SMART CITIES

Urban Science: A Conversation: Citizen Design Science

Gerhard Schmitt, Artem Cirkin, November 2, 2015

Smart Cities

1 GS: Introduction	2 GS: Urban Systems I	3 PJ: Urban Systems II	4 GS: Urban Systems III	5 GS: Urban Research	6 GS: Urban Science	7 GS: Complexity Science	8 GS: Urban Governance	9 GS: Responsive Cities	10 GS: Final Critique
Principles of Information Architecture and Urban Simulation	Smart Cities	Methods and Tools for Urban Design	Stocks and Flows in Urban Systems	A Conversation: Measurements in the City	A Conversation: Citizen Design Science	Cities as Complex Systems	Participatory Design and Management	Cognitive Design Computing	Presentation of Results from 3 Courses
Exercise 1: Examples of Smart Cities			Exercise 2: Data Collection and Specification			Exercise 3: Energy and Mobility Data			Certificates

The story so far:

- 2.11.2015 Citizen Design Science closes the gap between science and city
- 26.10.2015 Metrics of Smart Cities are basic instruments of urban research
- 12.10.2015 Stocks and Flows are fundamental concepts for understanding urban dynamics
- 5.10.2015 Methods and Tools for Urban Design can support the creative design process
- 28.9.2015 From smart houses to smart cities – emerging criteria for smart cities as urban systems
- 21.9.2015 Cities are complex systems. Ideally, they are sustainable, resilient, livable, smart, and finally responsive – from production machines to human habitat

Content

- Urban Science
- A Conversation: Citizen Design Science
- An Example: Cooler Calmer Singapore
- Conclusions

Urban Science

Science

„knowledge about the structure and behaviour of the natural and physical world, based on facts that you can prove, for example by experiments “http://www.oxforddictionaries.com/de/definition/learner/science

Urban Science

Knowledge about the structure and behaviour of an urban system, based on facts that you can prove, for example by theory, experiments, and simulation

Urban Science: Structure

"A city is not a tree" revisited:

The tree of my title is not a green tree with leaves. It is the name of an abstract structure. I shall contrast it with another, more complex abstract structure called a semilattice. In order to relate these abstract structures to the nature of the city, I must first make a simple distinction.

I want to call those cities which have arisen more or less spontaneously over many, many years *natural cities*. And I shall call those cities and parts of cities which have been deliberately created by designers and planners artificial cities. Siena, Liverpool, Kyoto, Manhattan are examples of natural cities. Levittown, Chandigarh and the British New Towns are examples of artificial cities.

It is more and more widely recognized today that there is some essential ingredient missing from artificial cities. When compared with ancient cities that have acquired the patina of life, our modern attempts to create cities artificially are, from a human point of view, entirely unsuccessful.

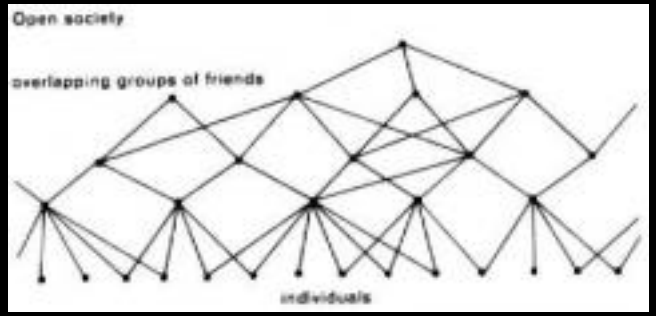
Both the tree and the semilattice are ways of thinking about how a large collection of many small systems goes to make up a large and complex system. More generally, they are both names for structures of sets.

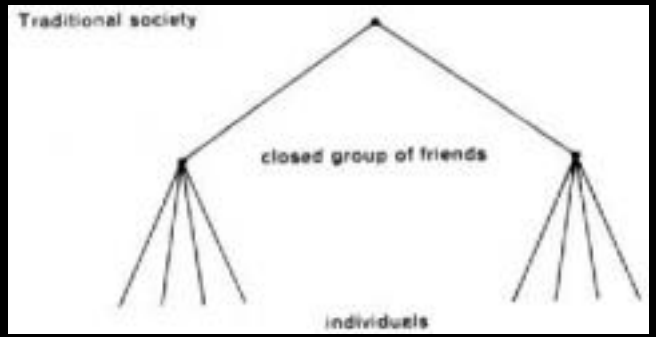
Christopher Alexander, http://www.rudi.net/pages/8755

Urban Science: Structure

In a traditional society, if we ask a man to name his best friends and then ask each of these in turn to name their best friends, they will all name each other so that they form a closed group. A village is made up of a number of separate closed groups of this kind.

