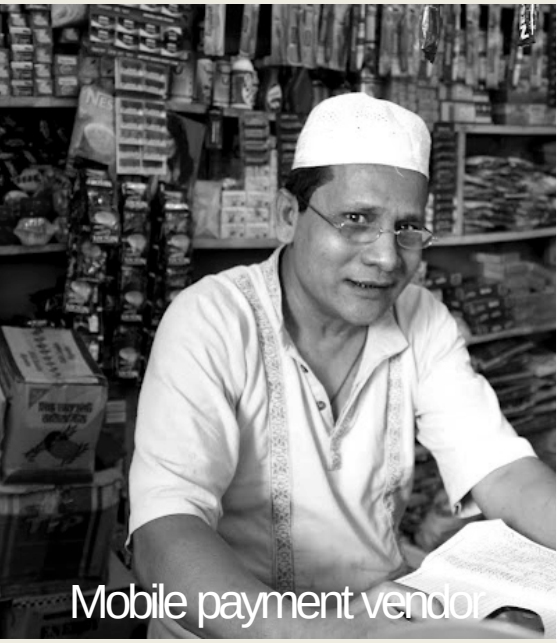
Industrialized world

Automated → Requires user input

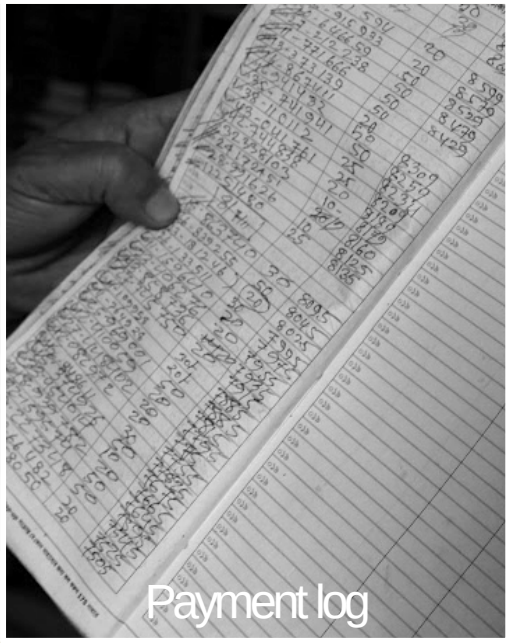
Data type	Speed	Collection tool	Public accessibility	Gap
(1) Time Travel time, wait time, road speed	Real-Time	**Digital** (using AVLs)	**Closed/Open**	Smaller cities / less frequent routes in big cities; Closed big cities e.g. Singapore
(2) Space Mapping, directions	(Almost) Real-Time	**Digital** (using custom hardware)	**Open**	
(3) Conditions Crowding, service disruptions, safety alerts	(Almost) Real-Time	**Analog** (moving to Digital) (Steinfeld 2011)	**Open but Ad Hoc**	Increased coverage
(4) Perception Satisfaction, commute time by age, gender, income	Slower Time	**Analog** (moving to Digital) (Stephen and Graves 2006)	**Semi-Open but Slow**	More frequent surveys / release of full data set

Dhaka….

