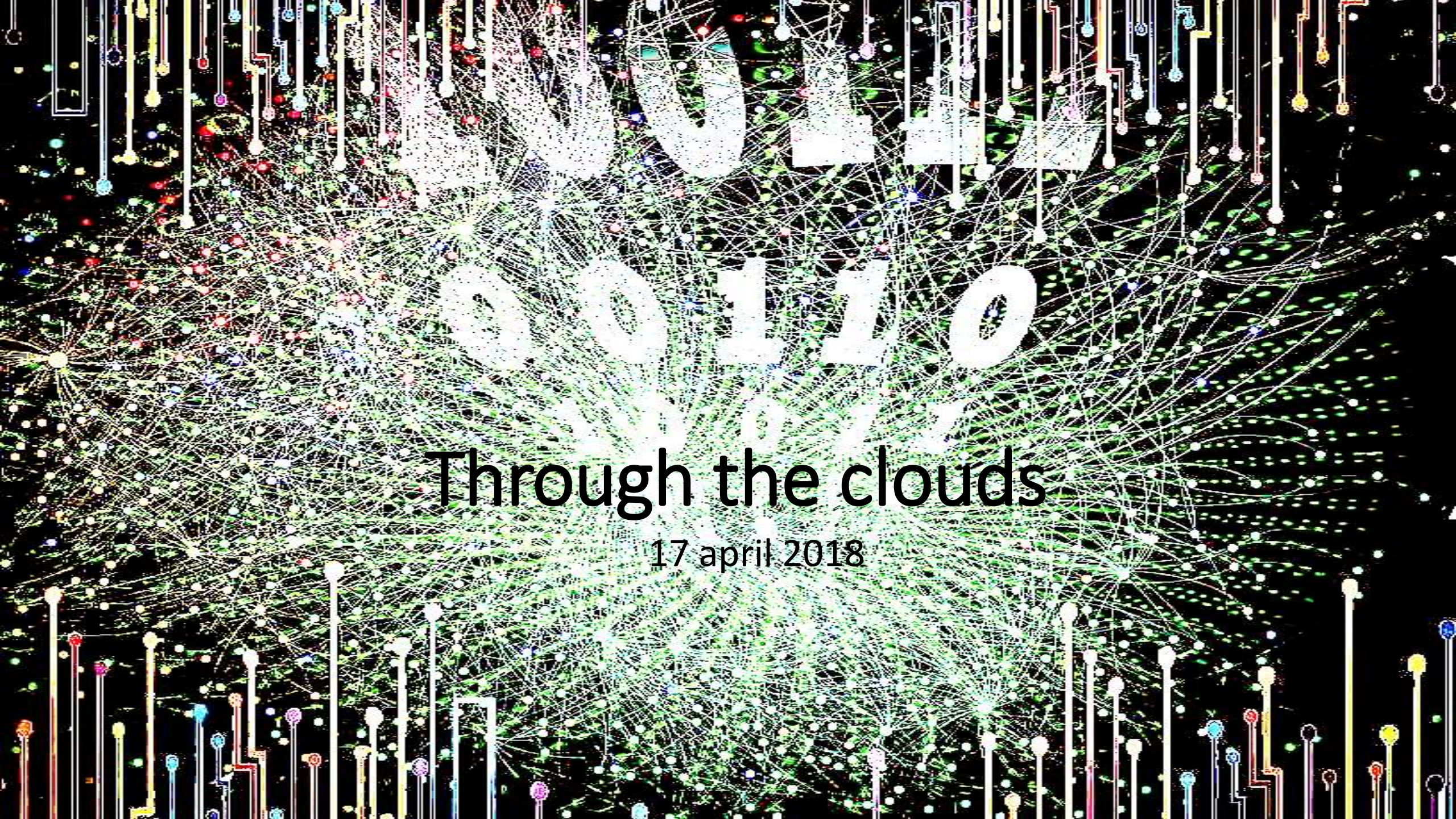


Through the clouds

17 april 2018

This is my father, Jan Piersma (1930-2016).

He owned a car repair store for almost 50 years. He had no computer system for inventory, no cash register and no customer relations system. When asked for a spare part from a motor block Vauxhall model 1972 he would immediately respond, "Second aisle left, top shelf, next to the model 1968."
He based his business decisions on knowledge and insight: "Do not take in the Toyota models for spare parts, but do so take them for the Volkswagen; they always break."

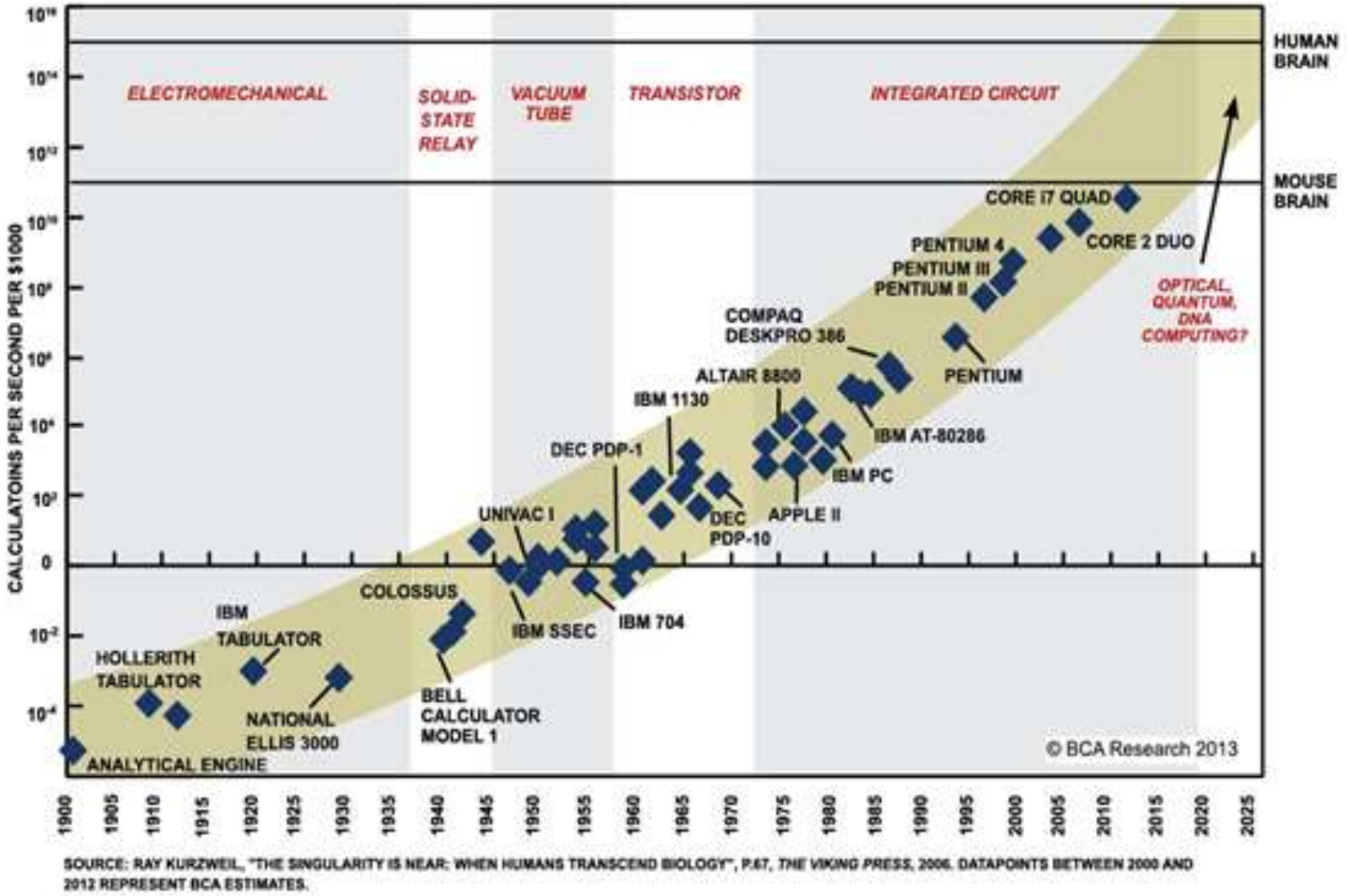
He memorized it all. Now, the digital society is here.

DIGITAL SOCIETY IS HERE

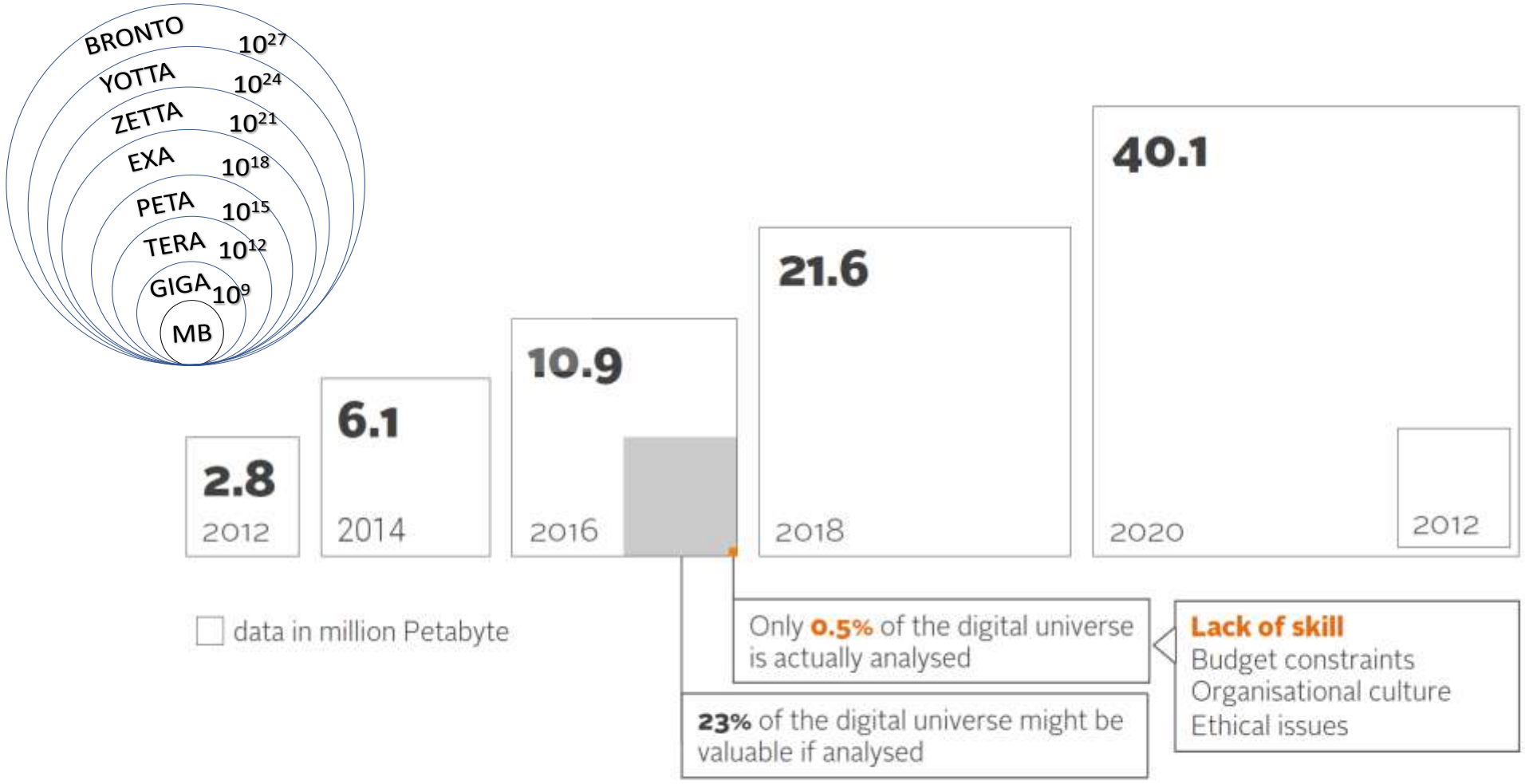
T	Tele-vision, tele-phone	Anywhere
E	E-business, E-commerce	Anytime anywhere
I	I-Pad I-Phone	Anytime Anywhere Individual

Ballon, 2016

COMPUTER POWER



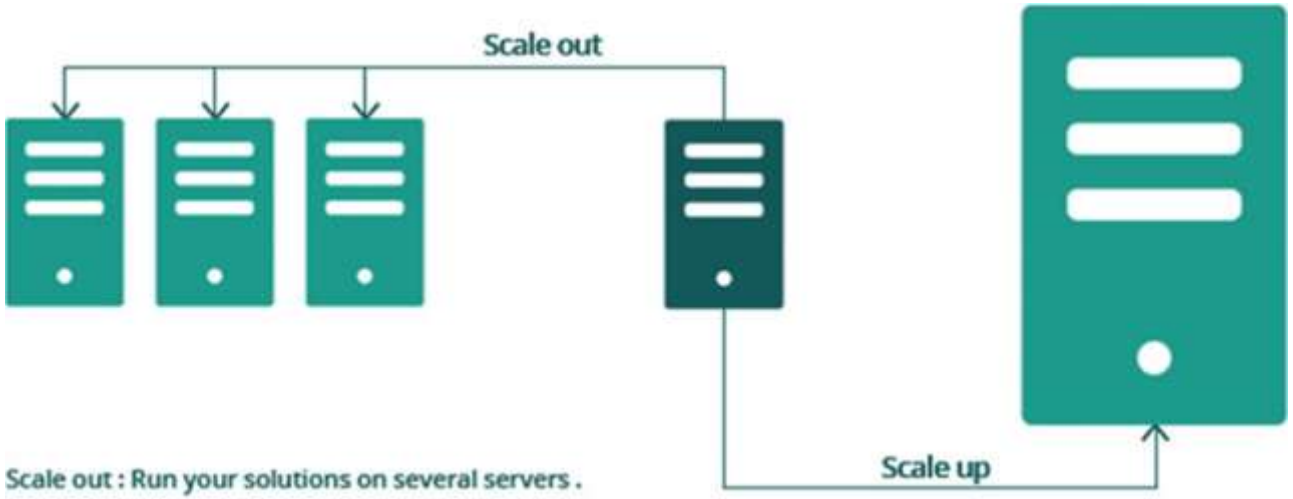
SOURCE: RAY KURZWEIL, "THE SINGULARITY IS NEAR: WHEN HUMANS TRANSCEND BIOLOGY", P.67, *THE VIKING PRESS*, 2006. DATAPOINTS BETWEEN 2000 AND 2012 REPRESENT BCA ESTIMATES.



source: Wallstreet Journal

Internet of Things & Connected Devices

CLOUD ENVIRONMENT



Scale out : Run your solutions on several servers .

Scale up : Run your solutions on bigger server.