But today's social structure is utterly different. If we ask a man to name his friends and then ask them in turn to name their friends, they will all name different people, very likely unknown to the first person; these people would again name others, and so on outwards. There are virtually no closed groups of people in modern society. The reality of today's social structure is thick with overlap - the systems of friends and acquaintances form a semilattice, not a tree (**Figure 10**).





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Urban Science: Behaviour

Example: CASA

„Founded almost two decades ago in **1995**, the **Centre for Advanced Spatial Analysis** (CASA) at University College London fails our 'newness' filter. Yet it is a logical starting point for our exploration of the new urban science for three other important reasons.

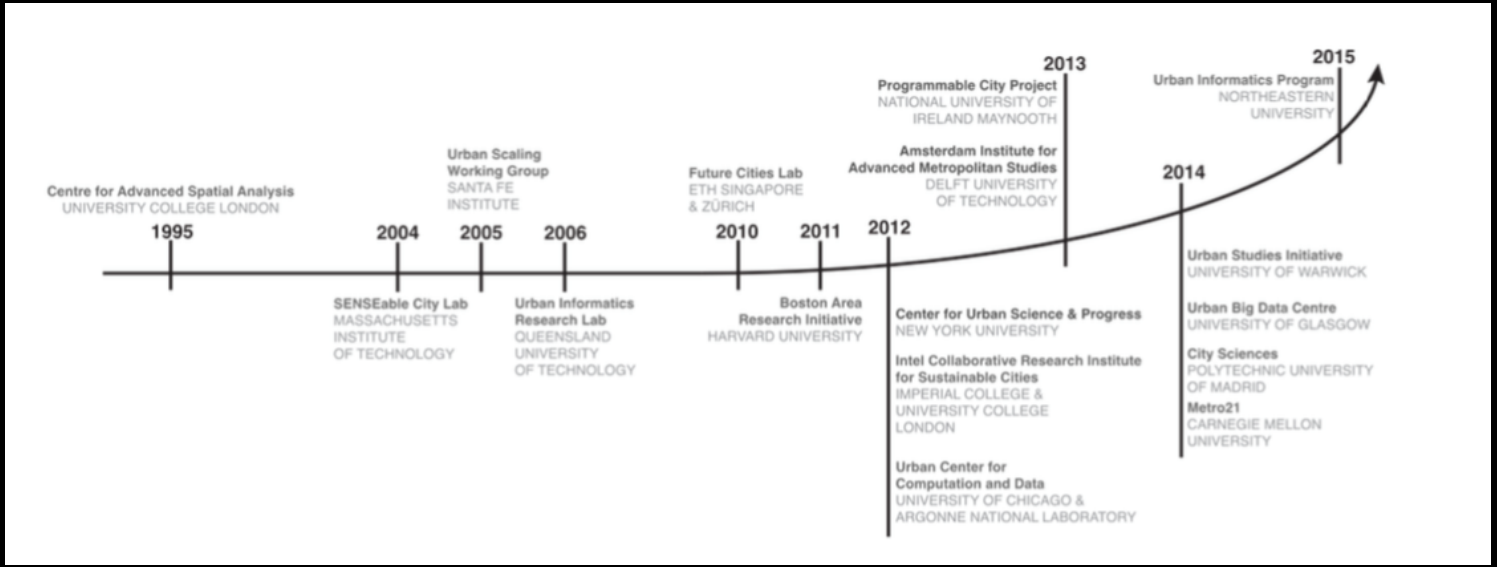
First, CASA's founder and long-time director Michael Batty is unique among leaders in the organizations in this study in that his career spans from the first wave of interest in urban science and computer-based analysis of cities in the 1960s to the present urban science movement. Second, Batty is the author of *The New Science of Cities* (MIT Press, 2014) which has become a standard textbook in urban modeling and simulation. Finally, over its nearly 20 years in existence, CASA has developed a strong series of partnerships with the Greater London Authority, most notably Transport for London, one of the GLA's three main units."http://www.citiesofdata.org/wp-content/uploads/2015/04/Making-Sense-of-the-New-Science-of-Cities-FINAL-2015.7.7.pdf