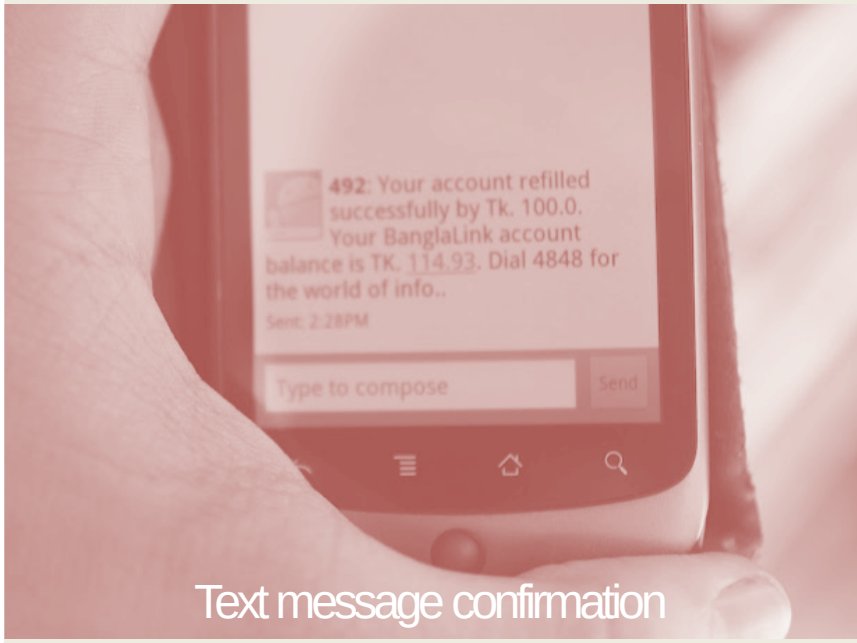




Mobile payment vendor

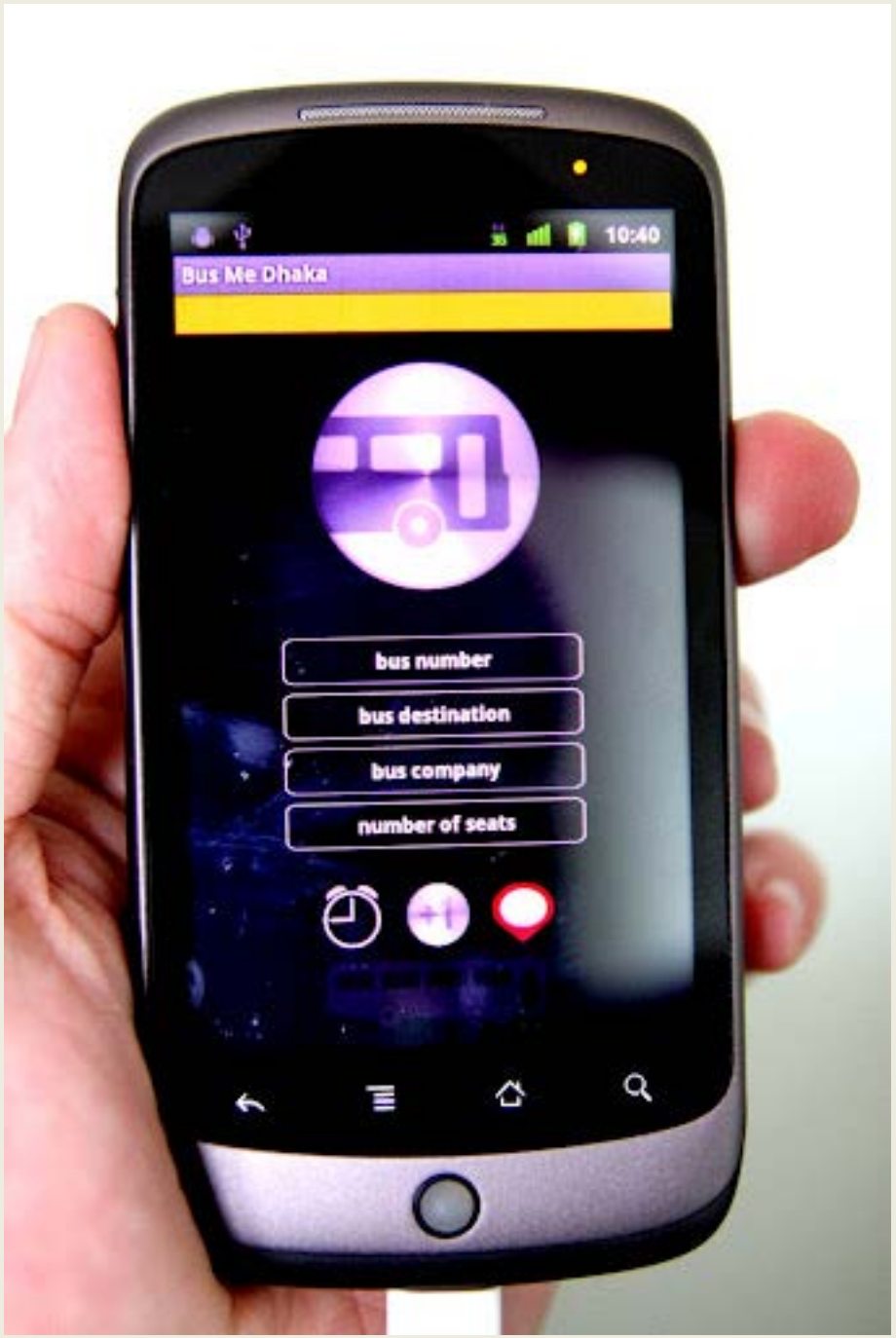


Payment log



Text message confirmation

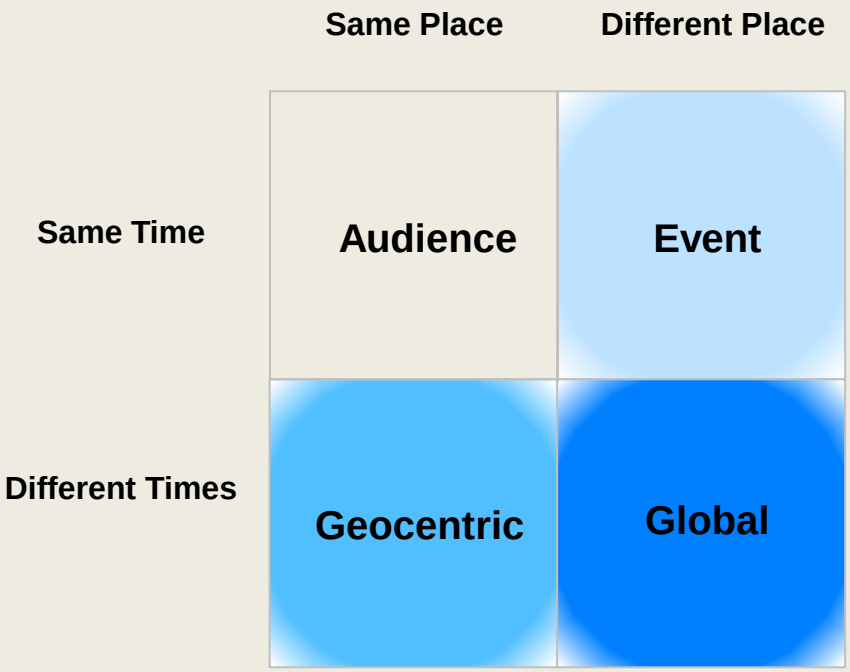
“Flocksourcing” =
crowdsourcing guiado


10:40
Bus Me Dhaka
bus number
bus destination
bus company
number of seats

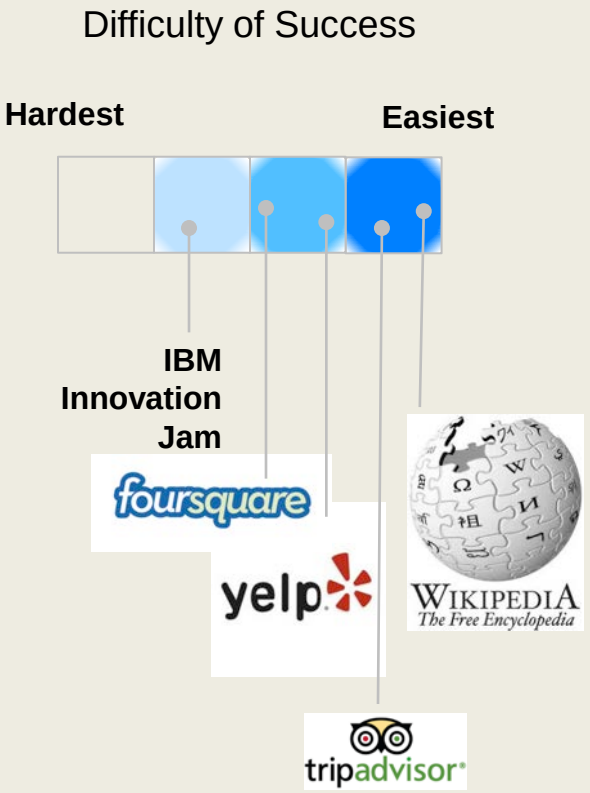
Minibus en las afueras de Dhaka, enero 2012


CORSA
TIMATE
SOUND

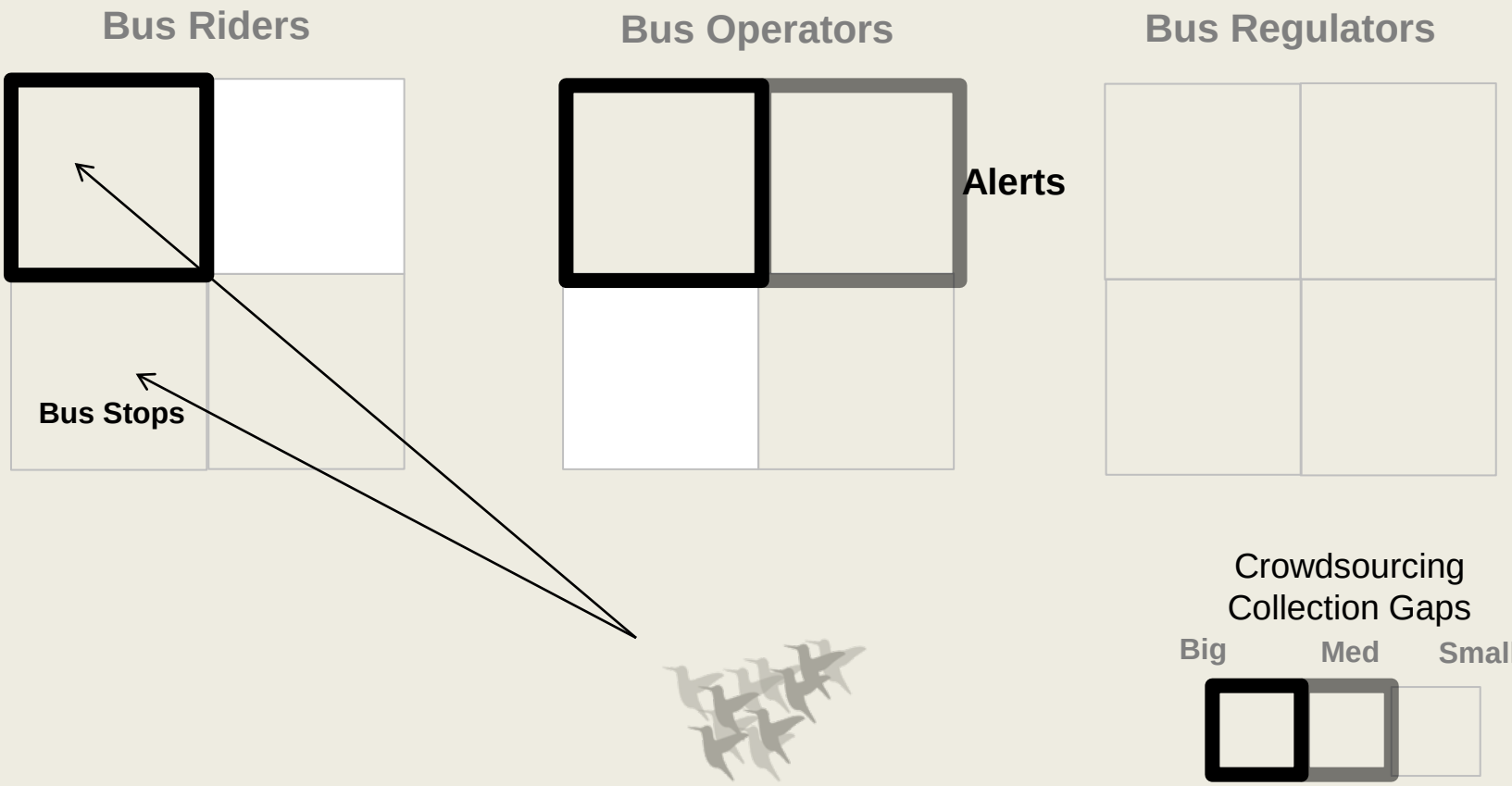
4 Types of Crowdsourcing



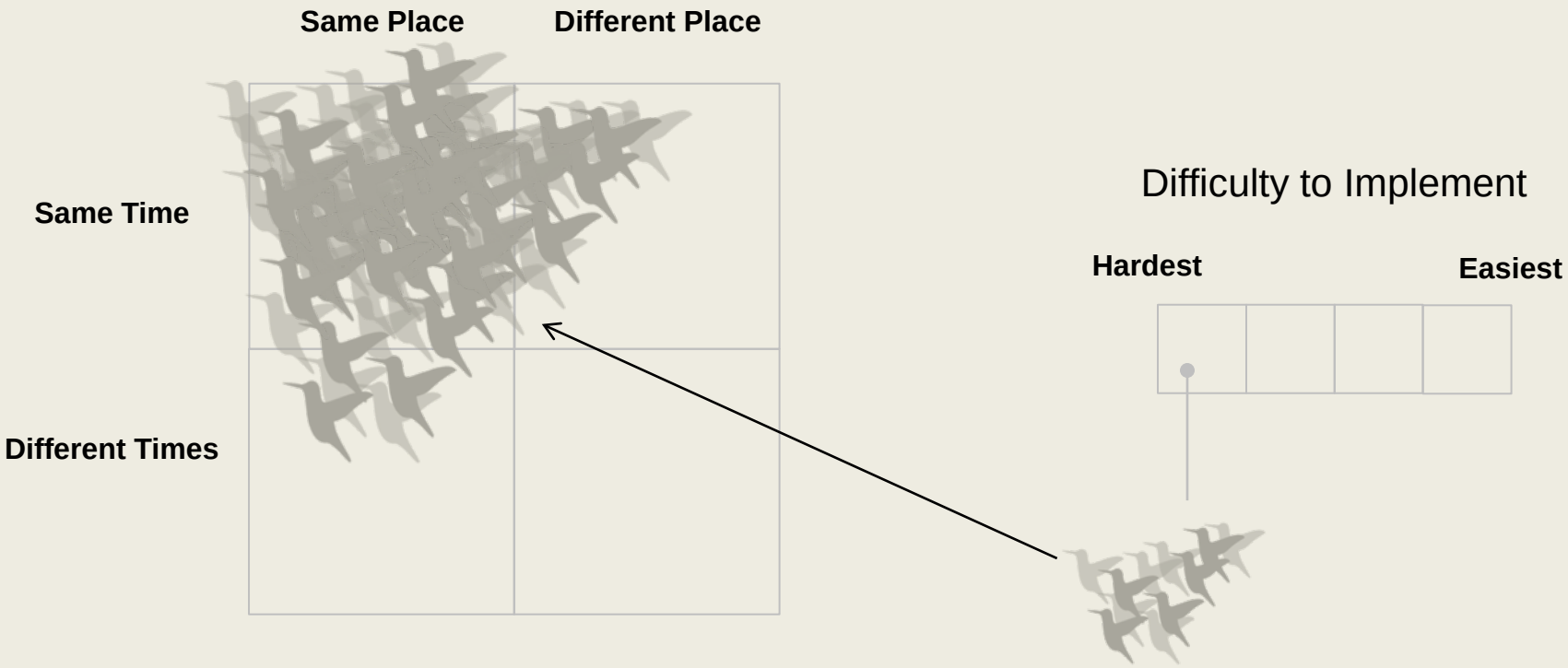
Erickson, 2010



Introducing Flocksourcing



Introducing Flocksourcing



Collect These Metrics . . .