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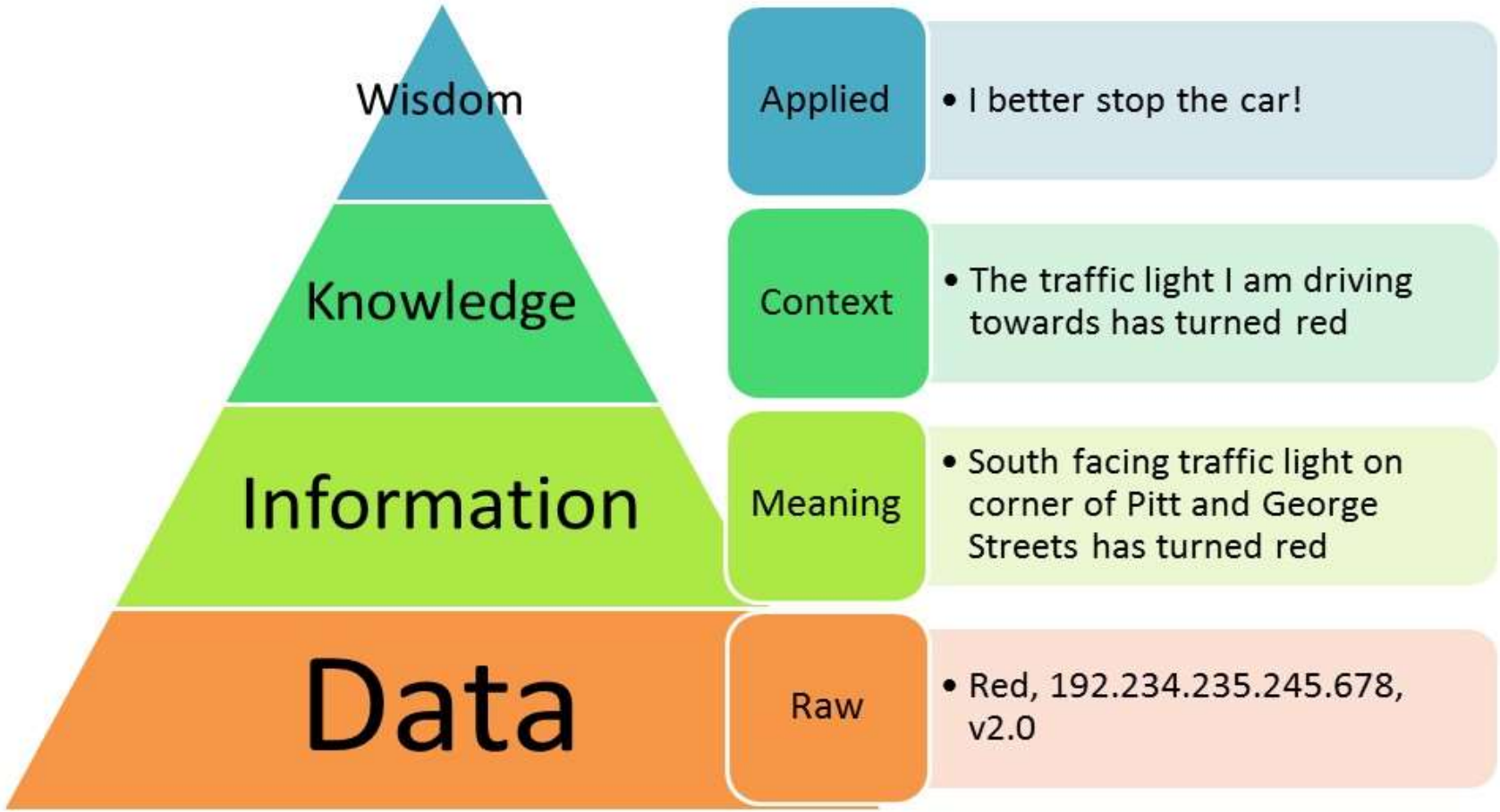
DEVELOPING A CITY BRAIN

How can we use data & computational power in urban environments?



https://thedatalab.com/

Urban Computing

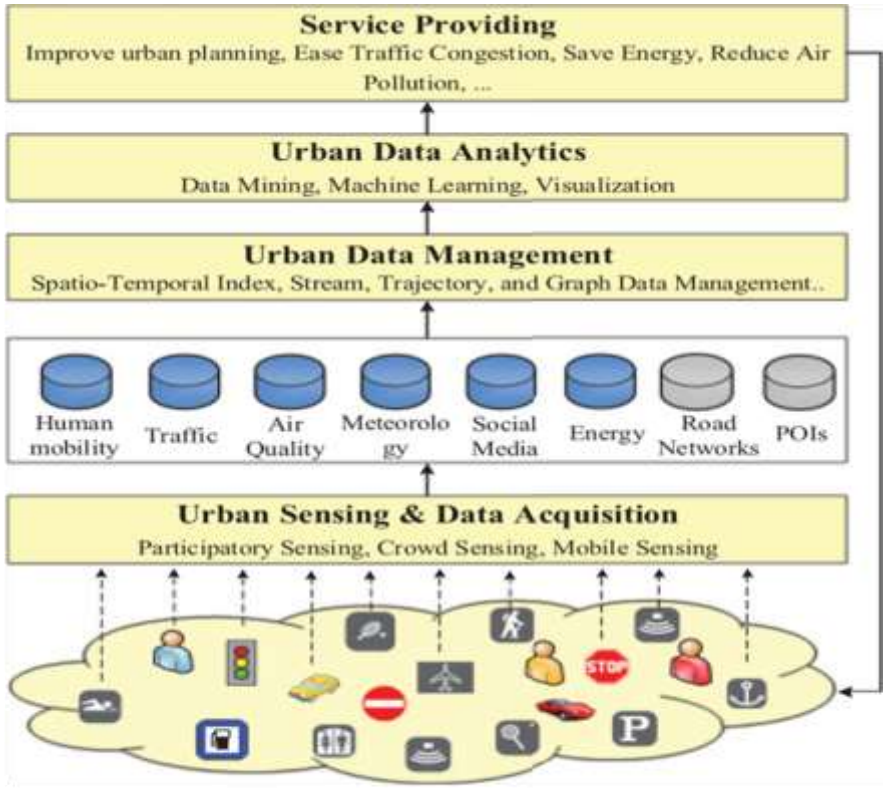


Fig. 2. General framework of urban computing.

(Zheng, Capra, Wolfson, Yang, 2014)

DATA MANAGEMENT

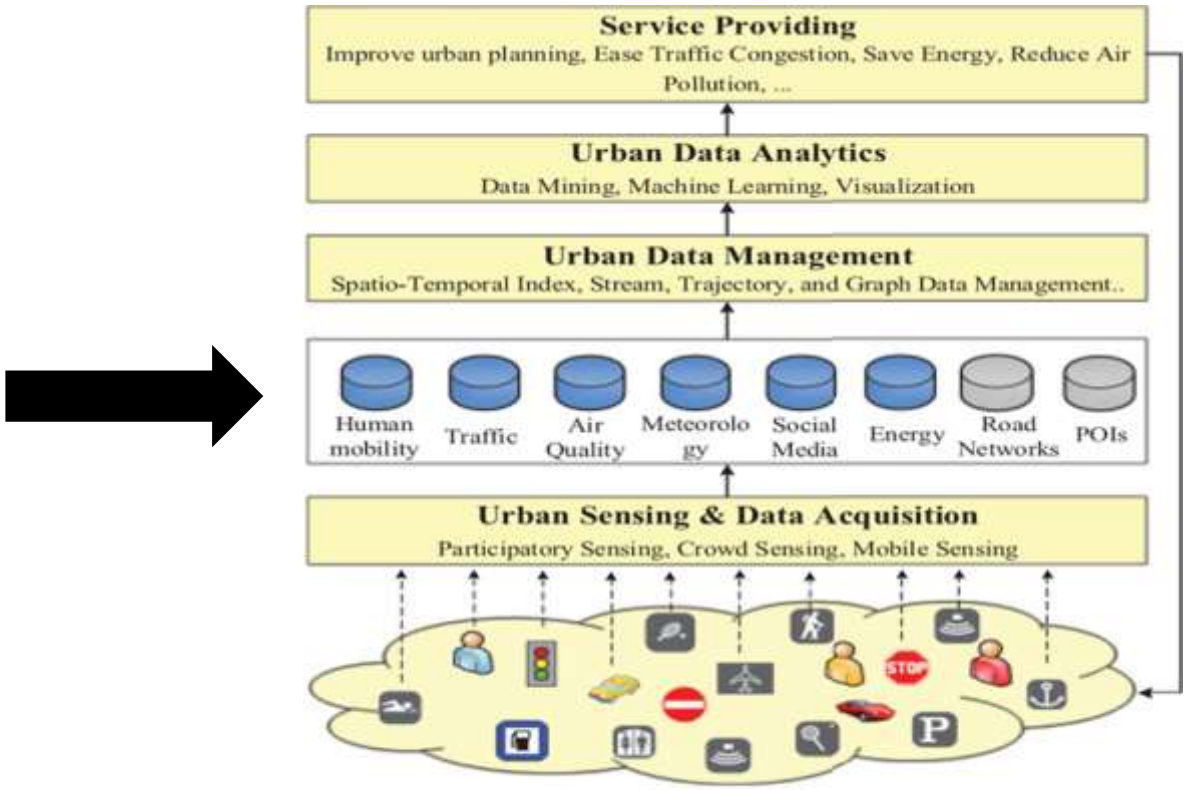
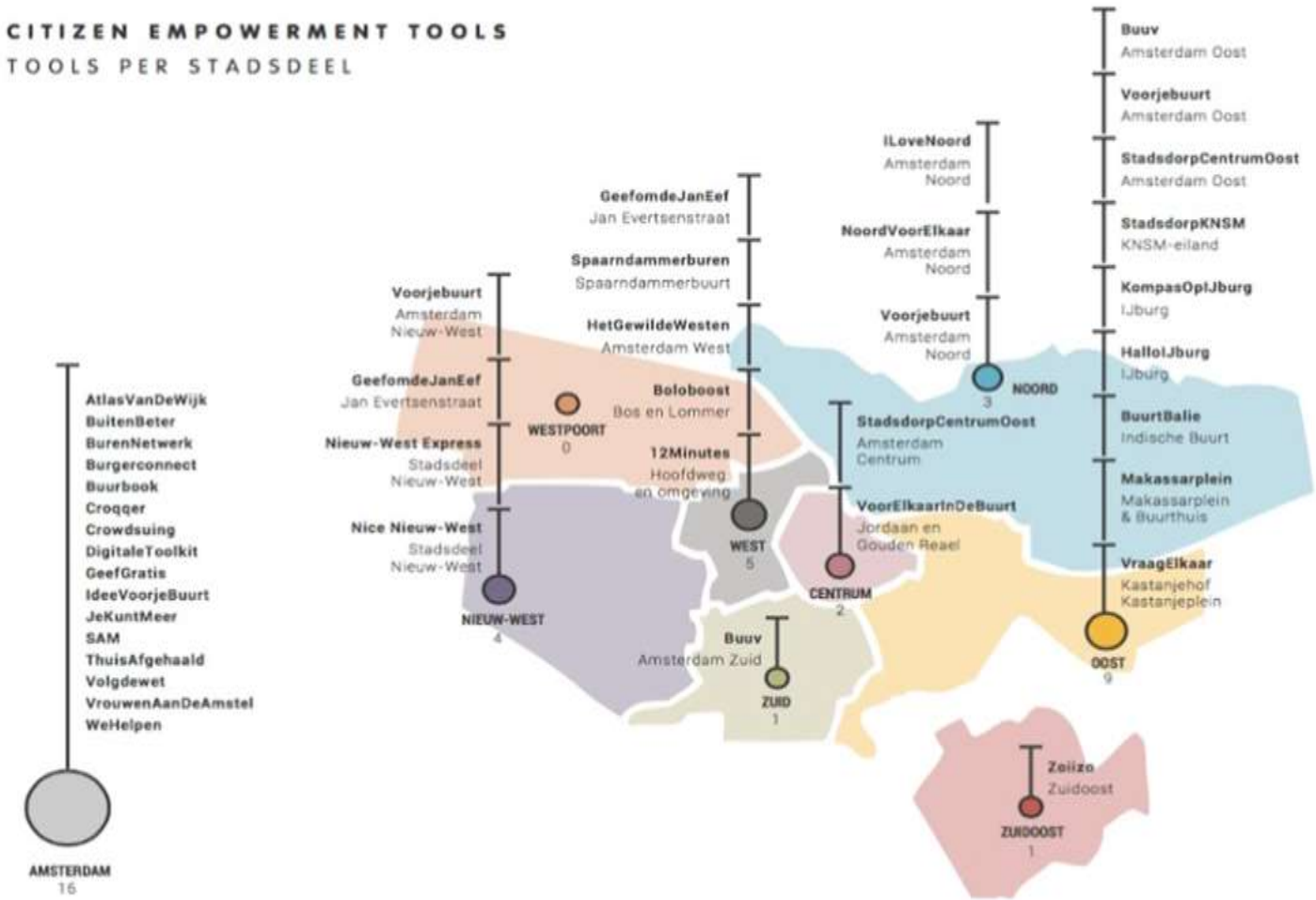


Fig. 2. General framework of urban computing.

DATA IN A SMART CITY



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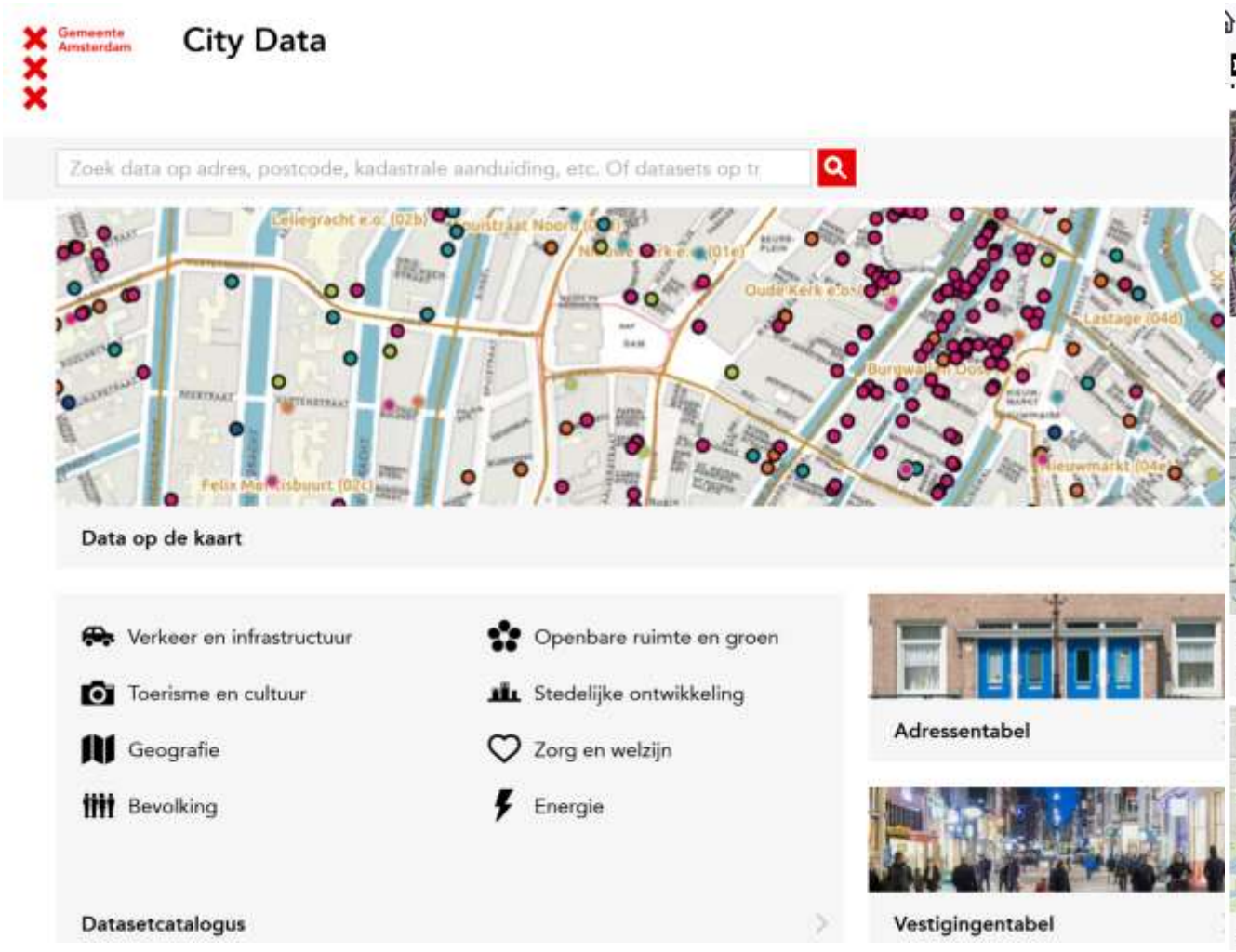
CITIZENS DATA LAB