Urban Science: Behaviour

Example: Future Cities Laboratory

„For instance, the head of ETH's Future Cities Lab in Singapore — arguably the largest urban science center by far — is a plant ecologist who started his career in a rainforest! Peter Edwards was the dean of environmental sciences at ETH and saw the lab as an opportunity to advance the agenda he had helped craft as coordinator of the Alliance for Global Sustainability over many years previously.“ http://www.citiesofdata.org/wp-content/uploads/2015/04/Making-Sense-of-the-New-Science-of-Cities-FINAL-2015.7.7.pdf

Urban Science: Behaviour



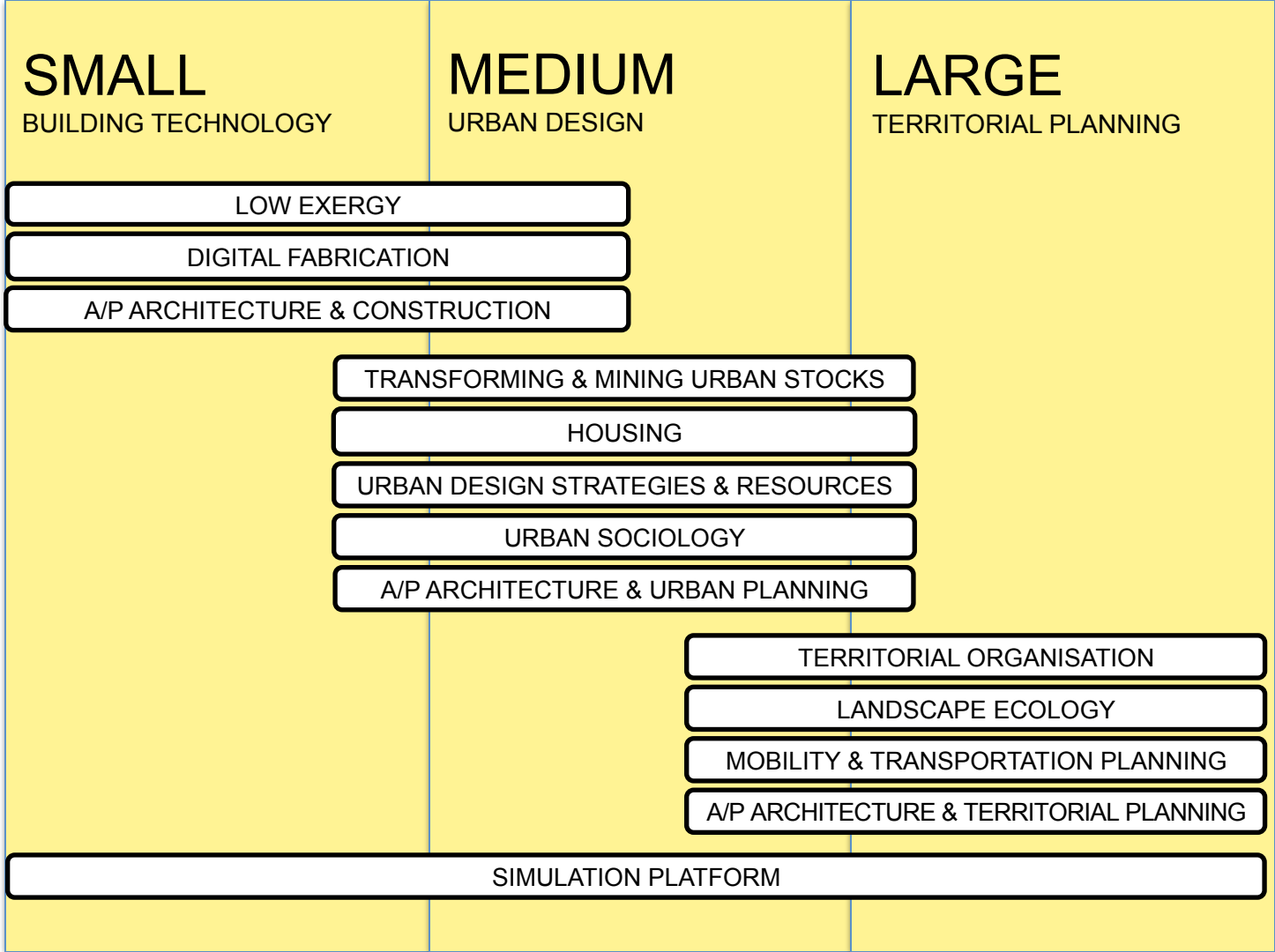
http://www.citiesofdata.org/wp-content/uploads/2015/04/Making-Sense-of-the-New-Science-of-Cities-FINAL-2015.7.7.pdf