Bus Details
Bus Number
Bus Destination
Bus Company
No. of Seats

Speed
Location
Time

Crowding
Passenger Count
Female Passenger Count

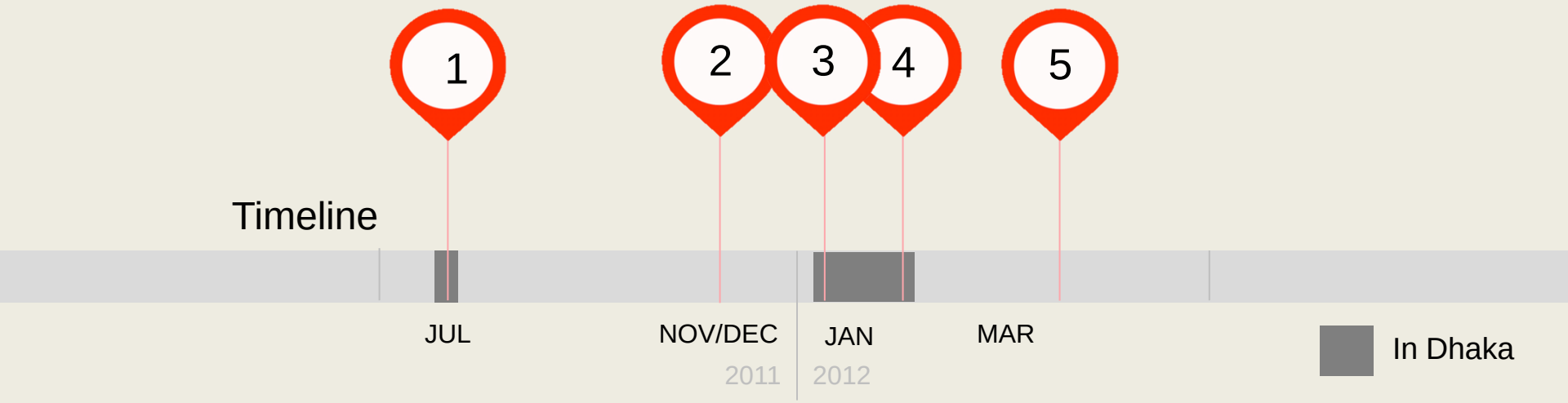
Usuario
Gender
Age
Home Location
Work Location
One-Way Commute
Income
Phone Ownership
Rider Satisfaction
Biggest Complaint
Riding Frequency

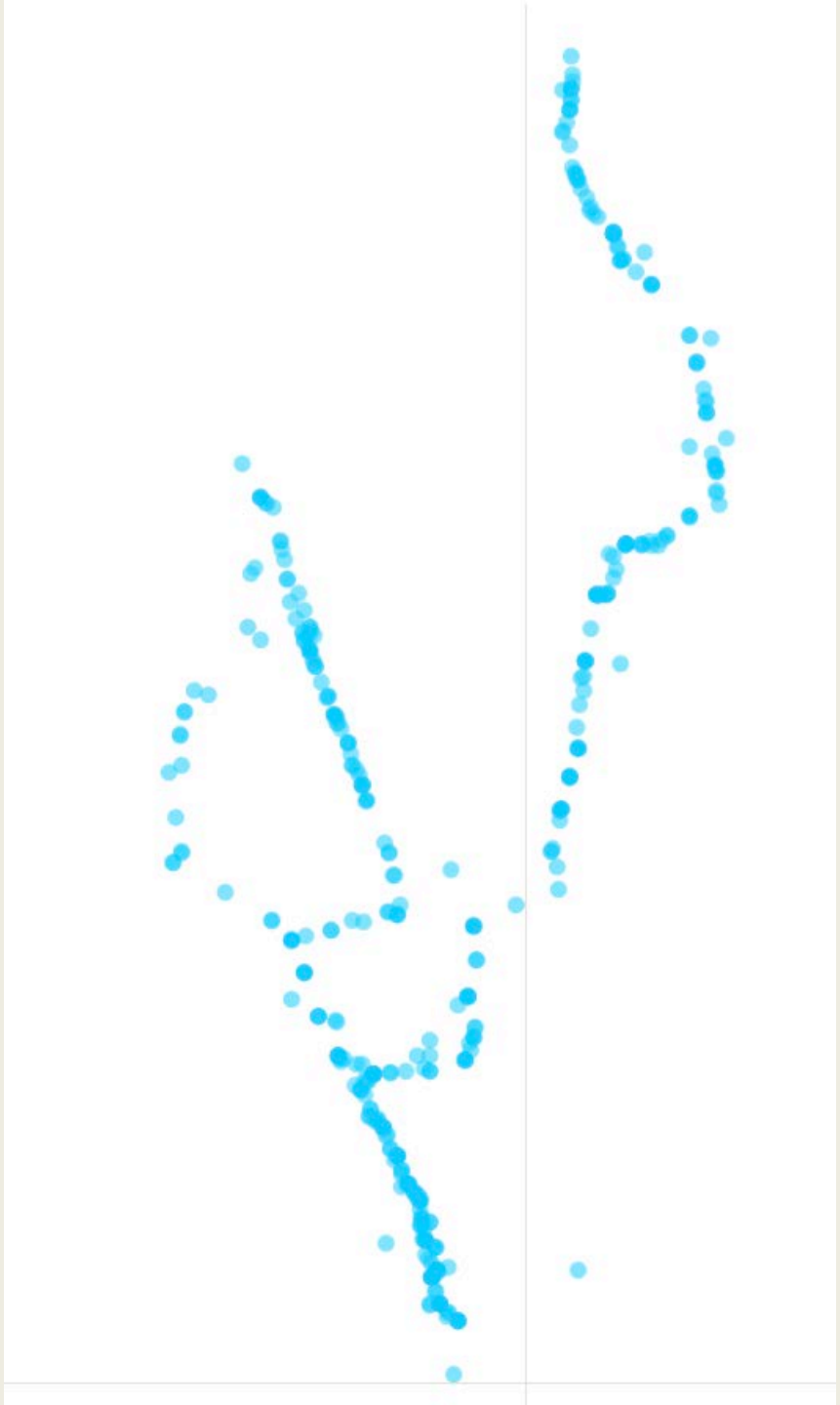
**Survey data linked to bus data*

Using this App . . .

*Download me if you have an Android

On These Bus Lines


1
2
3
4
5
Timeline
JUL
NOV/DEC
JAN
MAR
2011
2012
In Dhaka



resources

8

flock members

1

week

team target

270

120

one-way rides

1,014

100

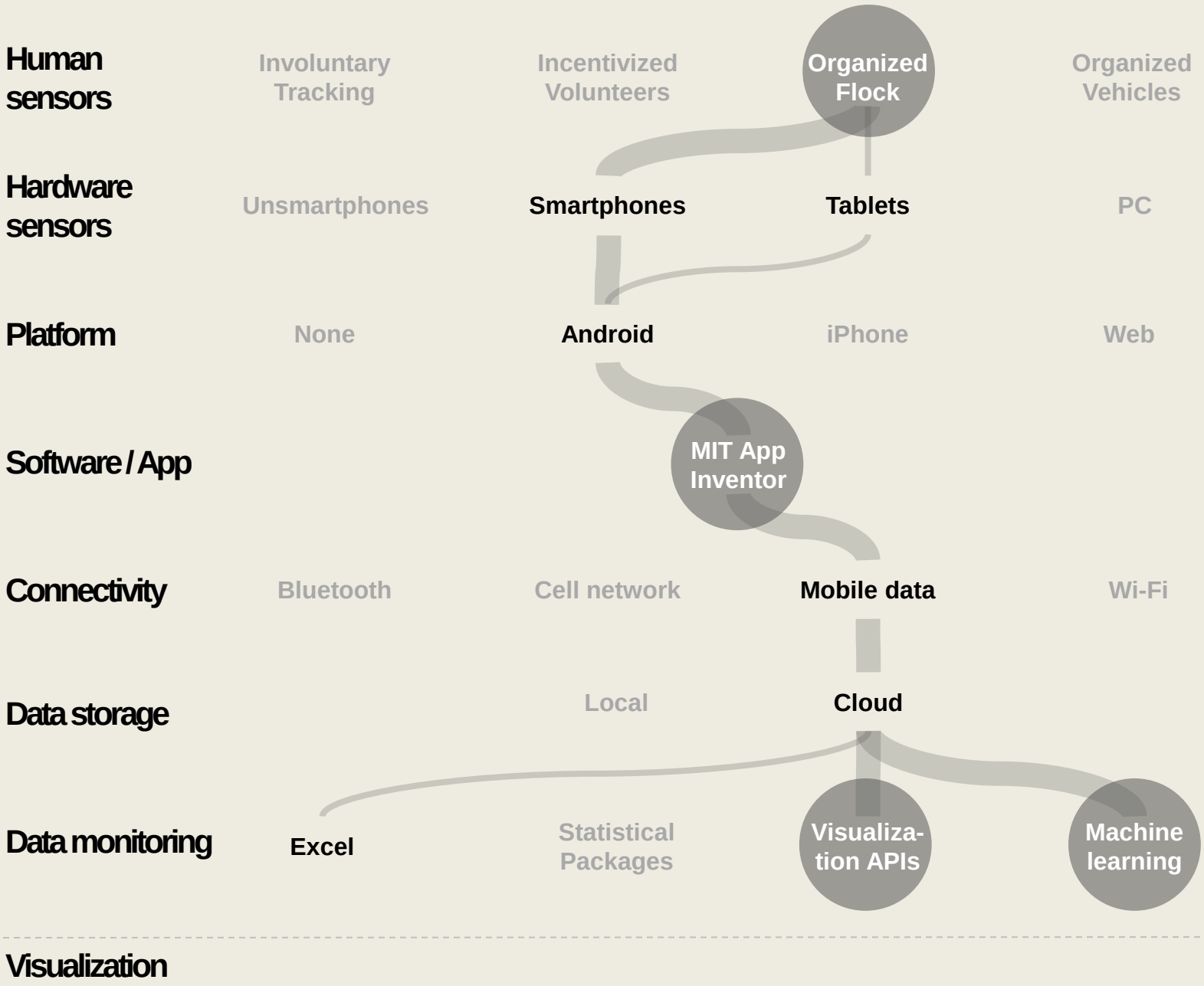
onboard individuals surveyed

+10,000

passenger counts, bus location points


Most accurate
Mirpur Road
Wi-Fi hot spots
Bus route
Azimpur to Dhanmondi
Least accurate
Khilket to Airport
Location Accuracy