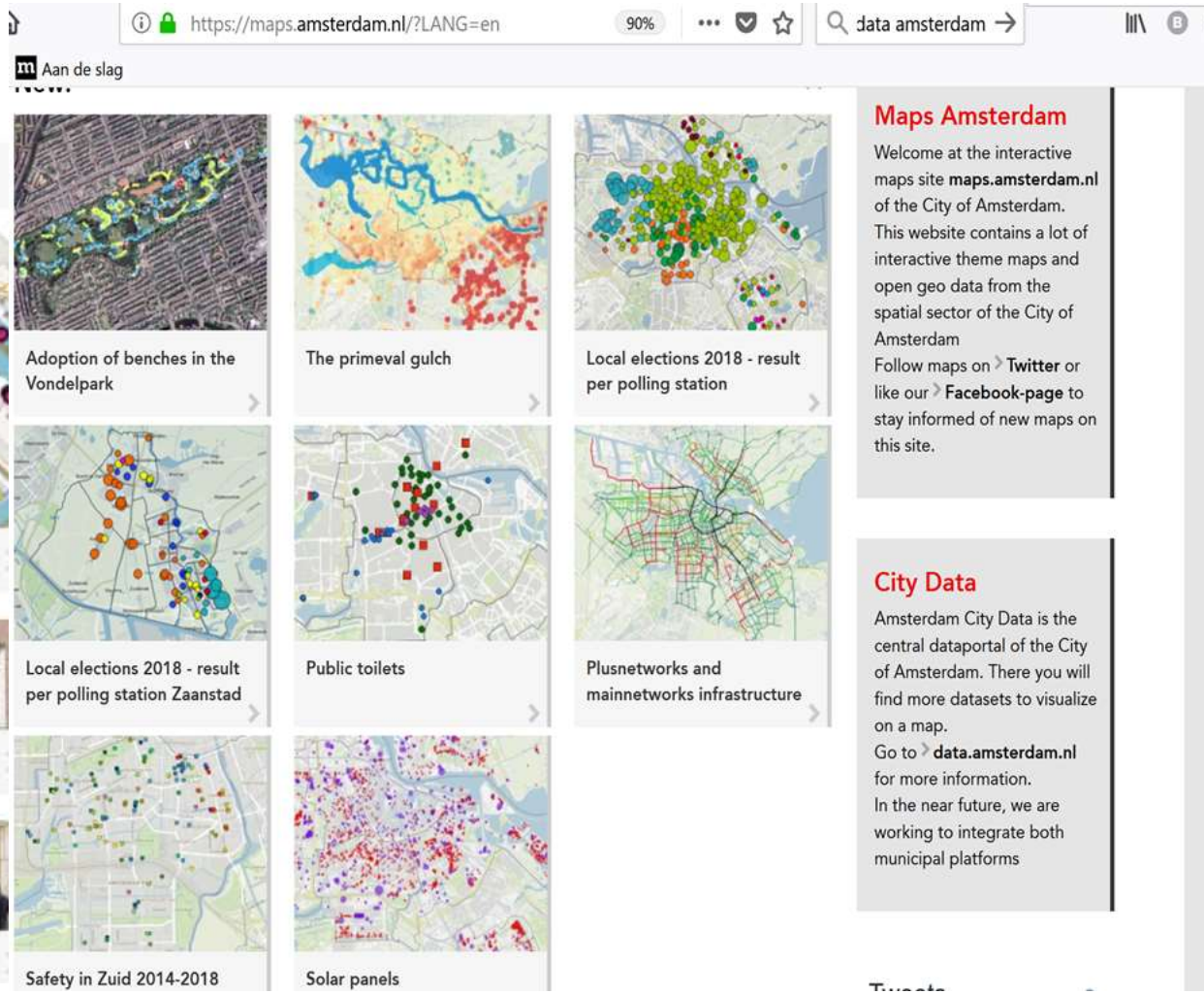
Participatory Mapping

Community Empowerment

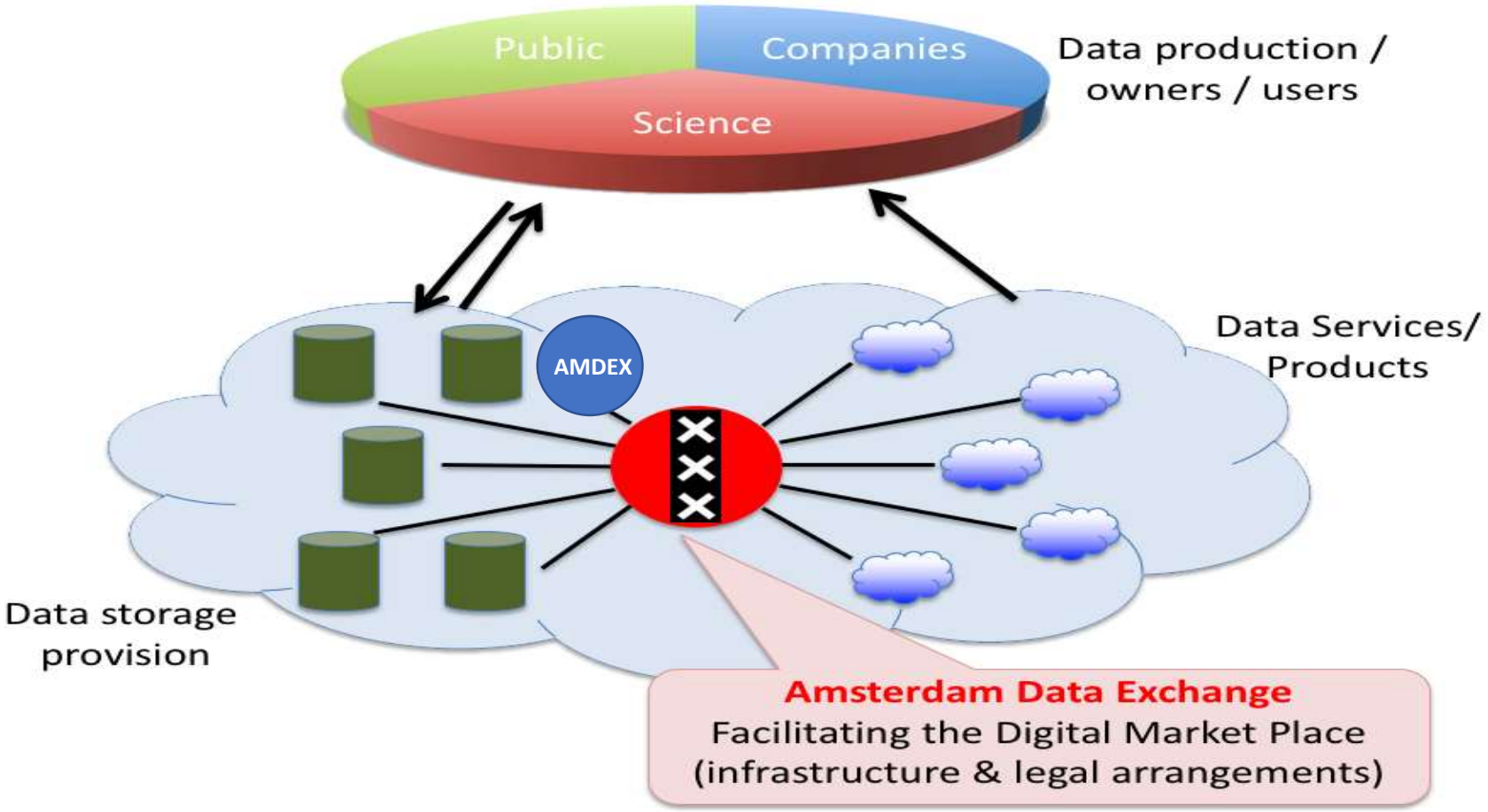
Data Awareness

OPEN DATA AMSTERDAM





Amsterdam Data Exchange (AMDEX)



CITY BRAIN ≠ DATA

CITY BRAIN infrastructure

CITY BRAIN services

Inclusive

Top Down and Bottom Up

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FACT

“Rather than to avoid the use of data altogether, we strongly believe that data science techniques, infrastructures and approaches need be made responsible by design”

Van der Aalst , Bichler Heinzl 2017

Fair

Accurate

Confidential

Transparant

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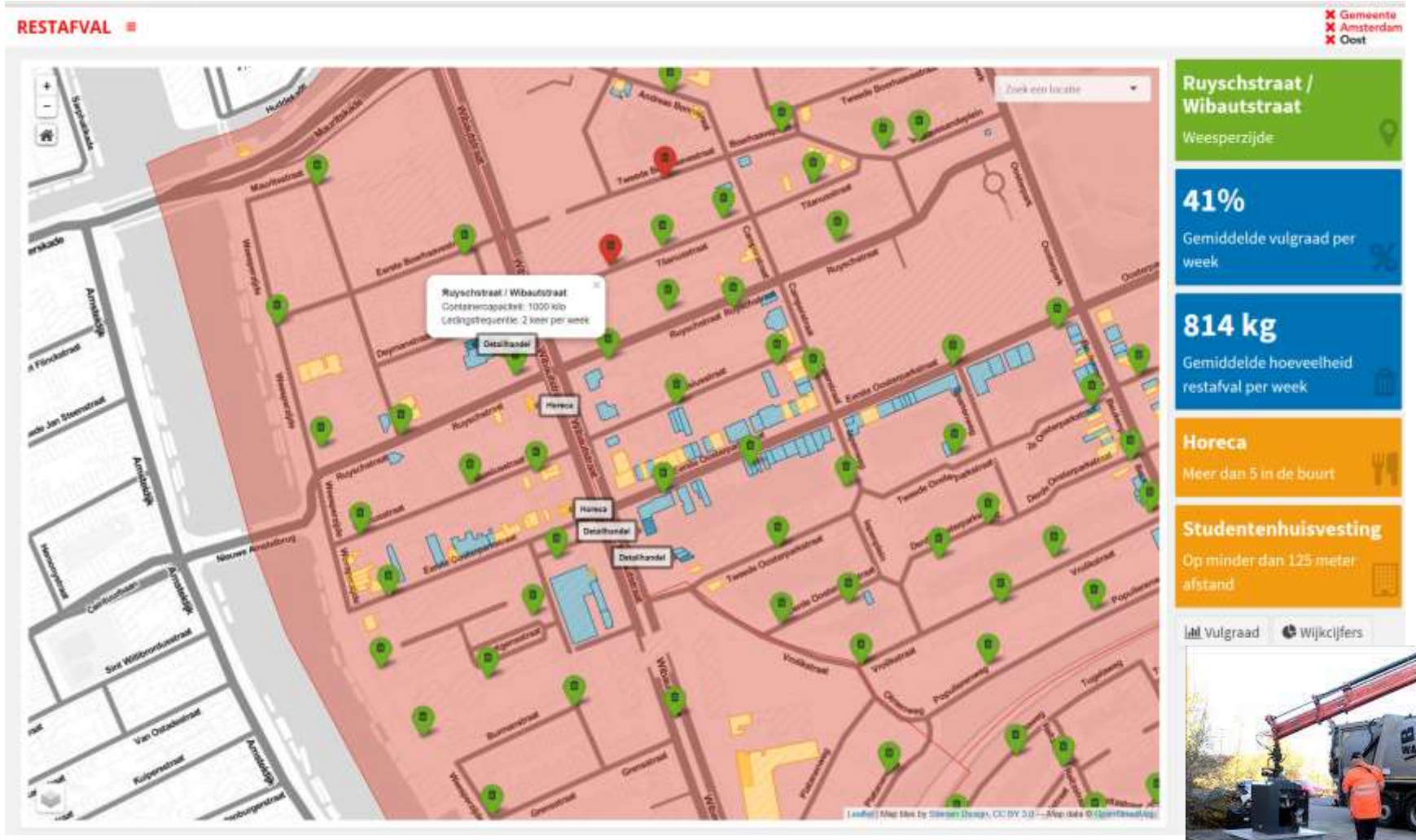
URBAN TECHNOLOGY