Urban Science: Structure + Behaviour

Example: Stocks and Flows

Scales, Stocks and Flows

SPACE
ENERGY
MATERIALS
PEOPLE
CAPITAL
WATER
INFORMATION



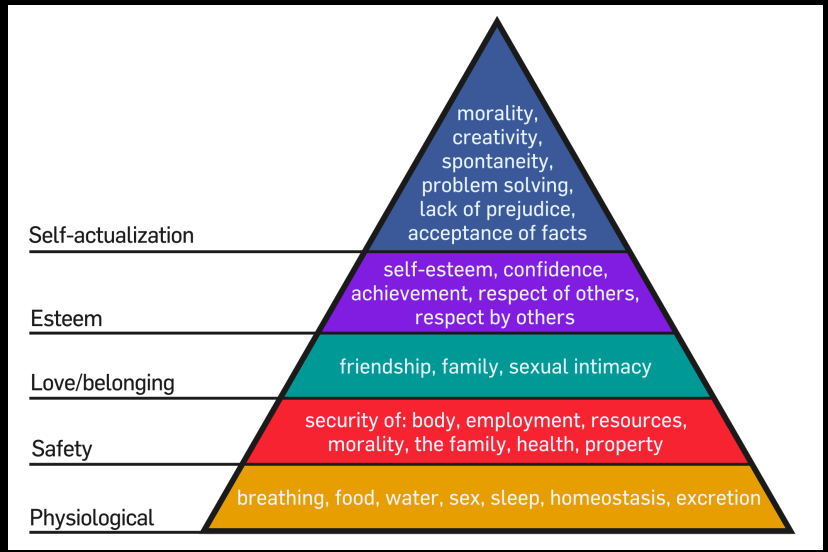
Urban Science: Behaviour

Example: Livability

Modern Eudaimonia

Models of eudaimonia in psychology emerged from early work on self-actualisation and the means of its accomplishment by researchers such as Erikson, Allport, and Abraham Maslow. The psychologist C. D. Ryff highlighted the distinction between *eudaimonia wellbeing*, which she identified as psychological well-being, and *hedonic wellbeing* or pleasure. Building on Aristotelian ideals of belonging and benefiting others, flourishing, thriving and exercising excellence, she conceptualised eudaimonia as a six-factor structure:

1. Autonomy
2. Personal growth
3. Self-acceptance
4. Purpose in life
5. Environmental mastery
6. Positive relations with others.