Flocksourcing WORKFLOW



Cost Structure

Human sensors

???
per person per day

Hardware sensors

$175
and rapidly declining

Software / App

MIT App Inventor BETA

Free

Connectivity

$4
per 1 GB

Data storage

Google fusion tables beta

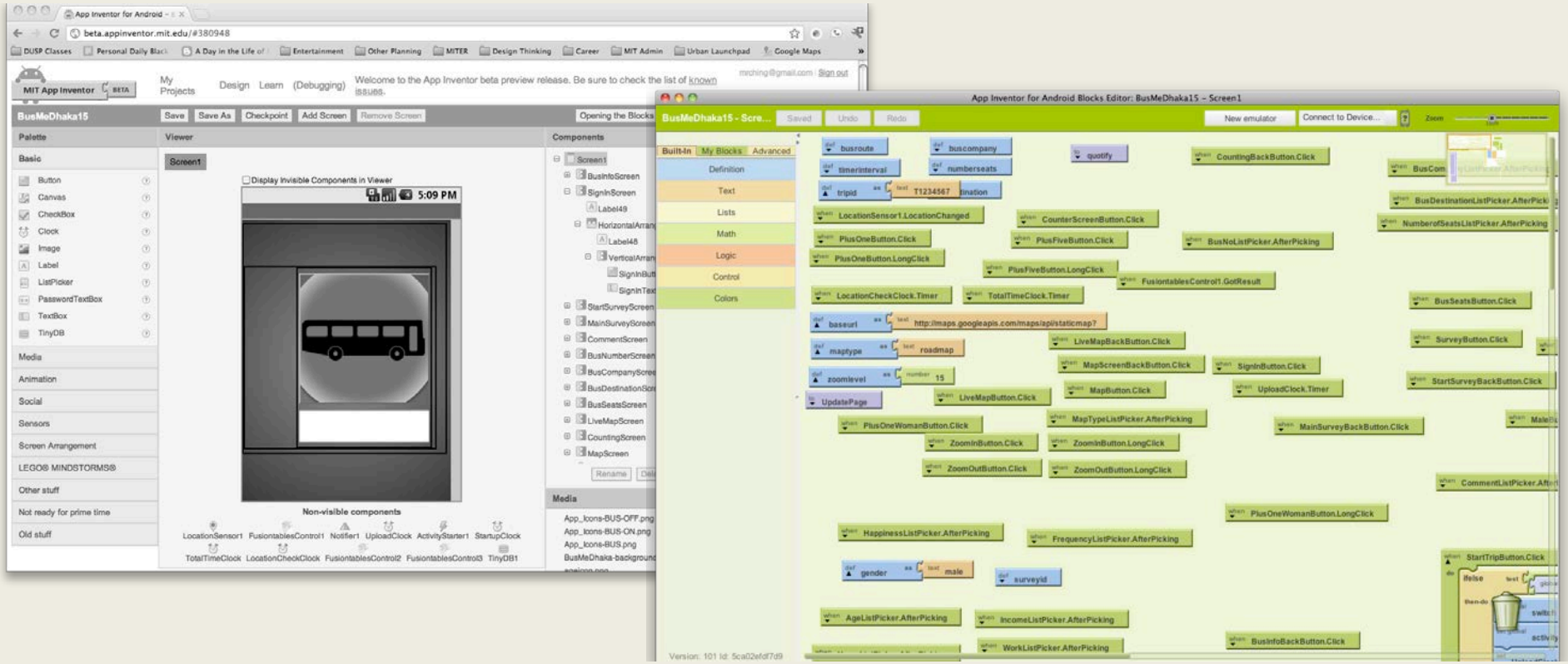
Free

Data monitoring

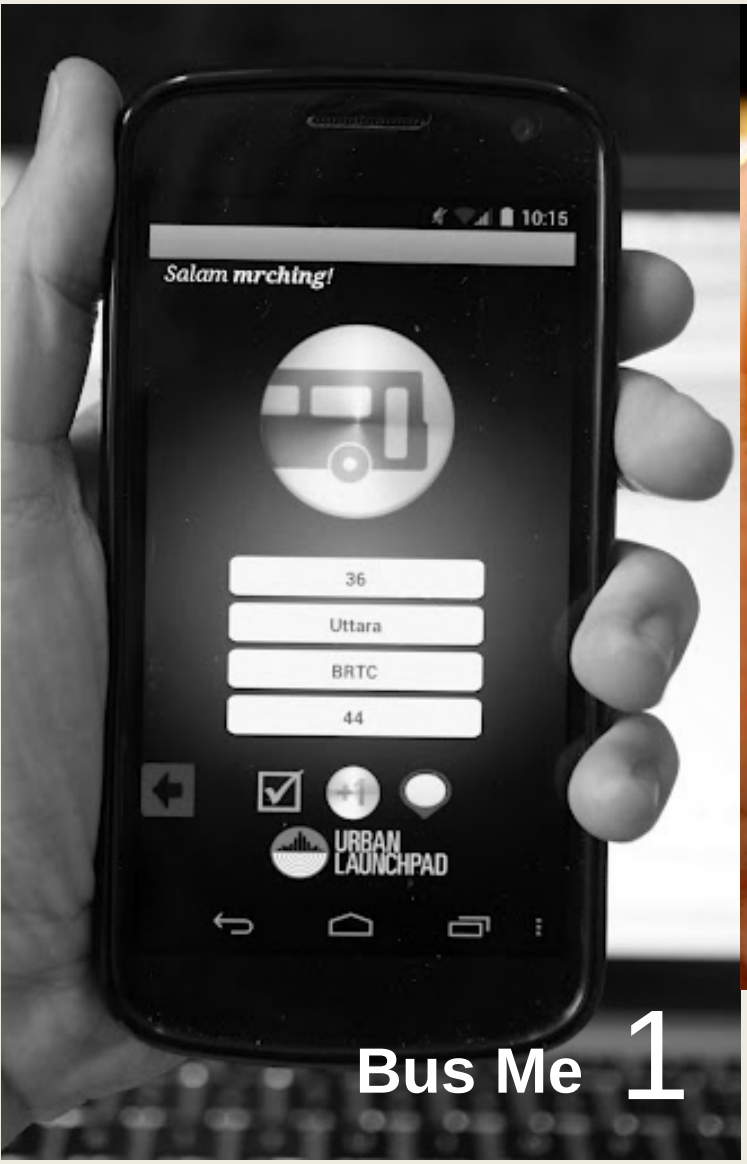
Google maps

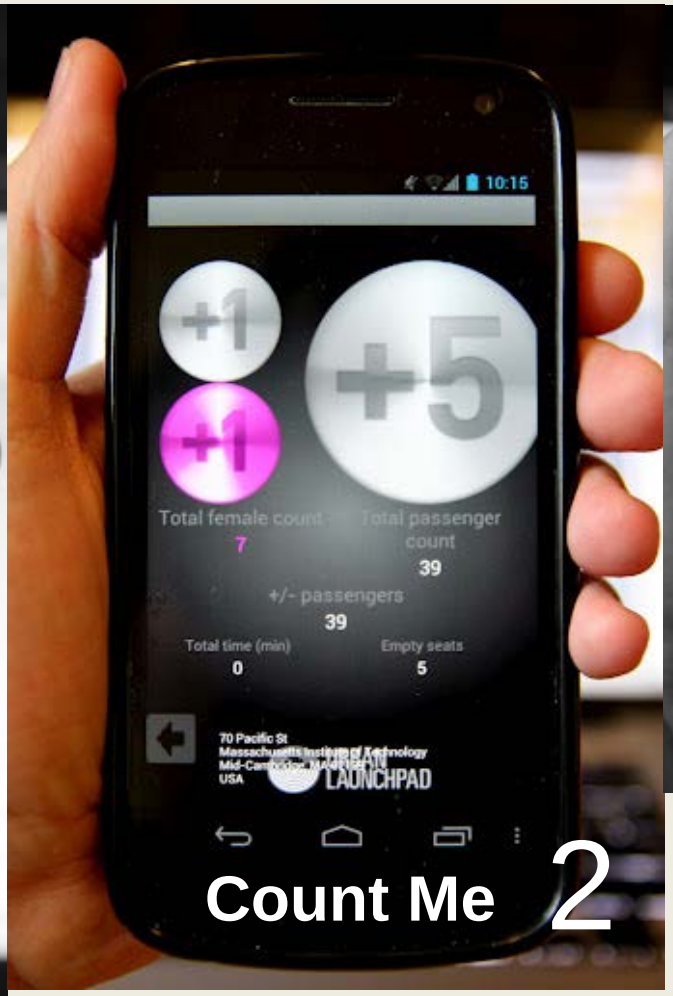
Free

MIT App Inventor

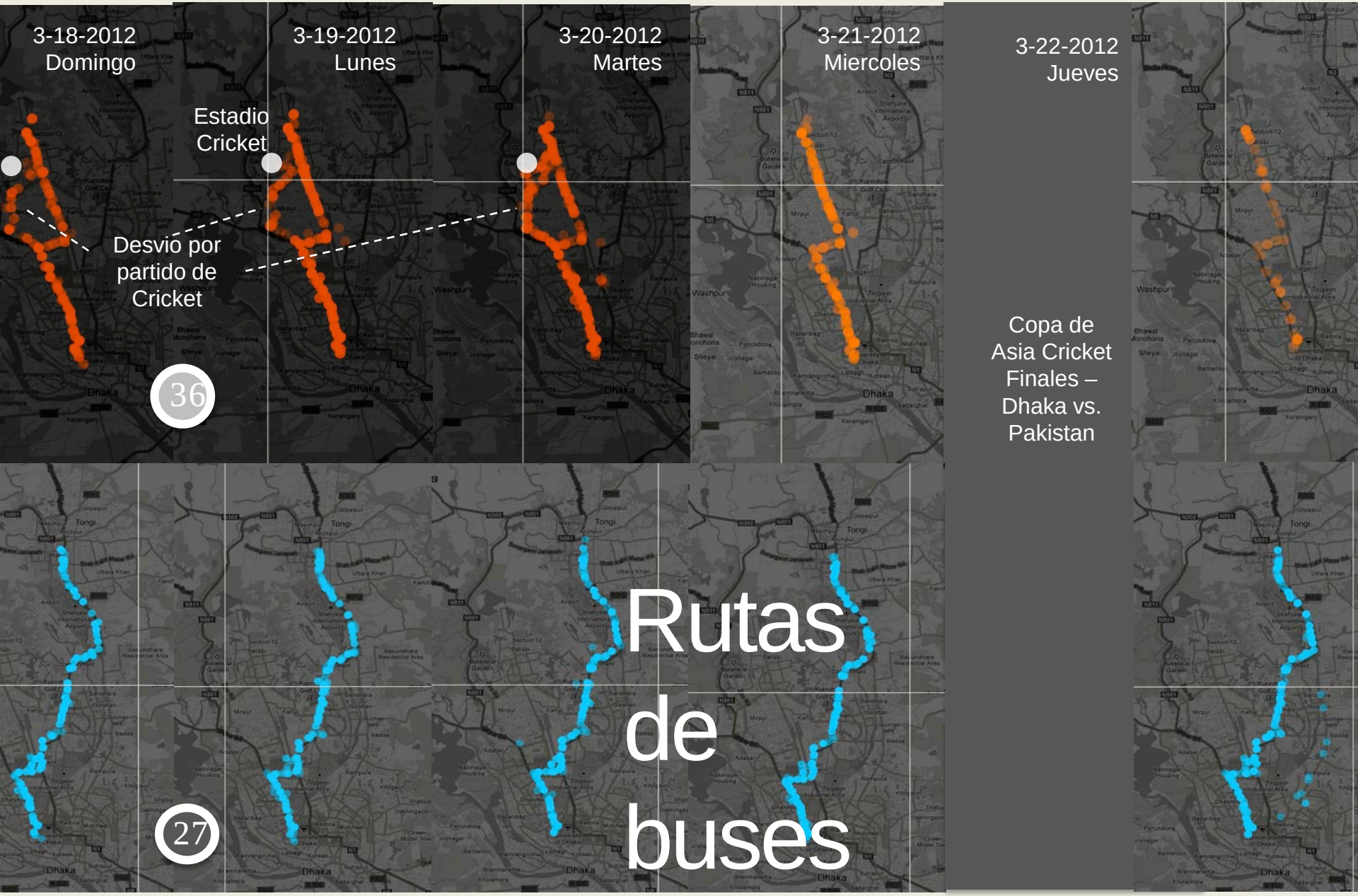


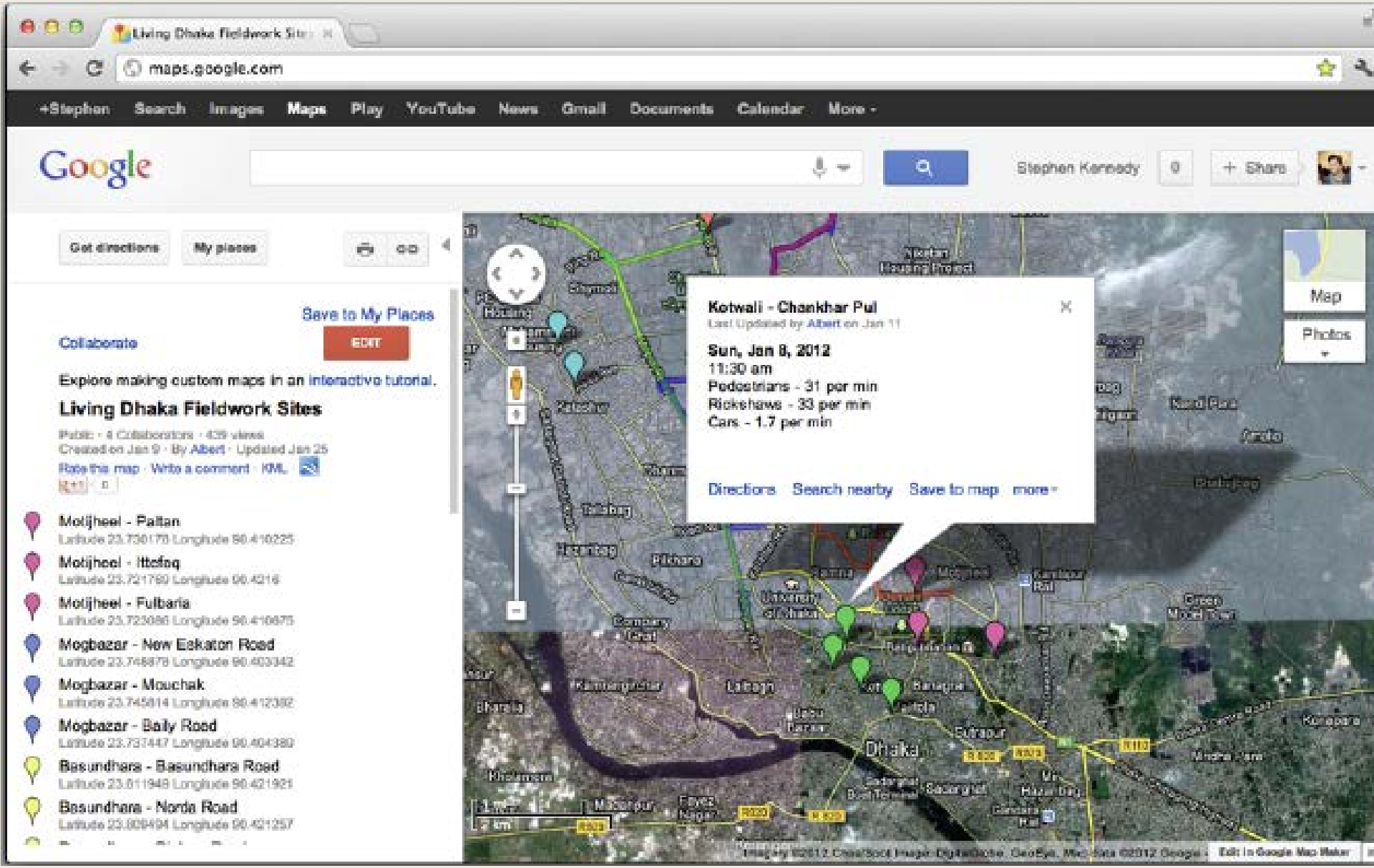
appinventor.mit.edu