SOLUTIONS FOR SUSTAINABLE, LIVEABLE AND CONNECTED CITIES

UNDERGROUND WASTE CONTAINERS



https://restafval-amsterdam-oost.shinyapps.io/dashboard/

Data driven household waste collection

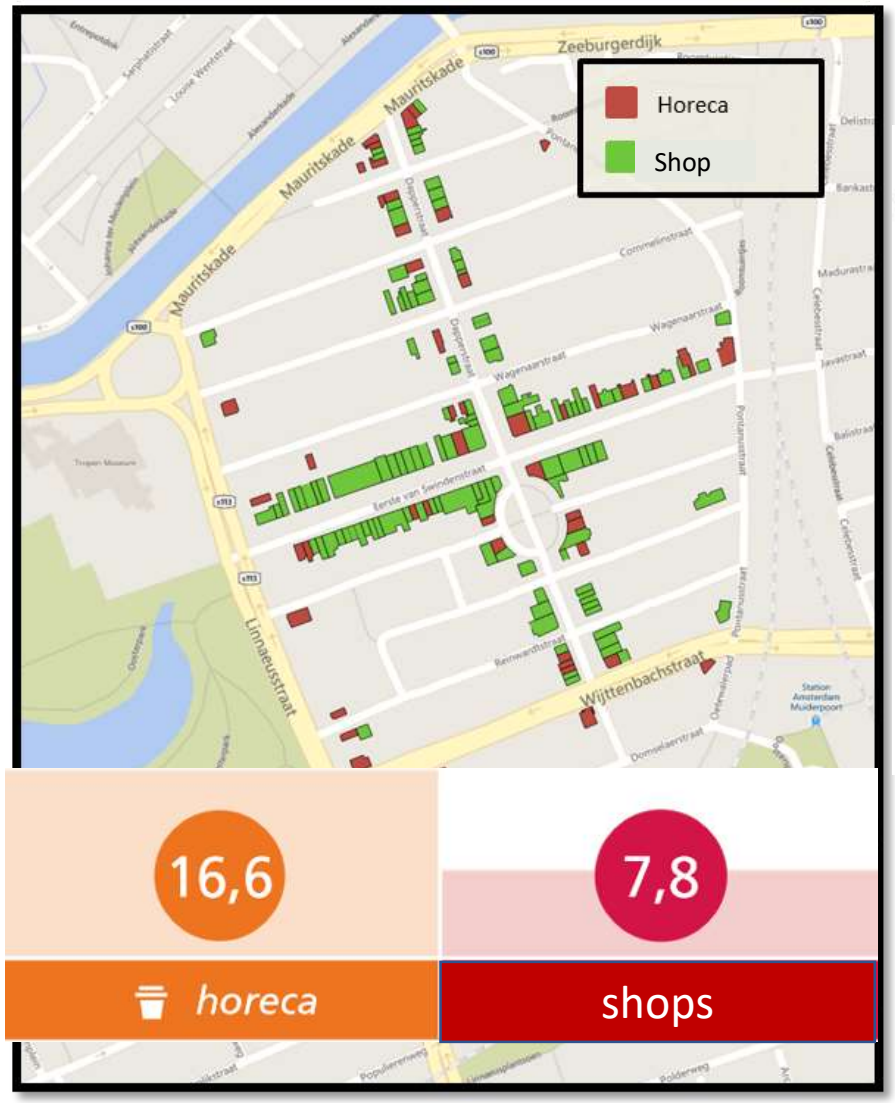
Predicting container fill rates

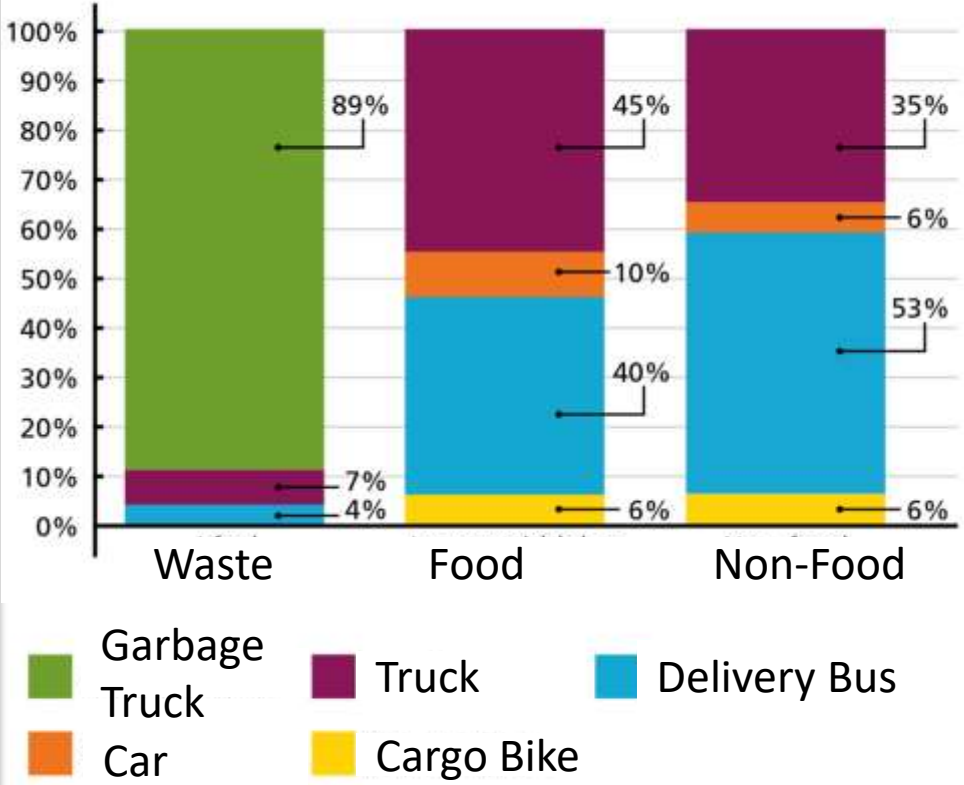
Optimize container locations (glass, paper, waste)

Data driven garbage collection planning

URBAN MOBILITY

Logistic profiles SHOPPING STREETS





Stadslogistiek in beeld profiel Oude Pijp, Ploos van Amstel, Balm 2016

Urban analytics

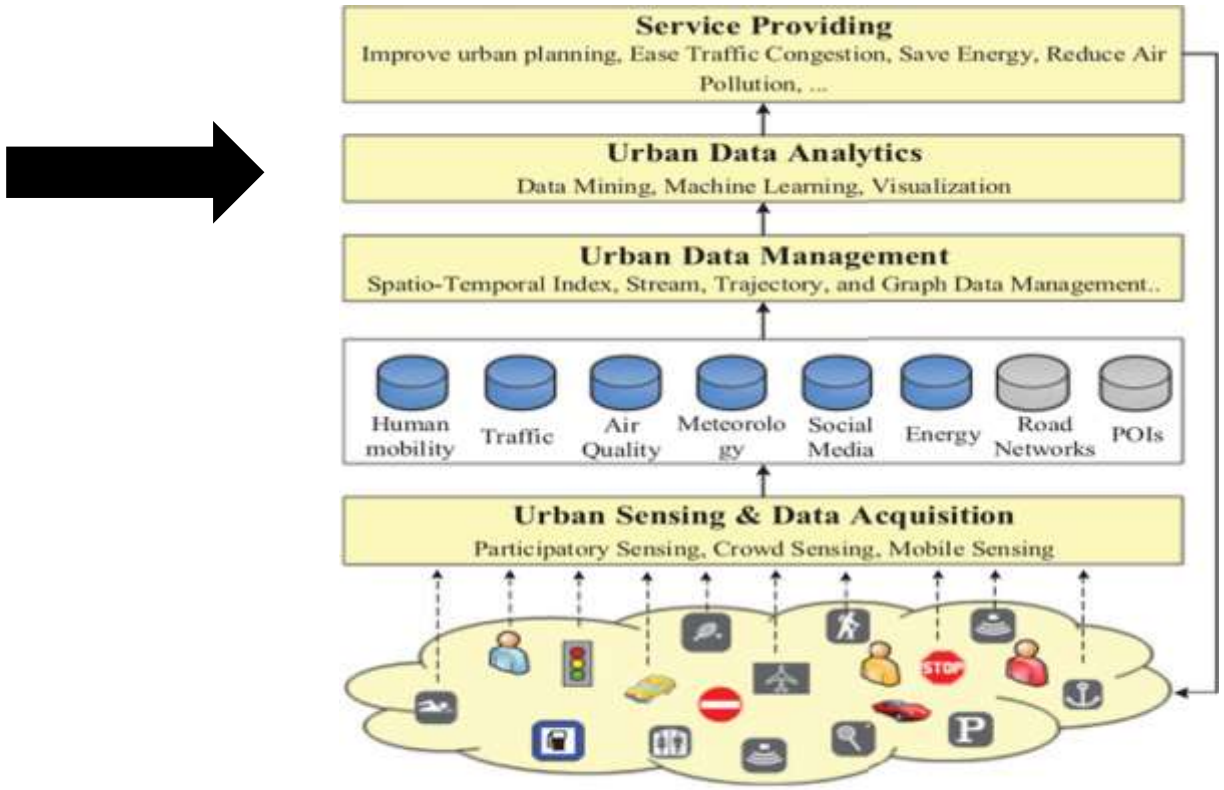
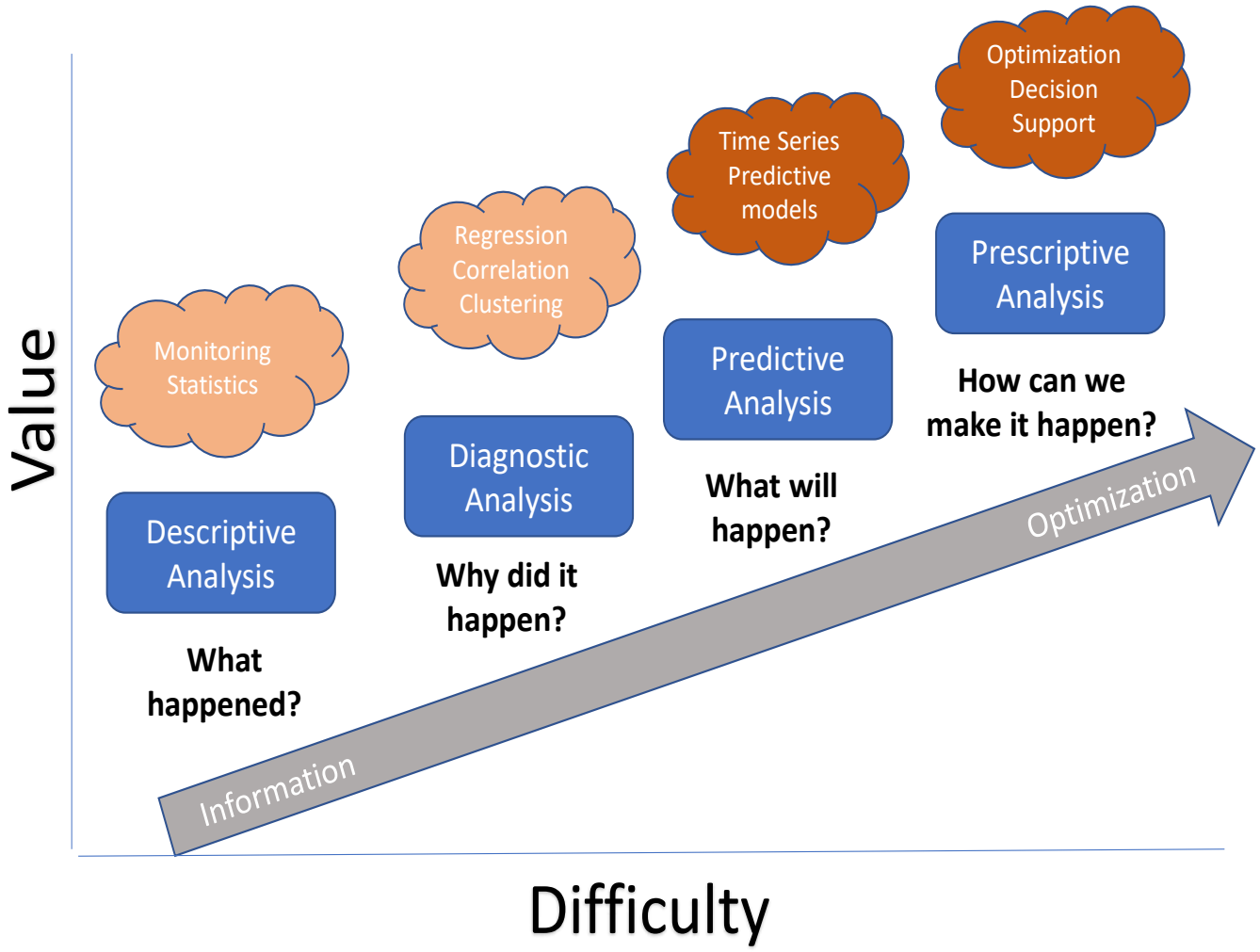


Fig. 2. General framework of urban computing.

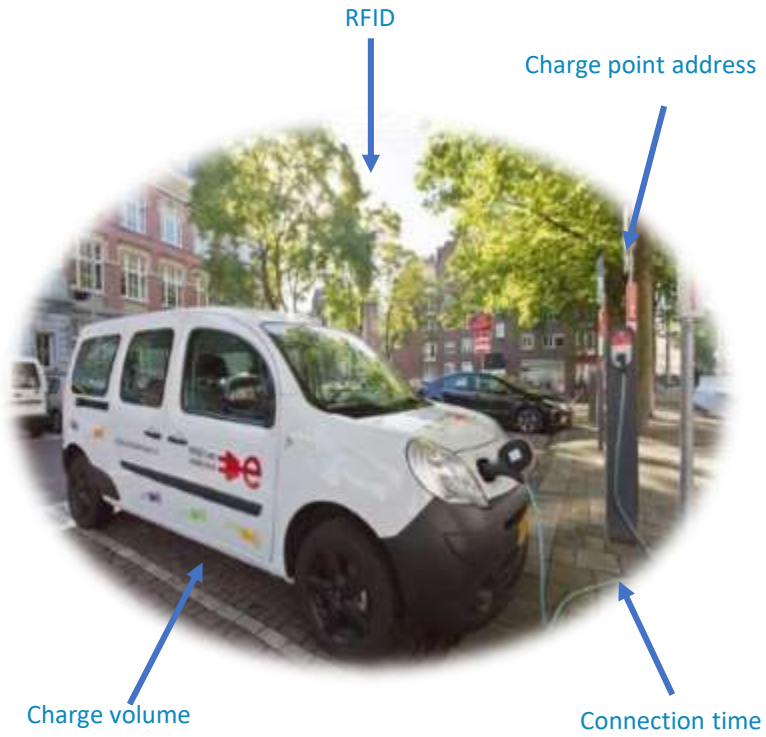

Value
Monitoring
Statistics
Descriptive
Analysis
What
happened?
Regression
Correlation
Clustering
Diagnostic
Analysis
Why did it
happen?
Time Series
Predictive
models
Predictive
Analysis
What will
happen?
Optimization
Decision
Support
Prescriptive
Analysis
How can we
make it happen?
Information
Optimization
Difficulty

Gartner.com

Parameter	Example	Explanation
Charge point address	Admiralengracht 44	Adress of the charge point
Charge point operator	Nuon	Owner of the charge point
Charging service provider	Essent	Owner of the used charging card
Charge point city	Amsterdam	
Charge point postal code	1057EW	ZIP code of the area of the charge point
Volume	0,86	Charged energy [kWh]
Connection time	0:14:23	Time the car was connected
Start Date	18-04-2012	Date the session started
End Date	18-04-2012	Date the session ended
Start Time	23:20:55	Time the session started
End Time	23:35:18	Time the session ended
Charging time	0:14:23	Time the car is actually charging
RFID	60DF4D78	RFID code of a charging card

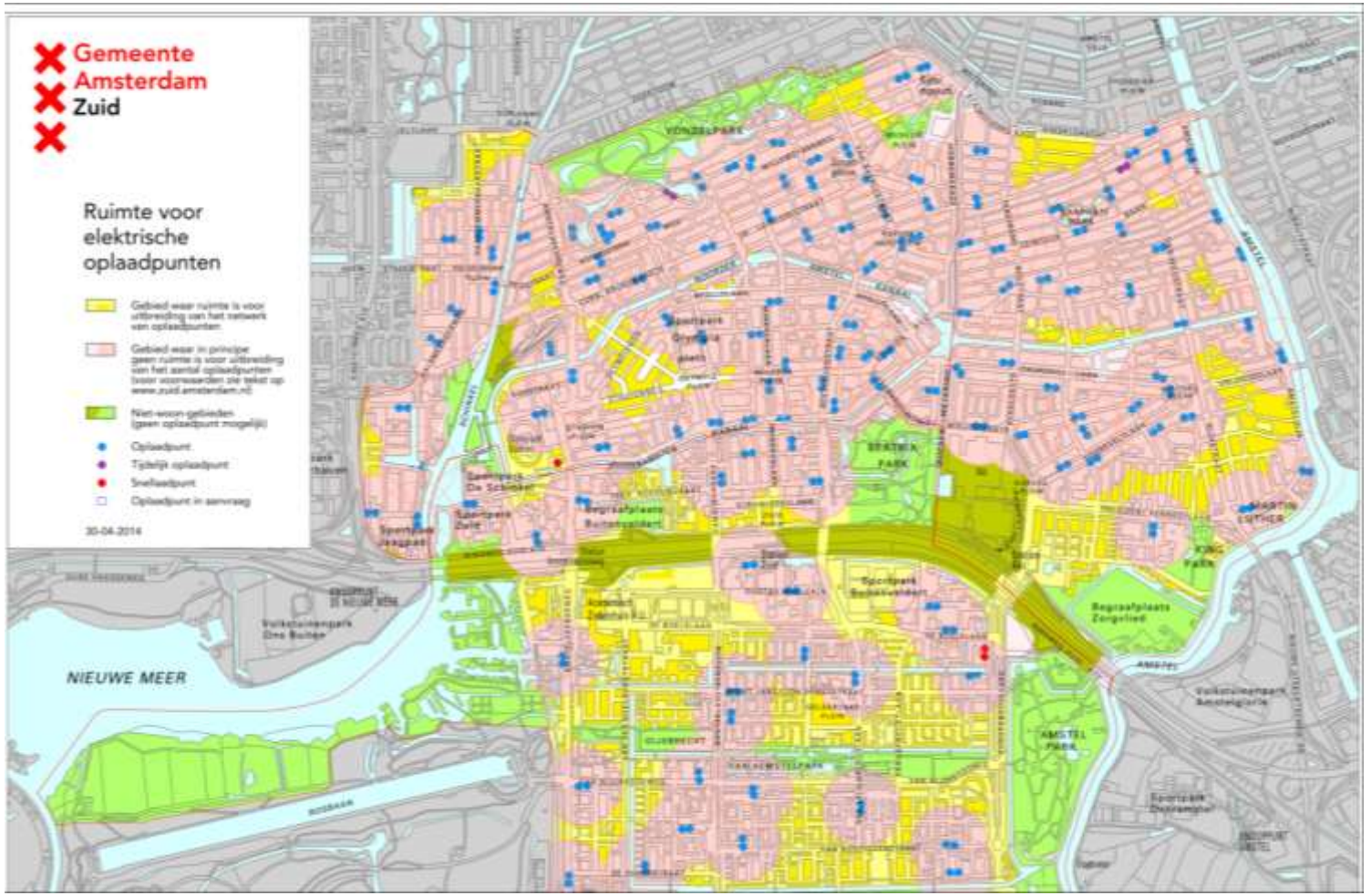
ENERGY Charging electric vehicles

Anonymous data about charge sessions is collected since 2012



NOTE:

Amsterdam Zuid: Has the highest density of charge poles in the WORLD!