Urban Science: Structure + Behaviour

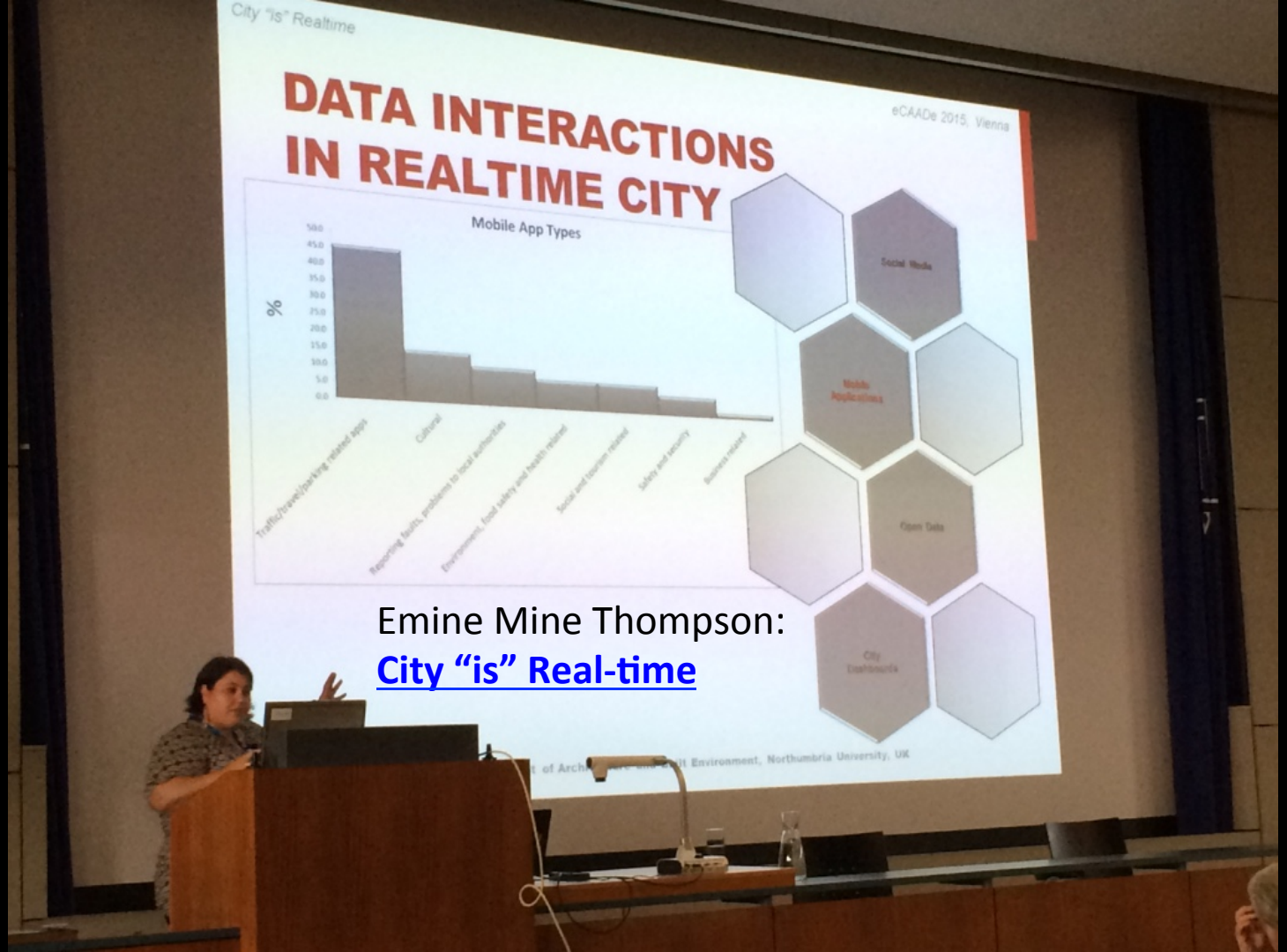
Example: Smart Cities

Example: Responsive Cities

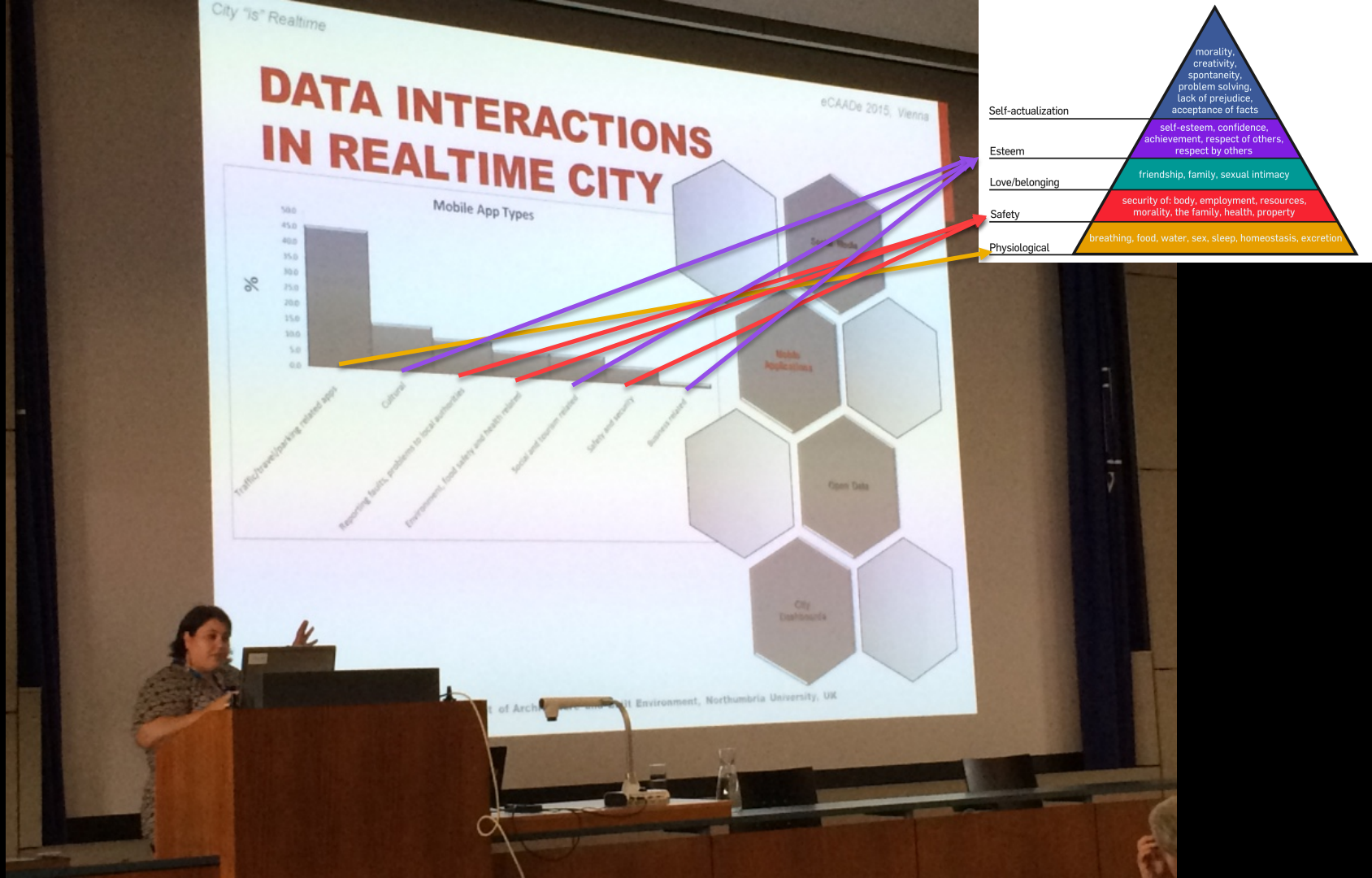

City 'is' Realtime
SMART CITY
British Standards Institution (2014), defines "smart city' as an effective integration of physical, digital and human systems in the built environment to deliver a sustainable, prosperous and inclusive future for its citizens
64
101
53
10
17
13