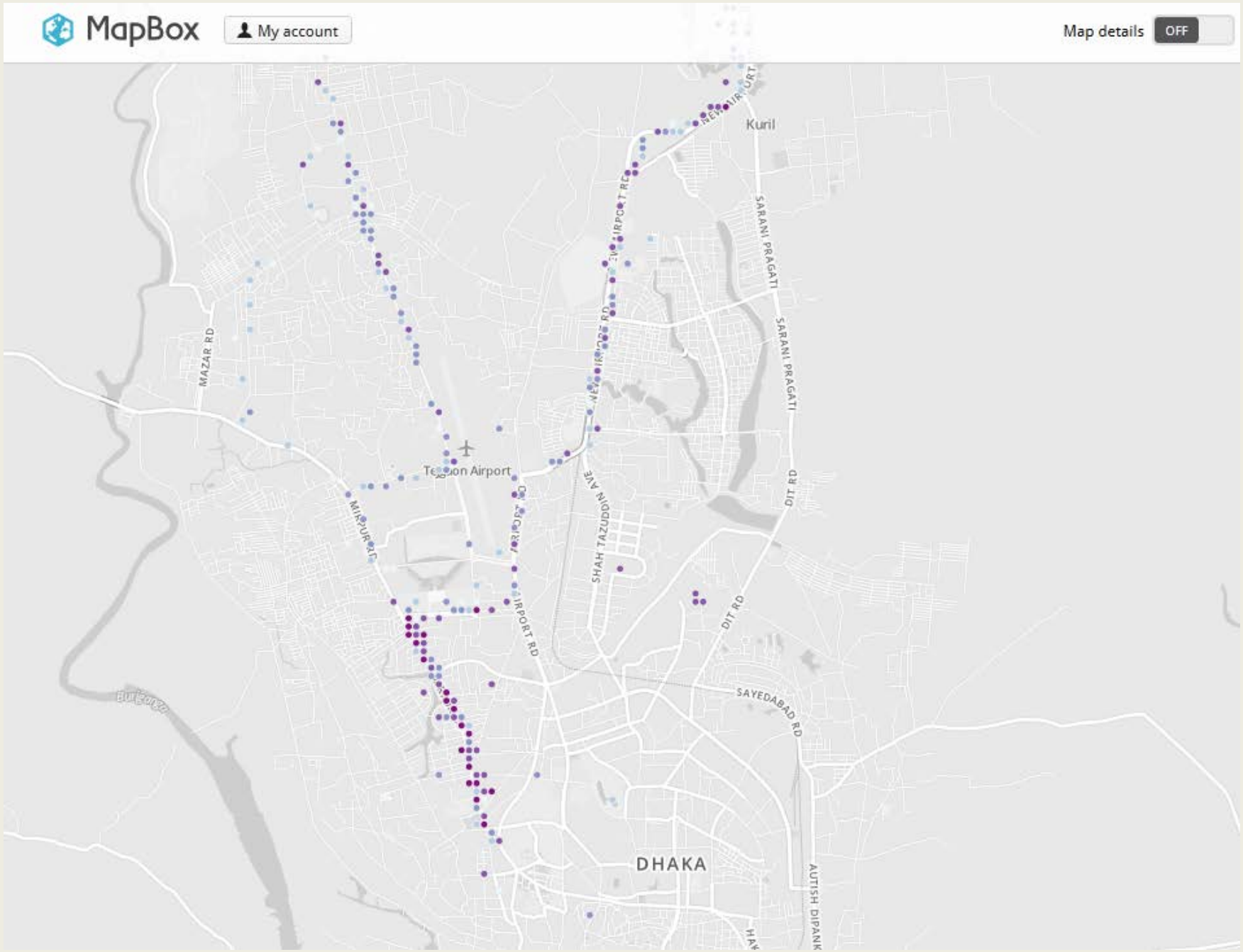

10:15
Salam mrching!
36
Uttara
BRTC
44
URBAN LAUNCHPAD
Bus Me 1

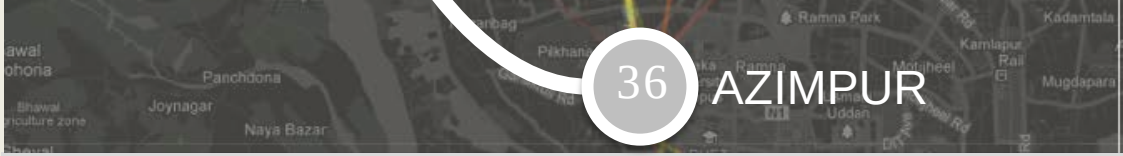

10:15
+1
+1
+5
Total female count
7
Total passenger count
39
+/- passengers
39
Total time (min)
0
Empty seats
5
70 Pacific St
URBAN LAUNCHPAD
Count Me 2


10:16
URBAN LAUNCHPAD
Survey Me 3


3-18-2012
Domingo
3-19-2012
Lunes
3-20-2012
Martes
3-21-2012
Miercoles
3-22-2012
Jueves
Estadio
Cricket
Desvio por
partido de
Cricket
36
Copa de
Asia Cricket
Finales –
Dhaka vs.
Pakistan
Rutas
de
buses
27