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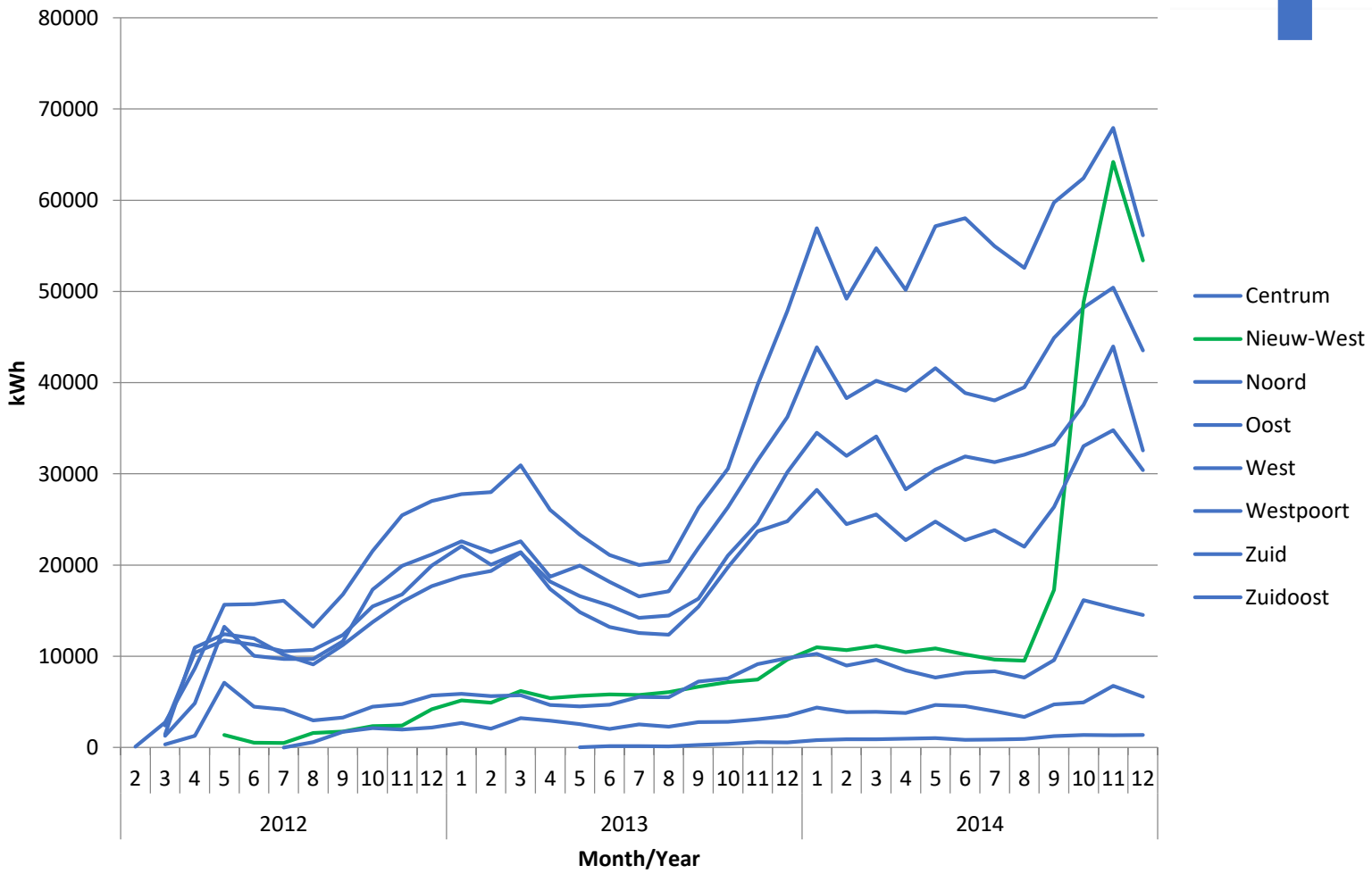
2014 Electric Taxi Tender Schiphol



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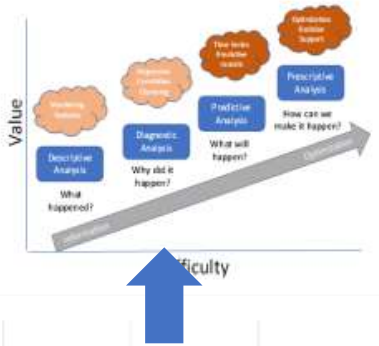
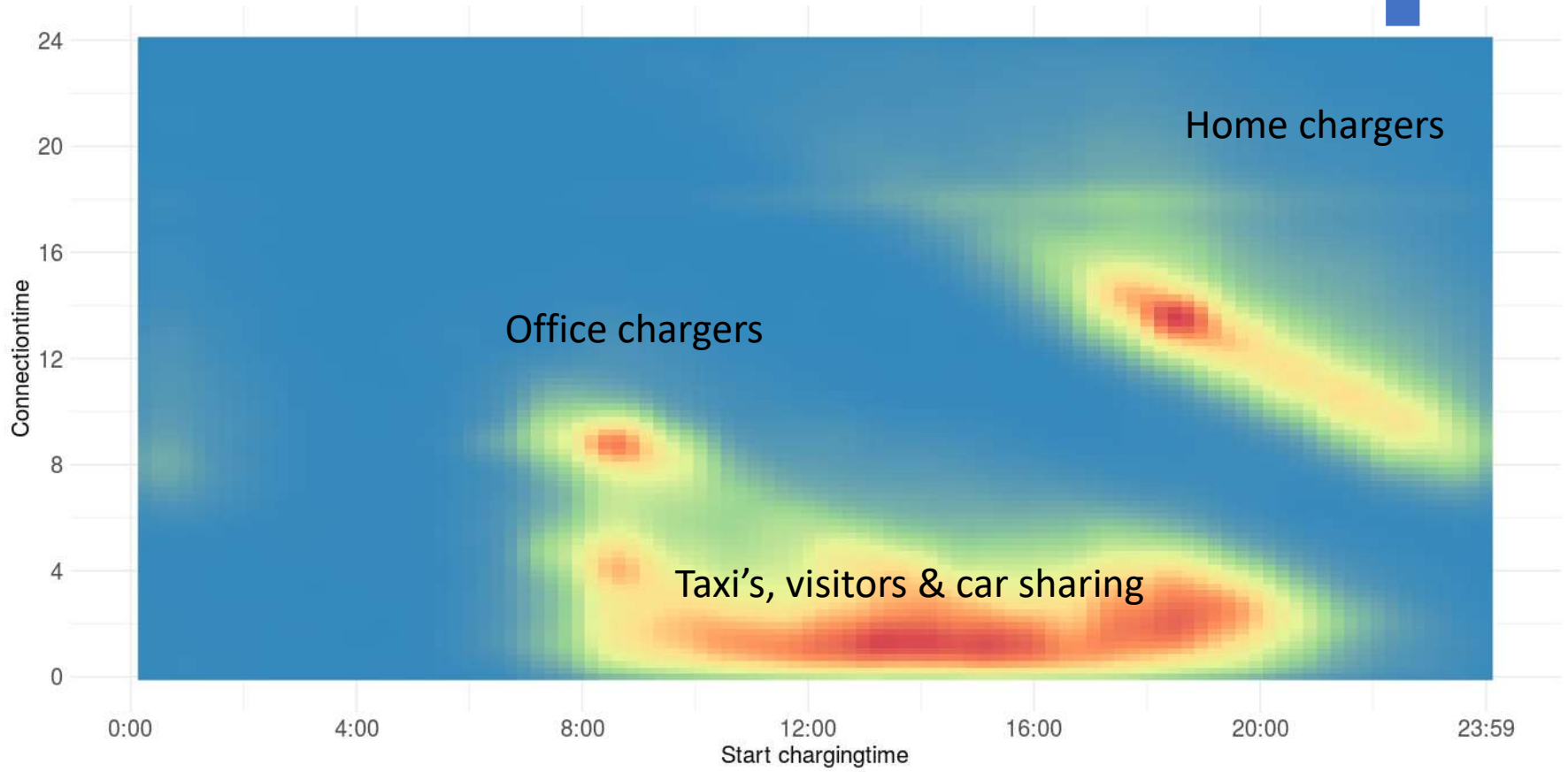
DATA MINING





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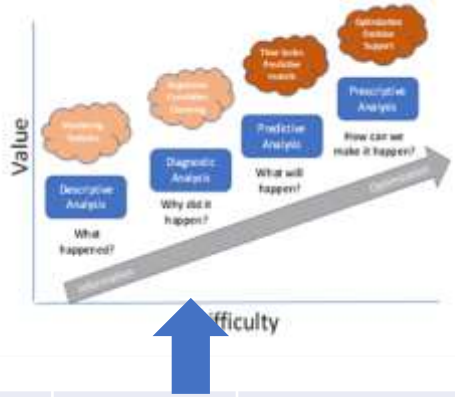
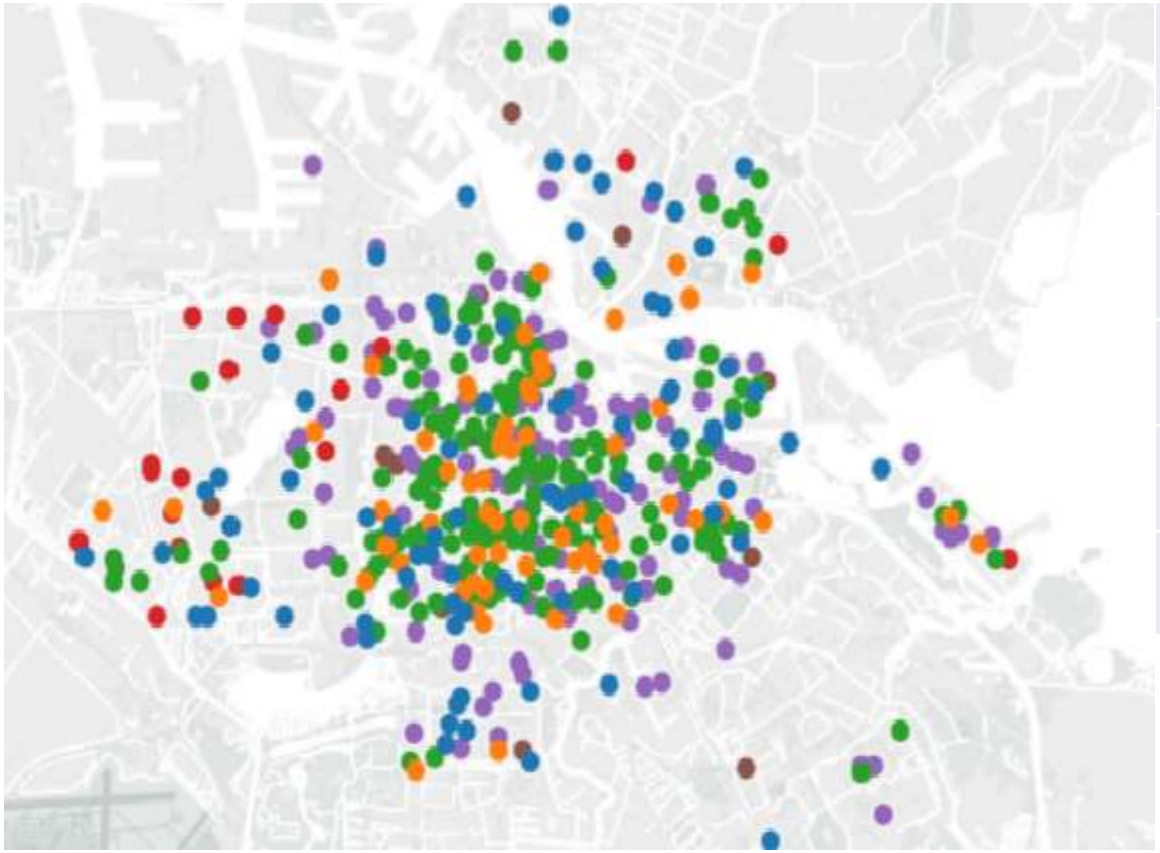
DATA MINING