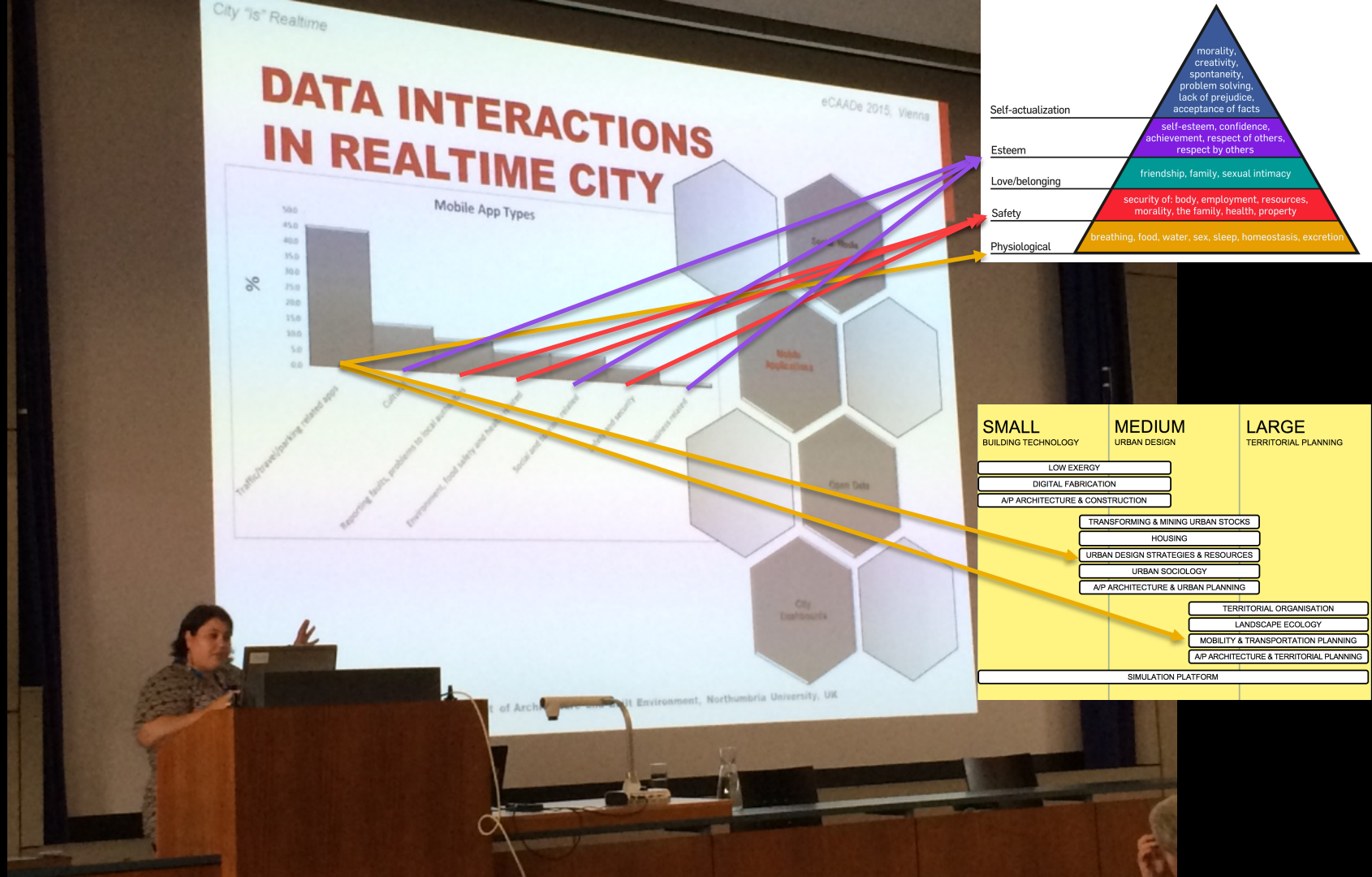

Margaretenhof
ACHTUNG
AUTOMATISCHES
TOR
Privatgrund
Betreten ist Zivilisten
verboten!
Margaretenhof


CENTRO DE OPERAÇÕES
PREFEITURA DO RIO
Central Coordination



Emine Mine Thompson:
[City "is" Real-time]