Living Dhaka Fieldwork Site
maps.google.com
+Stephen
Search
Images
Maps
Play
YouTube
News
Gmail
Documents
Calendar
More
Google
Stephen Kennedy
Share
Get directions
My places
Save to My Places
EDIT
Collaborate
Explore making custom maps in an interactive tutorial.
Living Dhaka Fieldwork Sites
Public - 4 Collaborators - 439 views
Created on Jan 9 - By Albert - Updated Jan 25
Rate this map - Write a comment - KML
Motijheel - Paltan
Latitude 23.730178 Longitude 90.416225
Motijheel - Ittefaq
Latitude 23.721760 Longitude 90.4216
Motijheel - Fulbaria
Latitude 23.723086 Longitude 90.416675
Mogbazar - New Eskaton Road
Latitude 23.746878 Longitude 90.403342
Mogbazar - Mouchak
Latitude 23.745814 Longitude 90.412392
Mogbazar - Baily Road
Latitude 23.737447 Longitude 90.404380
Basundhara - Basundhara Road
Latitude 23.811948 Longitude 90.421921
Basundhara - Norda Road
Latitude 23.809494 Longitude 90.421257
Kotwali - Chankhar Pul
Last Updated by Albert on Jan 11
Sun, Jan 8, 2012
11:30 am
Pedestrians - 31 per min
Rickshaws - 33 per min
Cars - 1.7 per min
Directions
Search nearby
Save to map
more
Map
Photos
Dhaka
Edit in Google Map Maker


MapBox
My account
Map details
OFF
Kuril
SARANI PRAGATI
SARANI PRAGATI
MAZAR RD
Tejgaon Airport
SHAH TAZUDDIN AVE
DIT RD
DIT RD
SAYEDABAD RD
DHAKA
AUTISH DIPANK