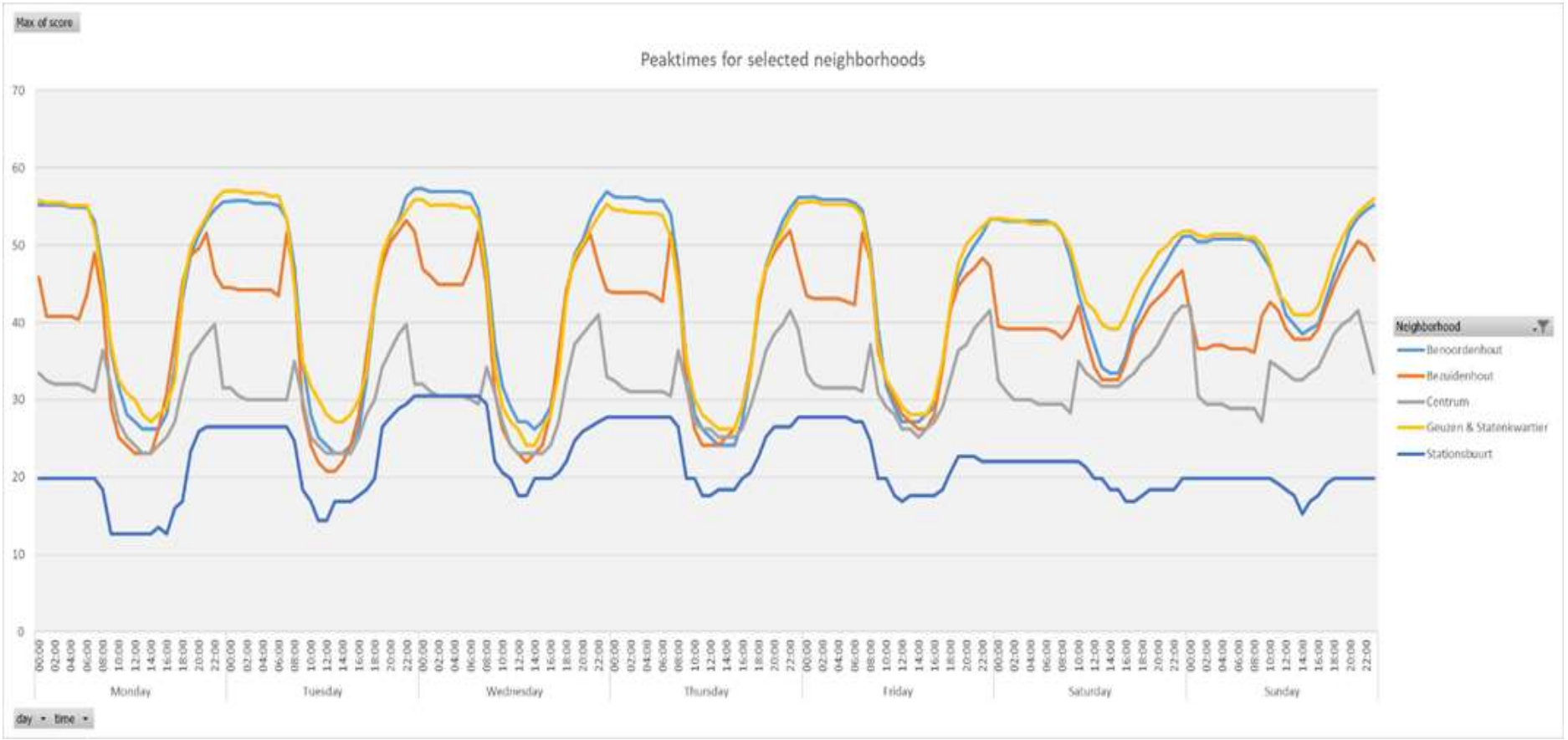


Unsupervised clustering Charge Poles

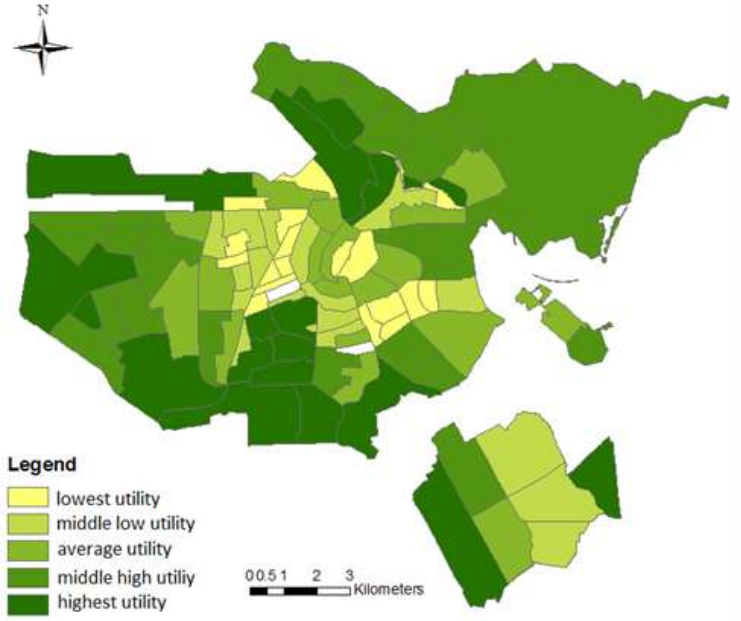


blue	day	commuters
orange	mixed	multiple users
green	night	home users
red	mixed	taxi
purple	day	multiple users
brown		unused poles

STATISTICAL MODELLING



STATISTICAL MODELLING



$$\mathbb{P}(i|C_{mn}) = \frac{\exp(\mu_m(V_{in} + \ln(\alpha_{im}))}{\sum_j \exp(\mu_m(V_{jn} + \ln(\alpha_{jm})))} = \frac{(\alpha_{im} e^{V_{in}})^{\mu_m}}{\sum_j (\alpha_{jm} e^{V_{jn}})^{\mu_m}}$$

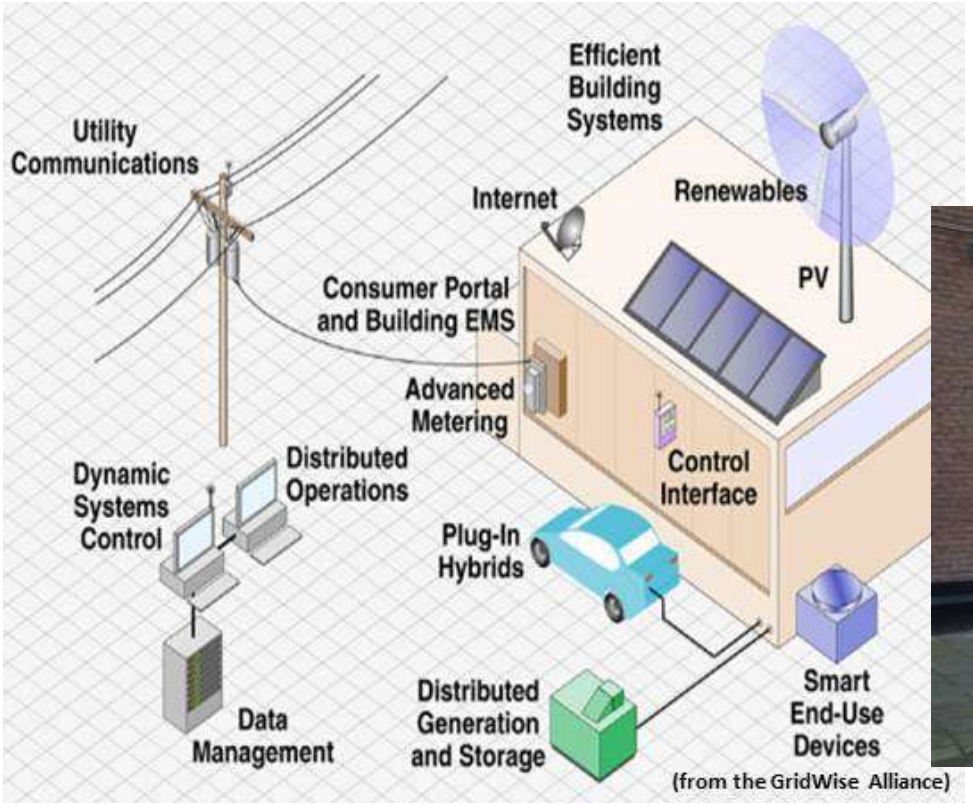
and

$$\mathbb{P}(C_{mn}) = \frac{\exp(\mu(V_{C_{mn}} + \bar{V}_{C_{mn}}))}{\sum_j \exp(\mu(V_{C_{jn}} + \bar{V}_{C_{jn}}))}$$

where $\bar{V}_{C_{mn}} = \frac{1}{\mu_m} \sum_j (\alpha_{jm} e^{V_{jn}})^{\mu_m}$

INNOVATIONS

VEHICLE 2 GRID



SMART CHARGING

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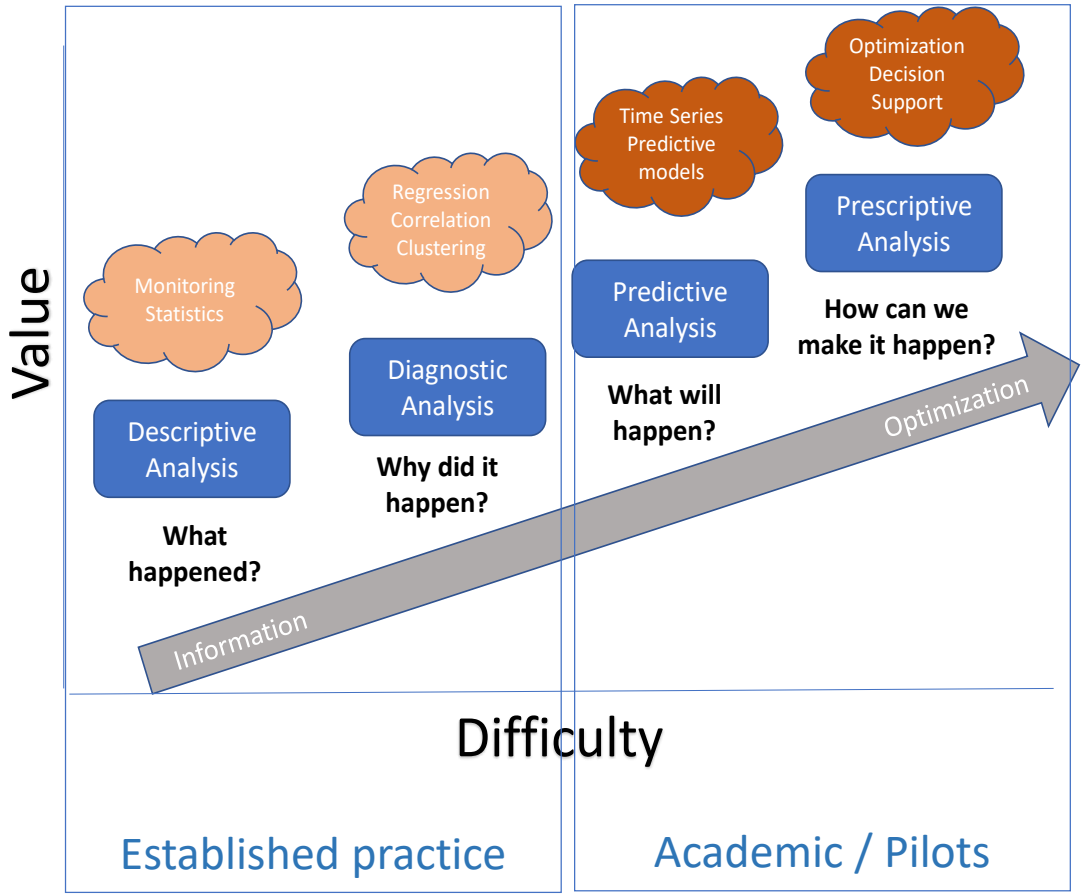
STATE OF THE ART
URBAN ANALYTICS 4 SMART CITIES



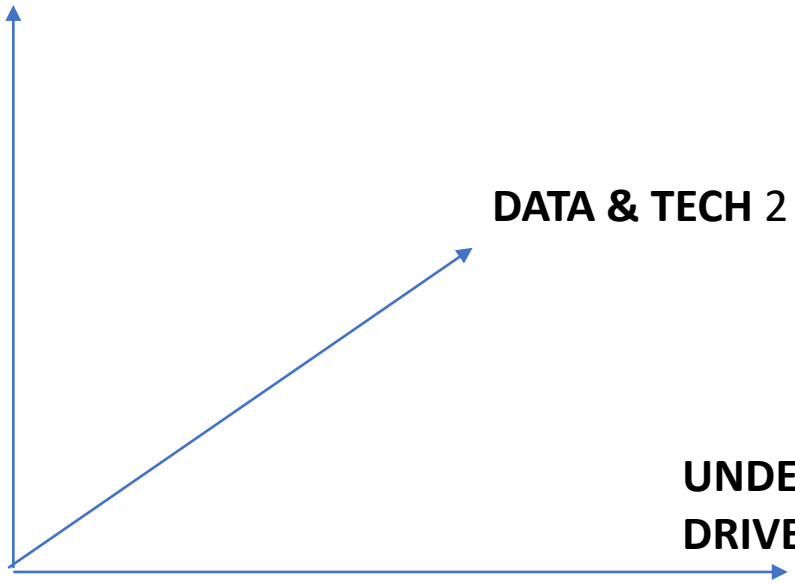
TAKE AWAYS

Data driven city services are just beginning

Techniques for Data Analysis are there -> applications are not
Data is often not available to the right people
Business processes (& people) need to adopt digital transformation to become data driven

CITY BRAIN: SETTING THE AGENDA

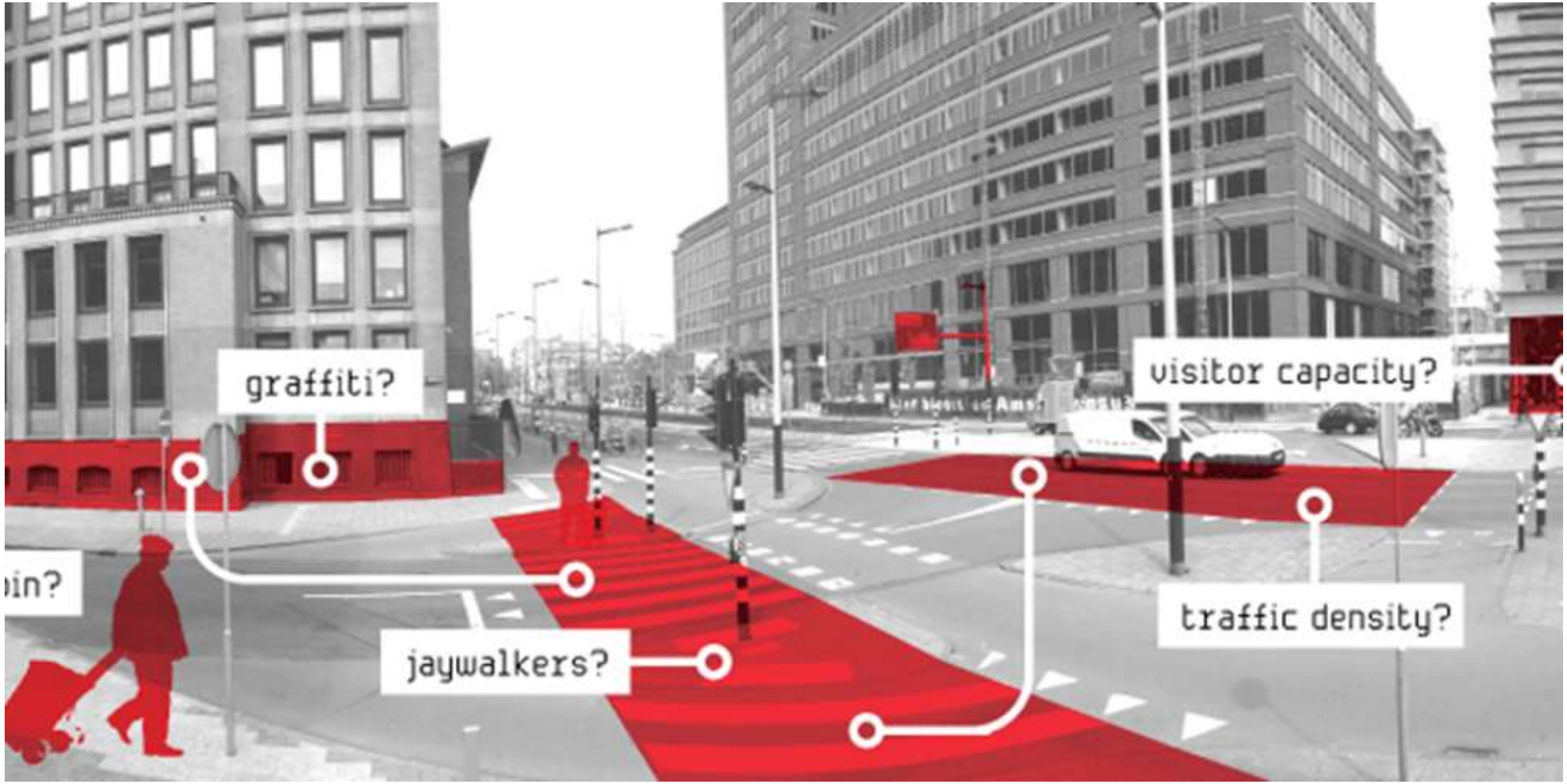
ACADEMIC RESEARCH 2 CITY SERVICES



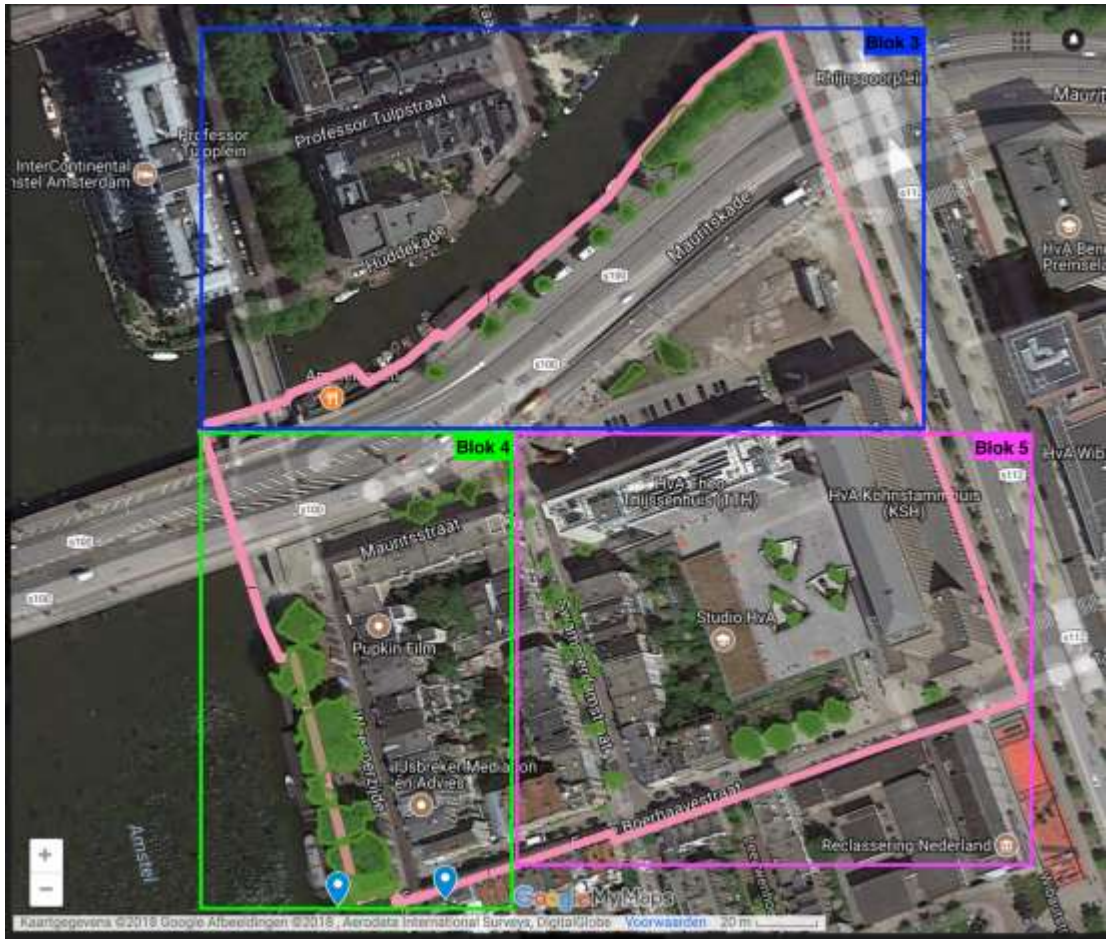
DATA & TECH 2 CITY SERVICES

UNDERSTANDING
DRIVERS OF CITY SERVICES

PREVENT traffic accidents in Wibautstraat

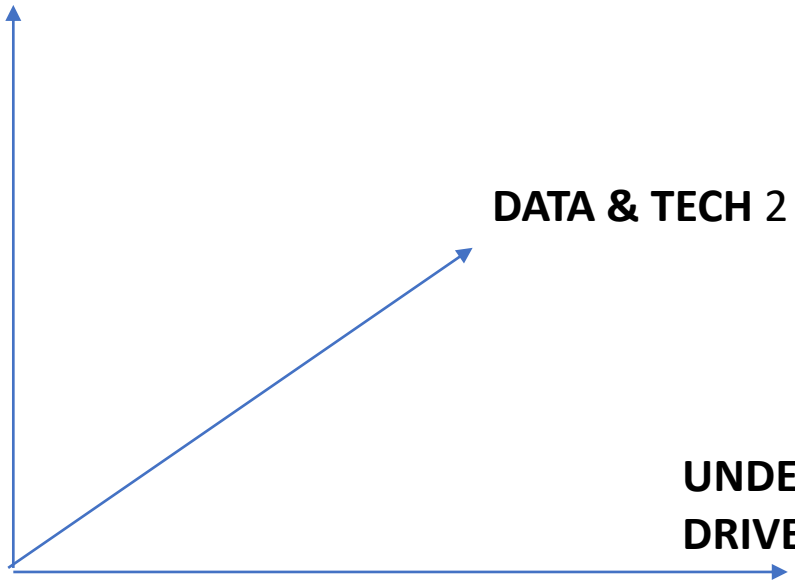


Model the impact of knowledge mile parc



CITY BRAIN: SETTING THE AGENDA

ACADEMIC RESEARCH 2 CITY SERVICES



DATA & TECH 2 CITY SERVICES

UNDERSTANDING
DRIVERS OF CITY SERVICES

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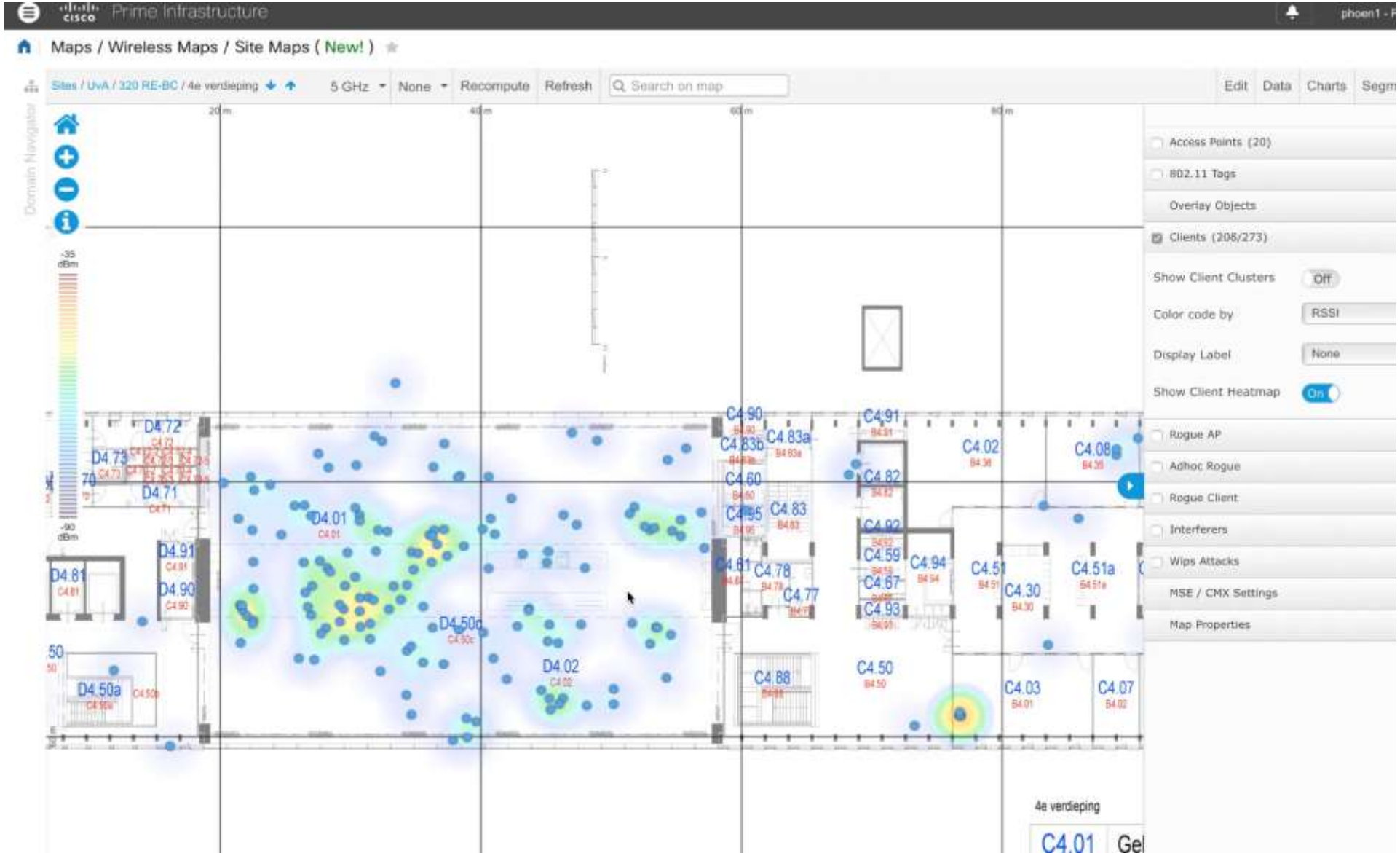
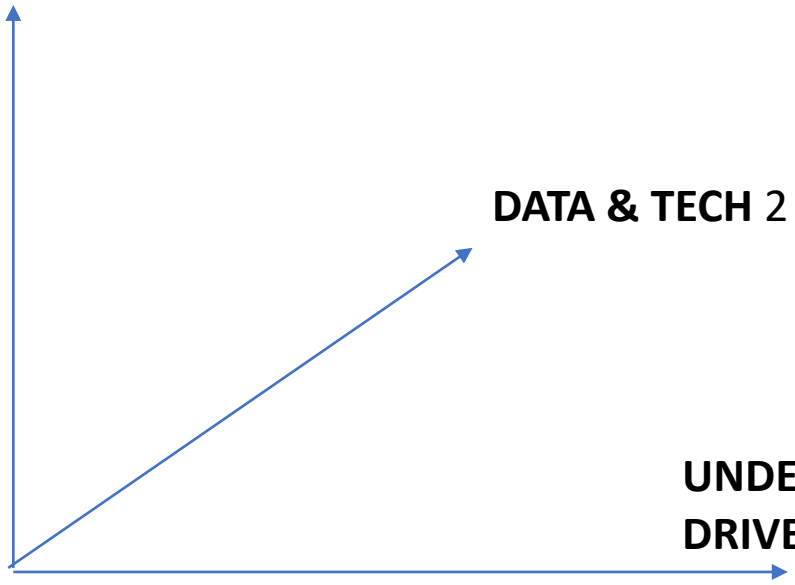
USING CAMERA RECOGNITION MODELS FOR SHOPPING STREETS DELIVERIES

HOW MANY PEOPLE ARE HERE?



CITY BRAIN: SETTING THE AGENDA

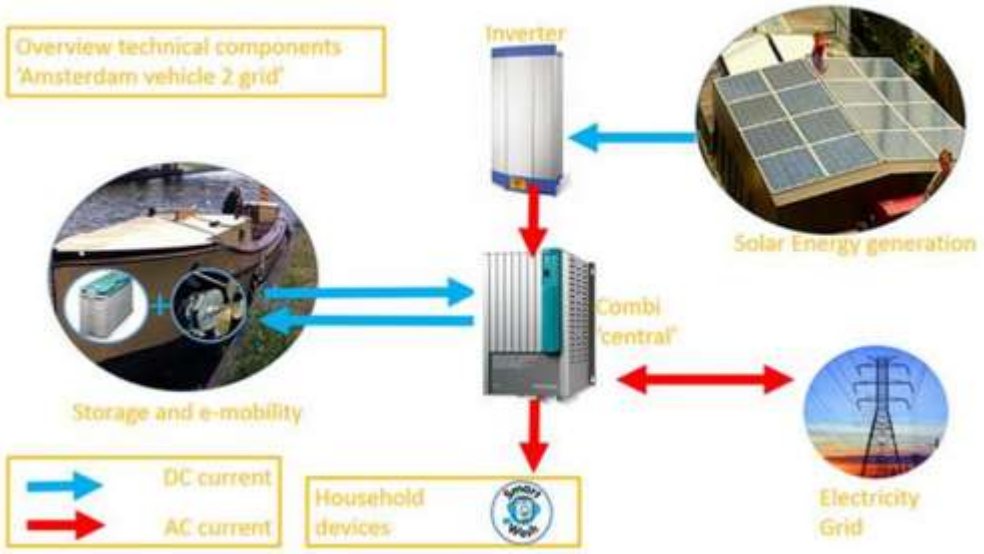
ACADEMIC RESEARCH 2 CITY SERVICES

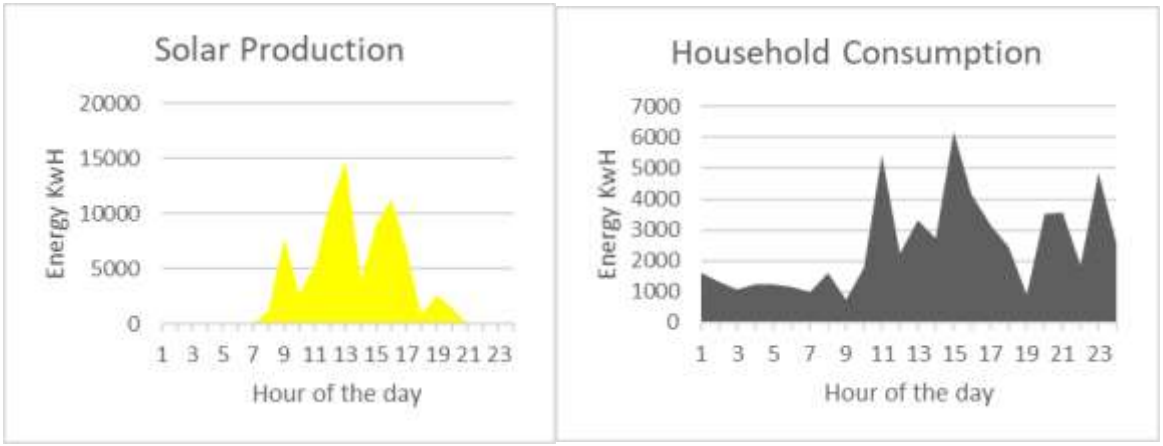


DATA & TECH 2 CITY SERVICES

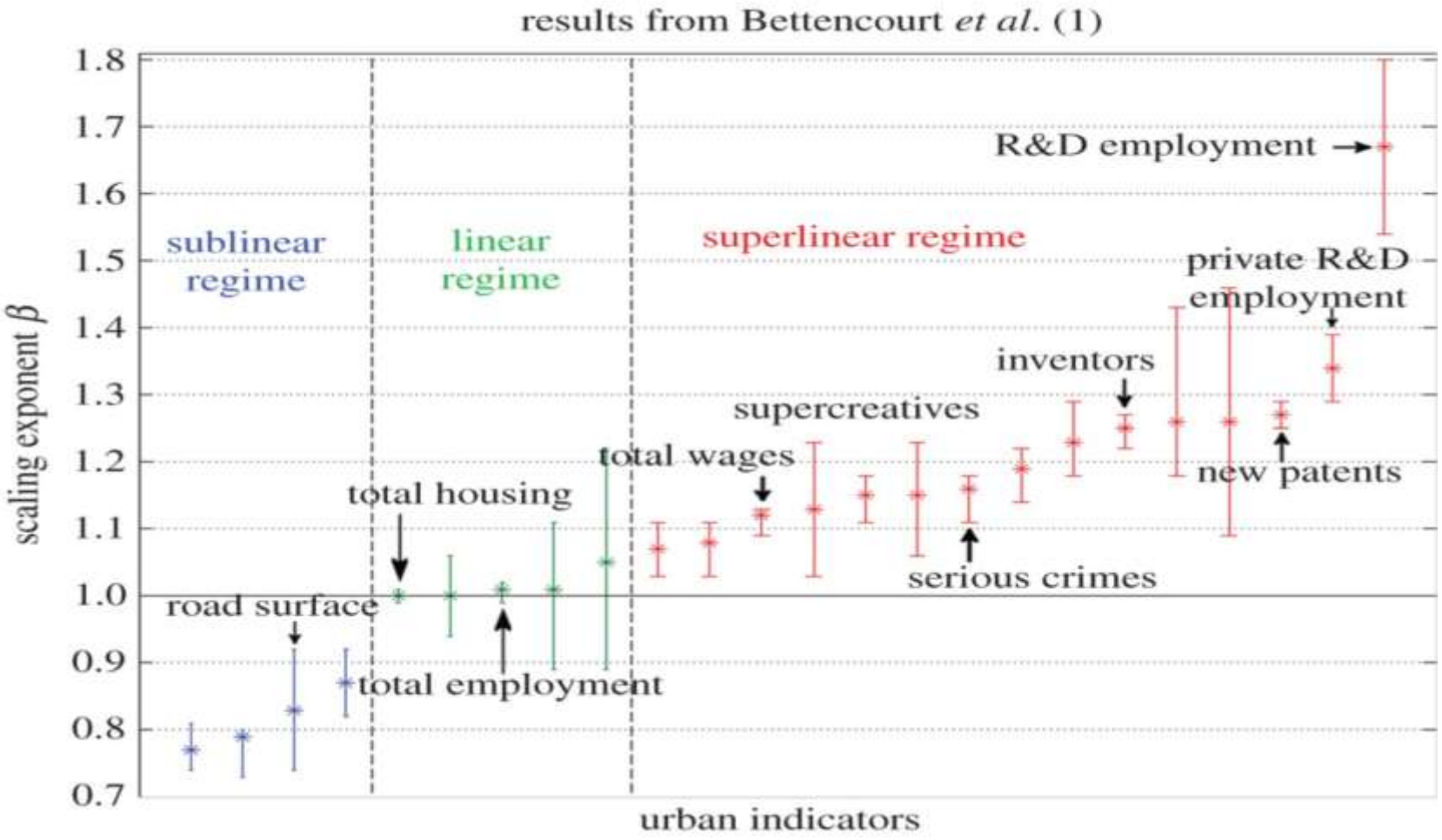
UNDERSTANDING
DRIVERS OF CITY SERVICES

How can data help the energy transition?