Slowness

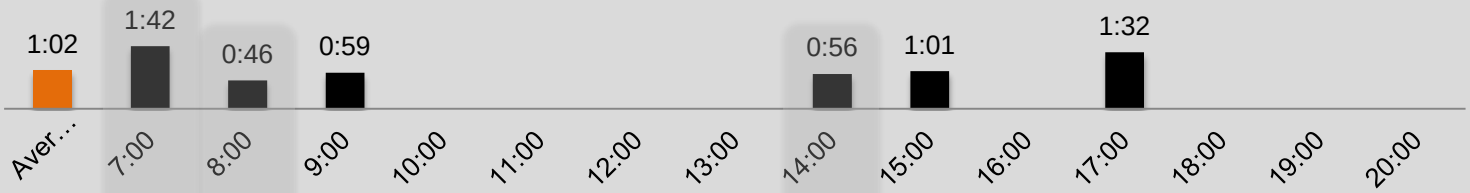
One-way commute times

36

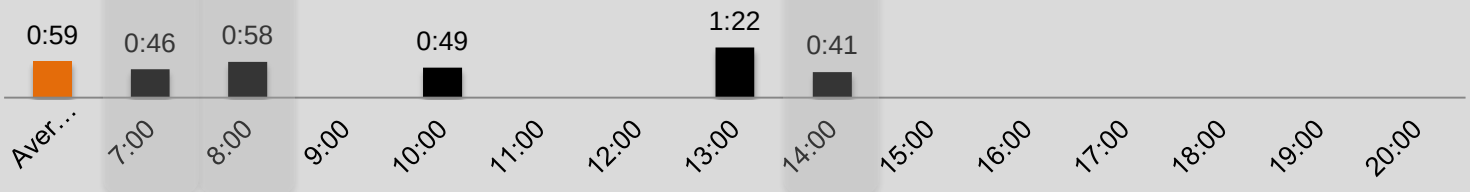
OVERALL

12.4 km

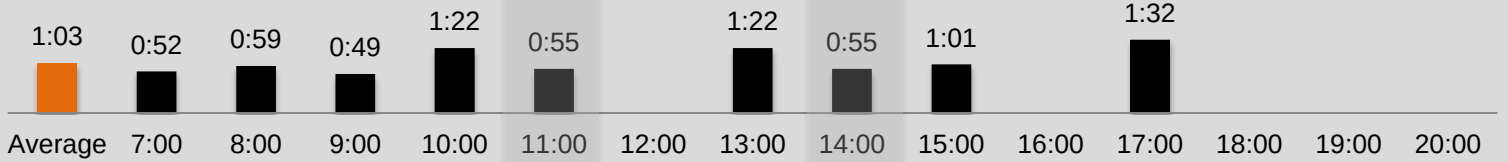
Inbound



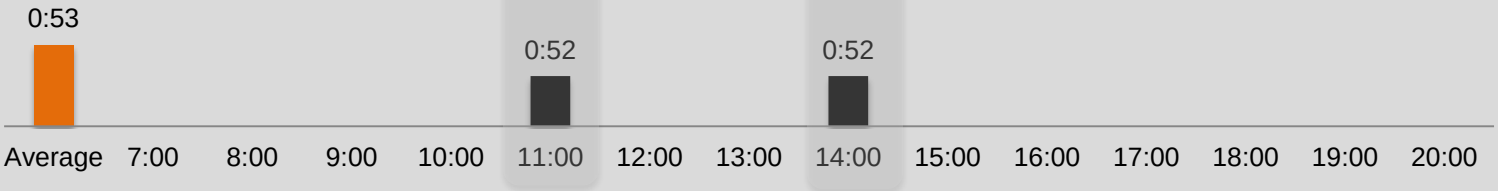
Outbound



Weekday



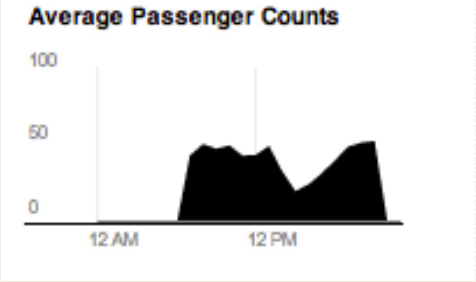
Weekend

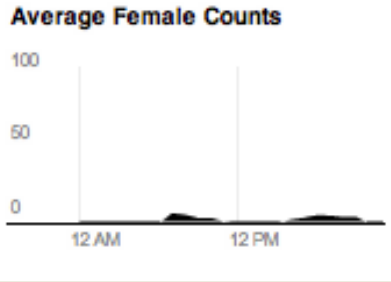


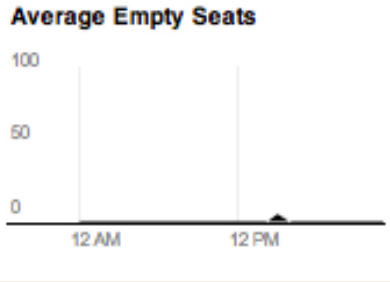
Travel Times

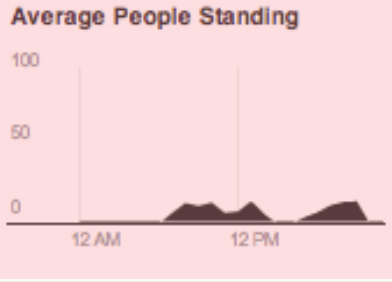
2.3

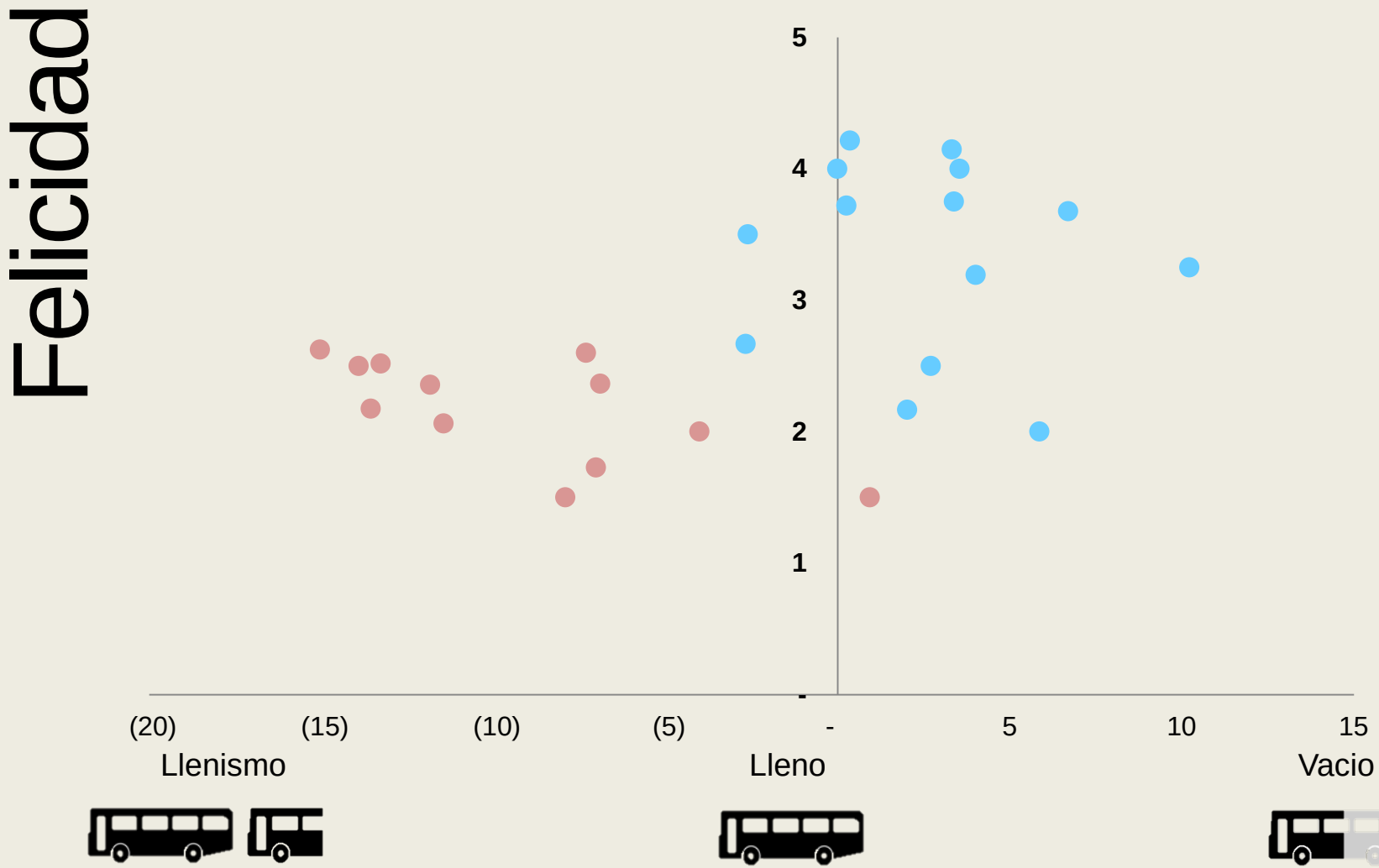
VIP 39 seats per bus

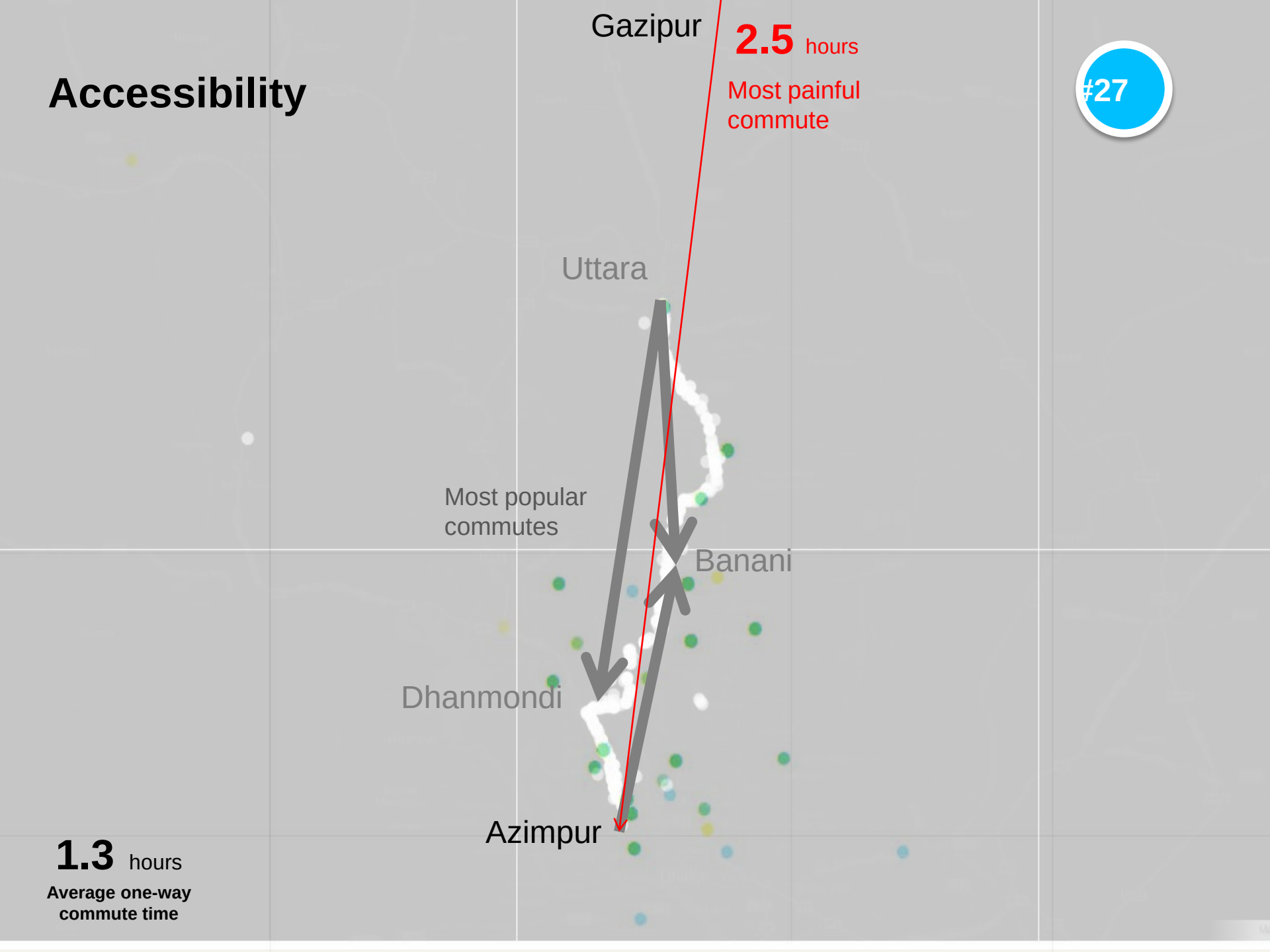


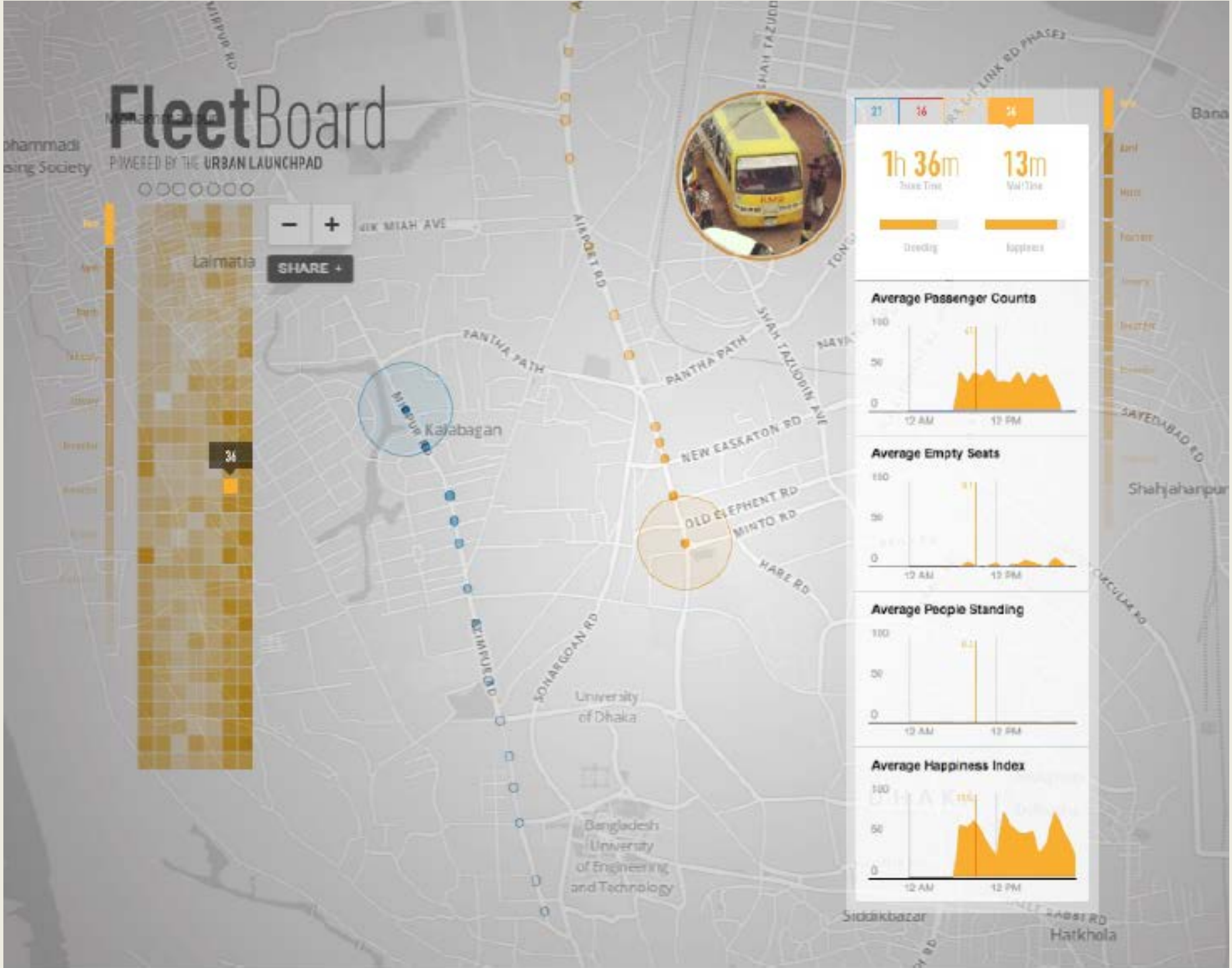


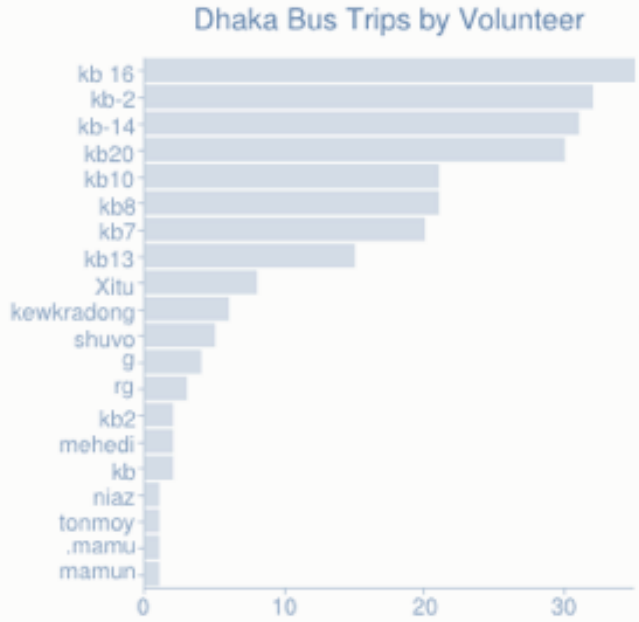


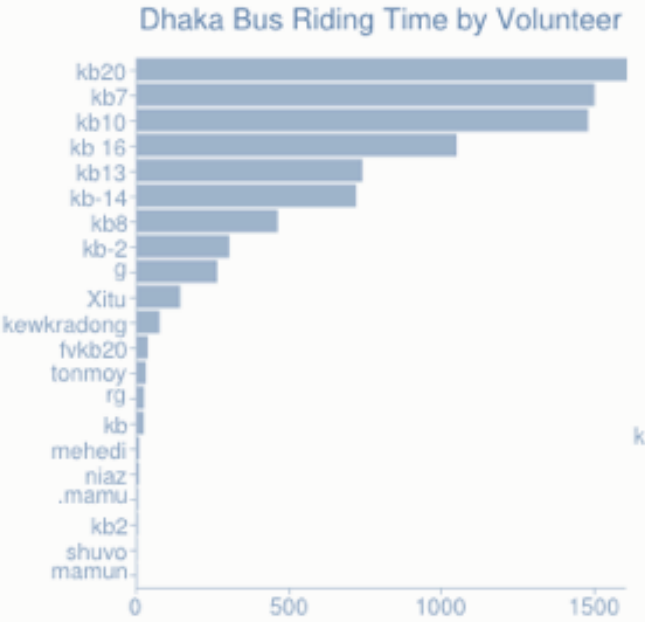


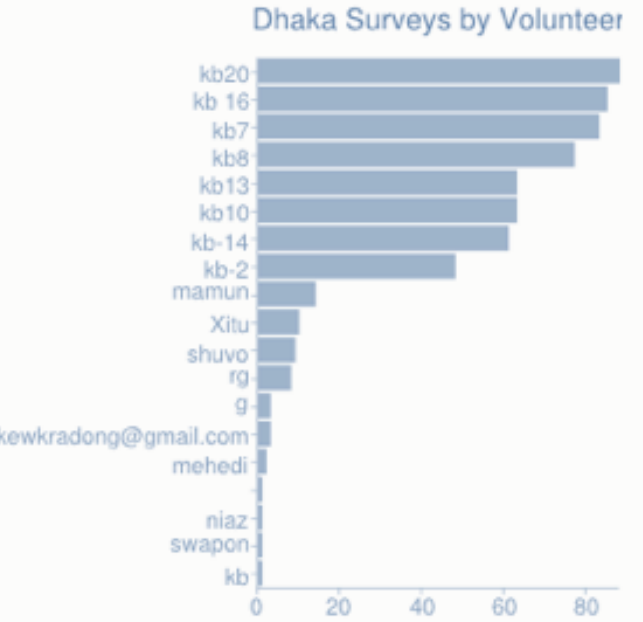



Accessibility
Gazipur
2.5 hours
Most painful commute
#27
Uttara
Most popular commutes
Banani
Dhanmondi
Azimpur
1.3 hours
Average one-way commute time