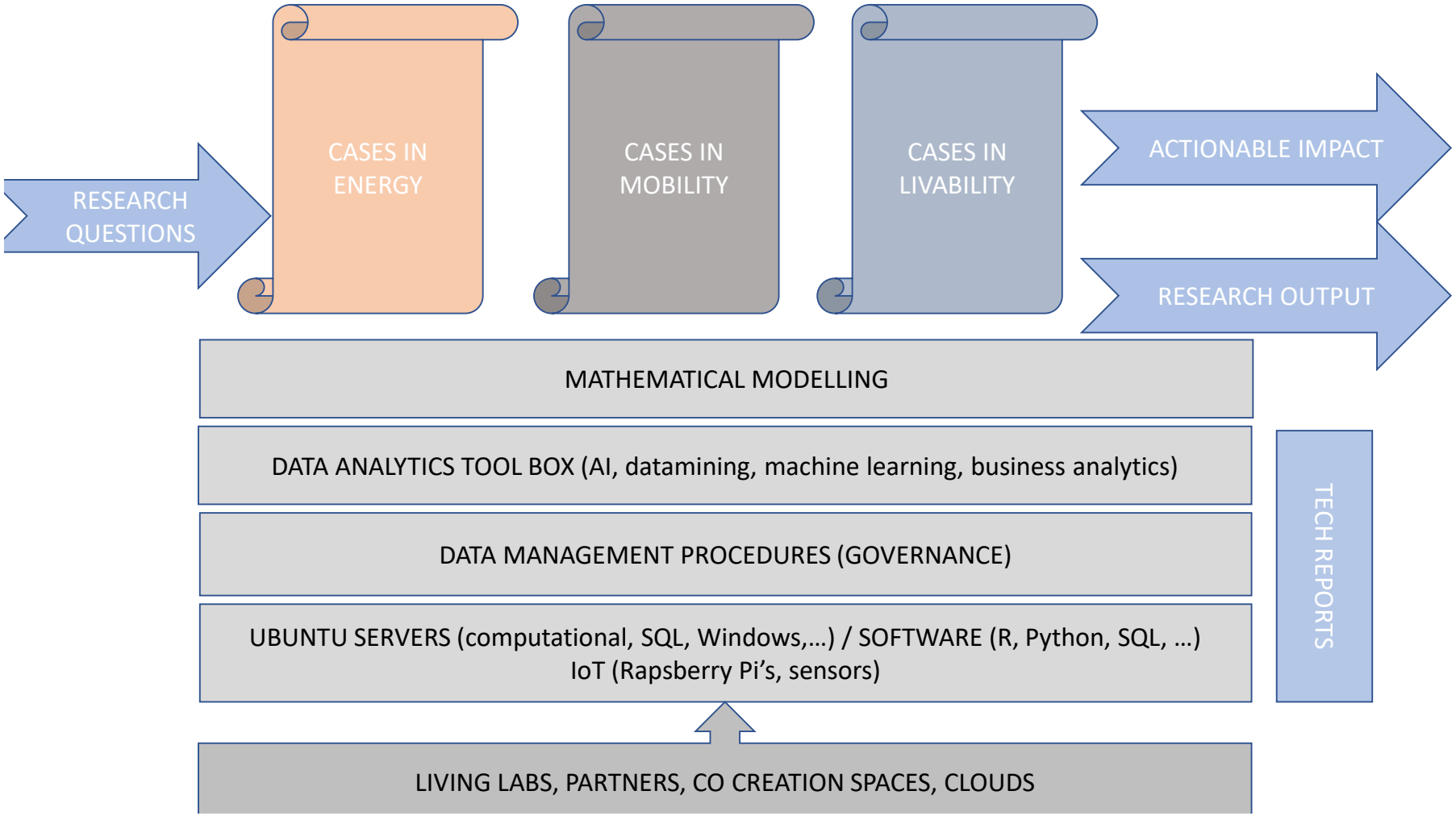




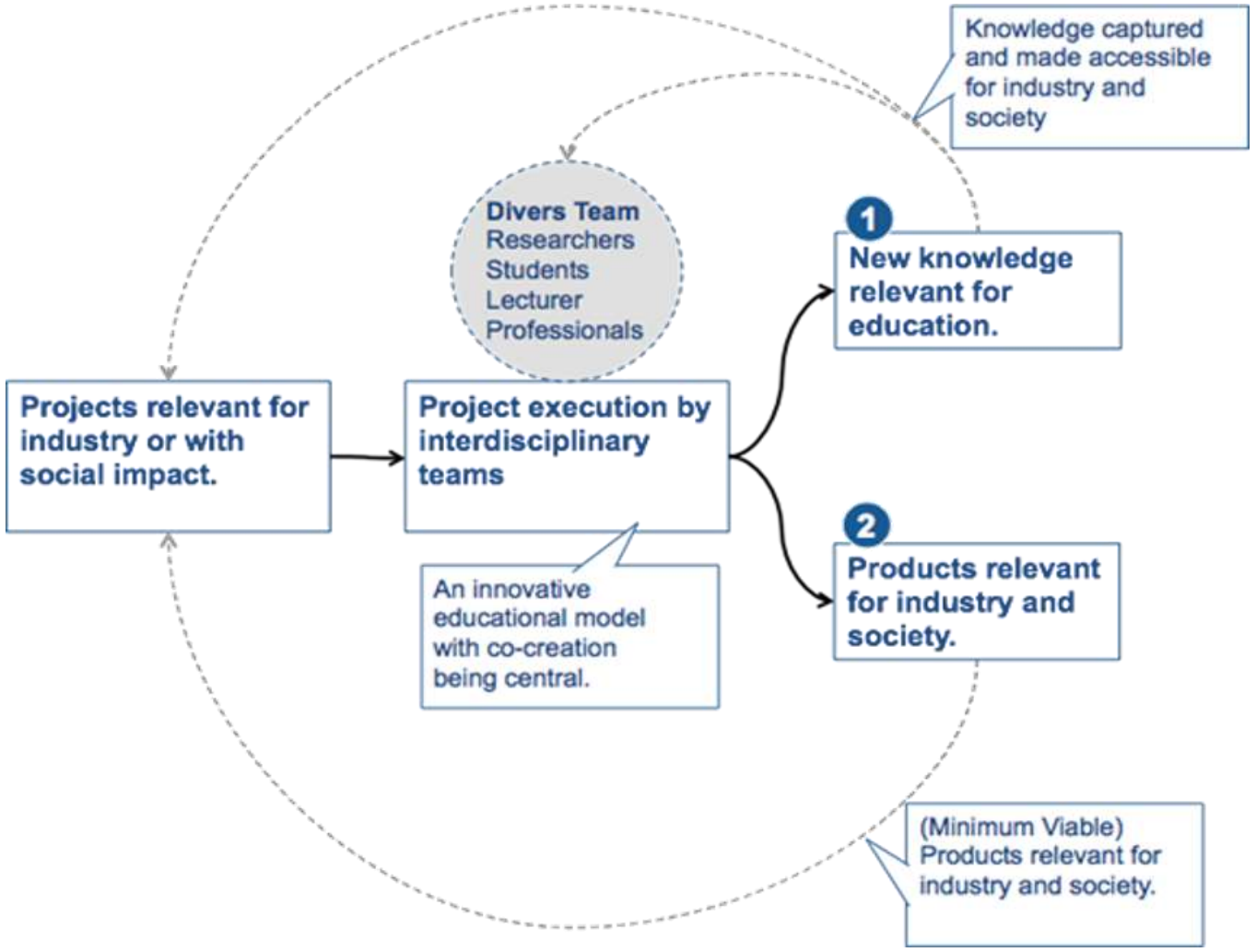
HOW DO CITY SERVICES SCALE WITH SIZE?



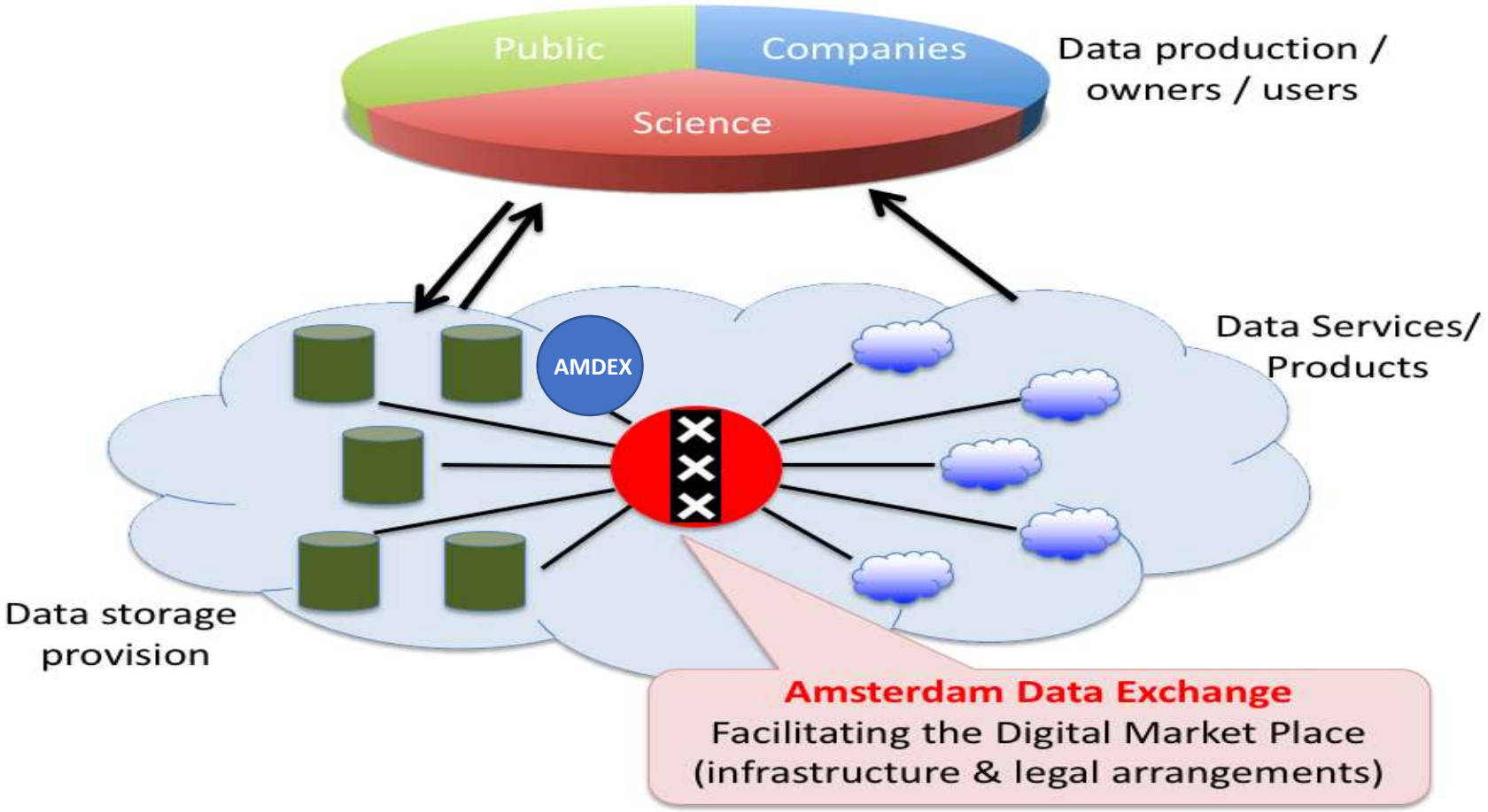
Bettencourt LMA, Lobo J, Helbing D, Kühnert C, West GB. *2007 Growth, innovation, scaling, and the pace of life in cities. Proc. Natl Acad. Sci. USA 104, 7301–7306.*


RESEARCH QUESTIONS
CASES IN ENERGY
CASES IN MOBILITY
CASES IN LIVABILITY
ACTIONABLE IMPACT
RESEARCH OUTPUT
MATHEMATICAL MODELLING
DATA ANALYTICS TOOL BOX (AI, datamining, machine learning, business analytics)
DATA MANAGEMENT PROCEDURES (GOVERNANCE)
UBUNTU SERVERS (computational, SQL, Windows,…) / SOFTWARE (R, Python, SQL, …)
IoT (Rapsberry Pi's, sensors)
TECH REPORTS
LIVING LABS, PARTNERS, CO CREATION SPACES, CLOUDS

BIG DATA STATION



Amsterdam Data Exchange (AMDEX)



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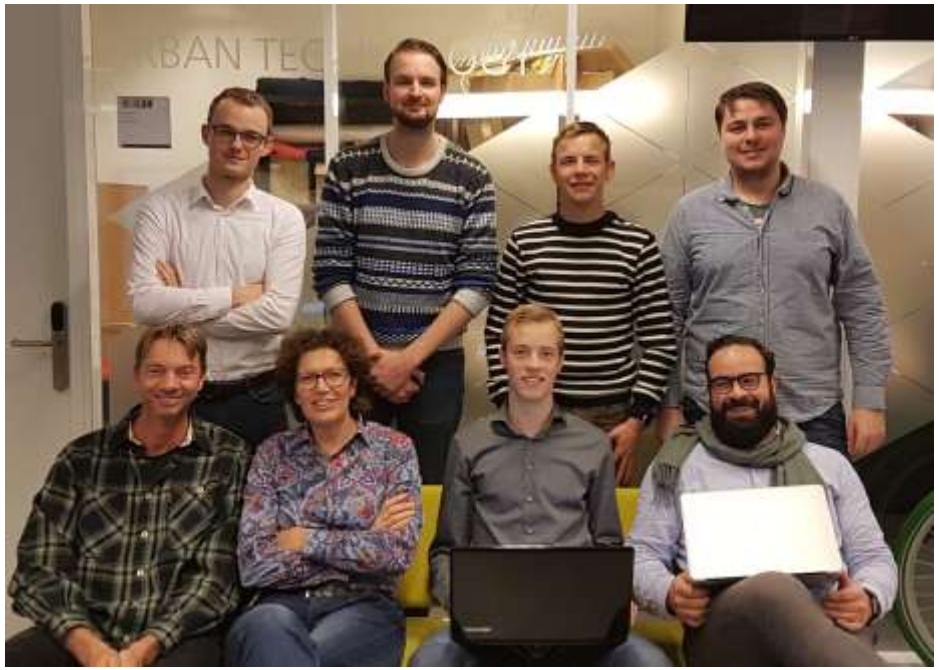
Urban analytics - WE LOVE DATA



THANK YOU