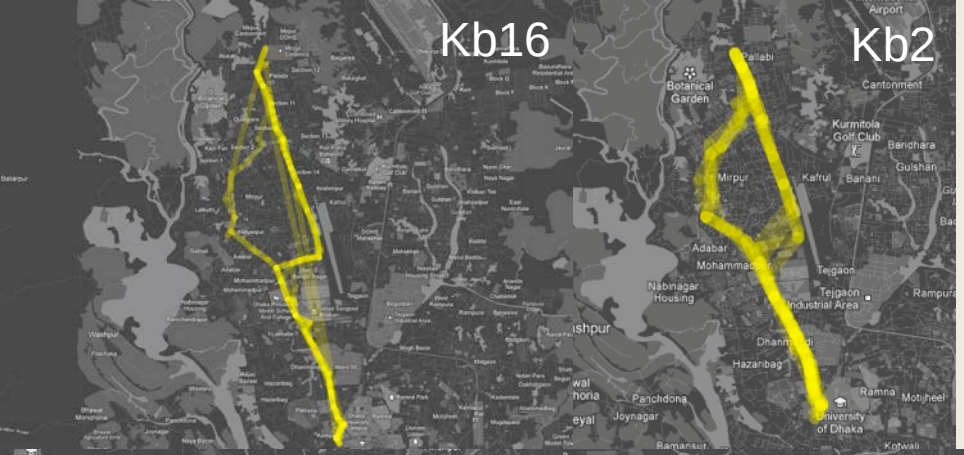

FleetBoard
POWERED BY THE URBAN LAUNCHPAD
SHARE +
Lalmatia
Kalabagan
PANTHA PATH
NEW EASKATON RD
OLD ELEPHENT RD
MINTO RD
HABE RD
SOHARDOAN RD
University of Dhaka
Bangladesh University of Engineering and Technology
Siddikbazar
Hatkhola
Shahjahanpur
1h 36m
13m
Average Passenger Counts
Average Empty Seats
Average People Standing
Average Happiness Index
12 AM
12 PM







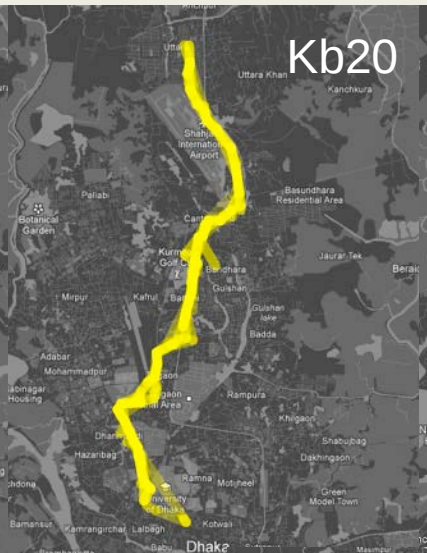
Data Collection Dash

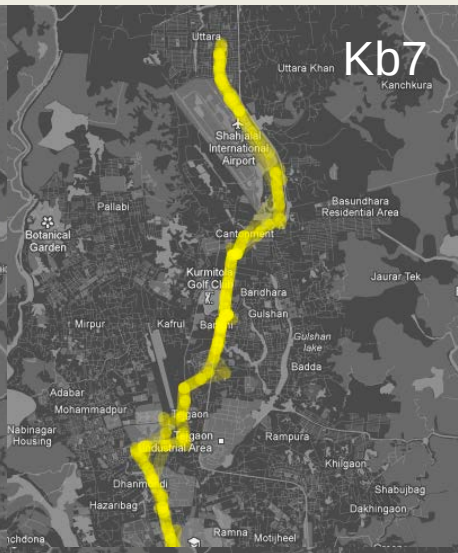

Kb16

Kb2


Kb10


Kb14


Kb20


Kb7


Kb8


Kb13

1,014

Individuals surveyed on Dhaka buses during rides in one week

(16% female of those counted on buses)

18%

Female respondents

(20% total population estimated in this category)

24-34 AGE

85% of respondents

(Per capita GDP of $1700)

$2,000 USD

Avg income of survey respondents

1.2 hours

Average one-way commute time

3.5 days per week

Average bus riding frequency

100%

Respondents who owned a mobile phone 18% owned a smartphone and 50% with an internet-enabled multimedia phone

(59% total in Bangladesh estimated with mobile phones)

***potential flock bias**

Current Bus Riders in Dhaka

16% female (of those counted)

100% with a mobile phone (18% with smartphone, 50% with internet-enabled multimedia phone)

Young, Male, Captive, Mobile, Hates Crowding

85% surveyed btwn 24-34 years

57% ride at least 5 times a week

Most common complaint about buses (23%)

Long waits (21%) and Too few buses (20%) were also common

* Potential flock bias

Happiness

Bus Travel Times

Weekday

Weekend

#27

Uttara

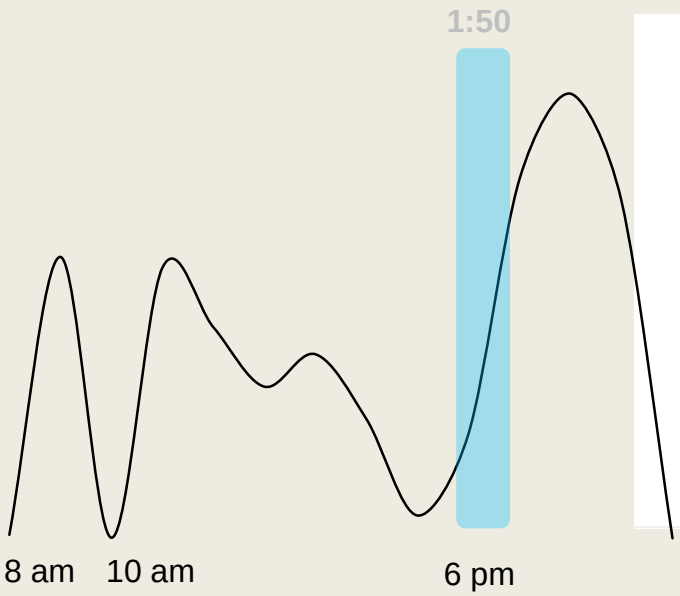
2:07 Bad day

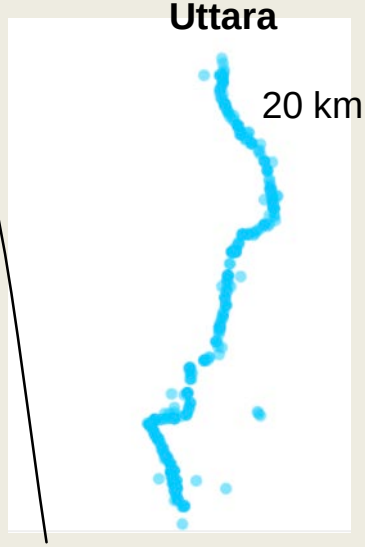
1:47

1:25 Average

1:04

0:43 Good day

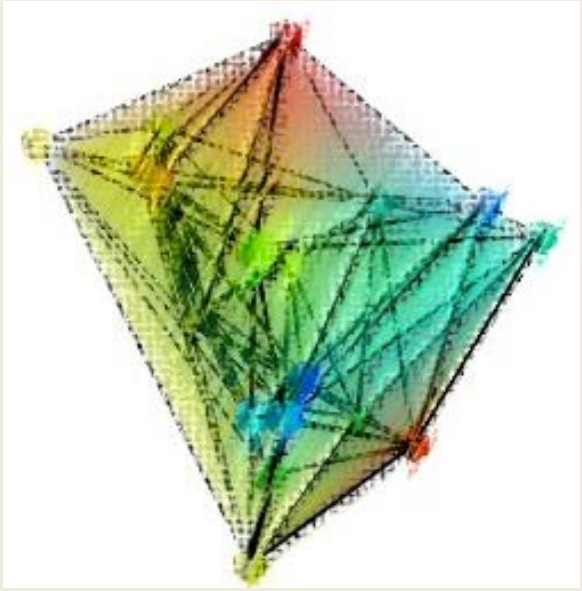




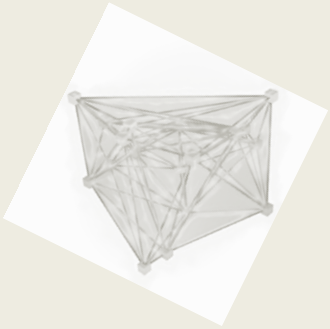
2
(Real-Time)
User Services

*Data based on 42 Rides in March 2012

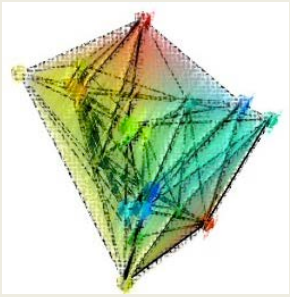
Dhaka bus system



Flock bias



Sample size



Aplicaciones potenciales

- Para la ciudadania
- Para los operadores
- Para las autoridades