City "is" Realtime
DATA INTERACTIONS IN REALTIME CITY
eCAADe 2015, Vienna
Mobile App Types
%
Traffic/travel/parking related apps
Culture
Reporting faults, problems to local authorities
Environment, food safety and health related
Social and tourism related
Safety and security
Business related
Mobile Applications
Open Data
City Dashboards
Environment, Northumbria University, UK
Self-actualization
Esteem
Love/belonging
Safety
Physiological
morality, creativity, spontaneity, problem solving, lack of prejudice, acceptance of facts
self-esteem, confidence, achievement, respect of others, respect by others
friendship, family, sexual intimacy
security of: body, employment, resources, morality, the family, health, property
breathing, food, water, sex, sleep, homeostasis, excretion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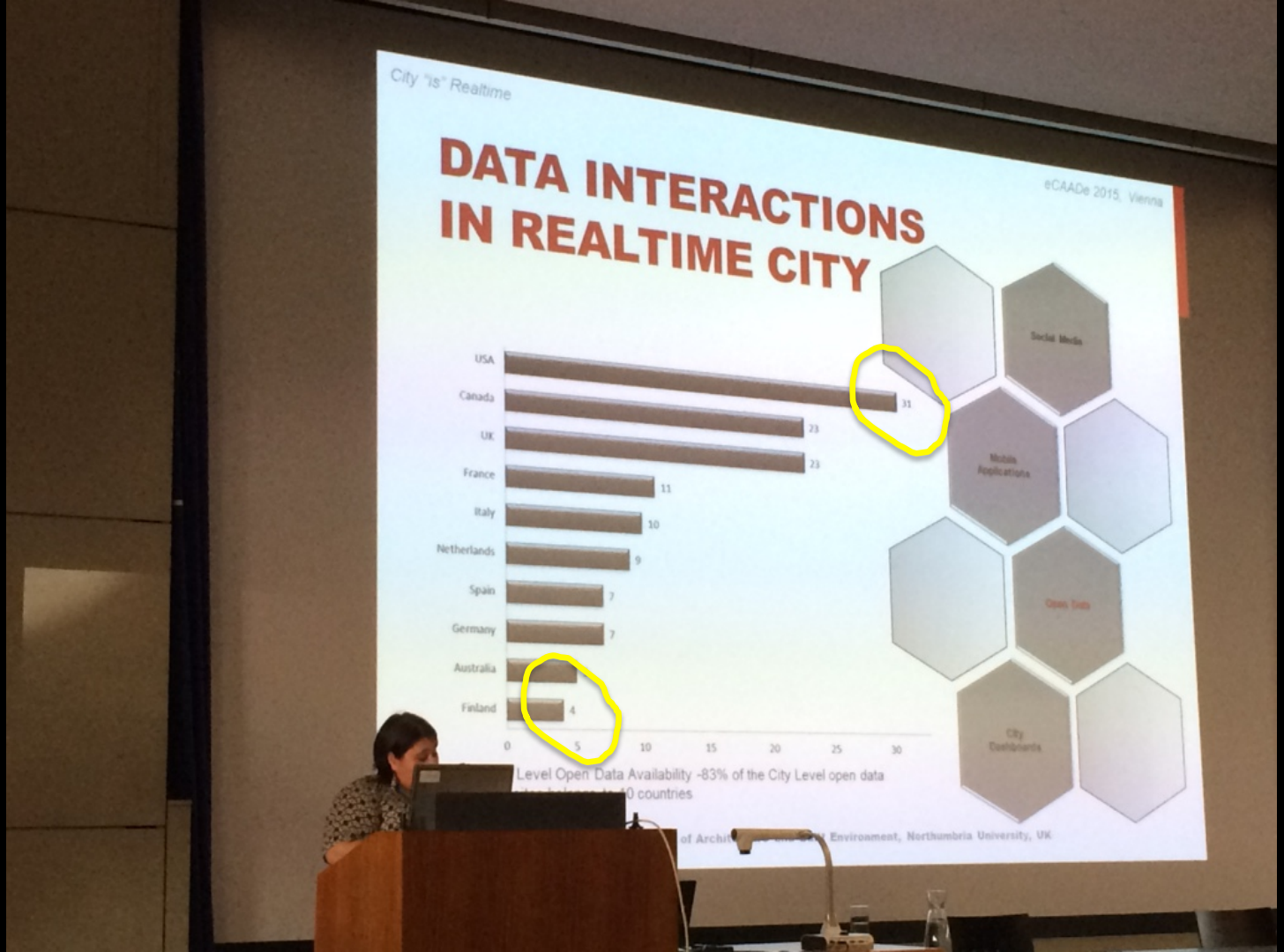
Environment, Northumbria University, UK
Self-actualization
morality, creativity, spontaneity, problem solving, lack of prejudice, acceptance of facts
Esteem
self-esteem, confidence, achievement, respect of others, respect by others
Love/belonging
friendship, family, sexual intimacy
Safety
security of: body, employment, resources, morality, the family, health, property
Physiological
breathing, food, water, sex, sleep, homeostasis, excretion
SMALL
BUILDING TECHNOLOGY
MEDIUM
URBAN DESIGN
LARGE
TERRITORIAL PLANNING
LOW EXERGY
DIGITAL FABRICATION
A/P ARCHITECTURE & CONSTRUCTION
TRANSFORMING & MINING URBAN STOCKS
HOUSING
URBAN DESIGN STRATEGIES & RESOURCES
URBAN SOCIOLOGY
A/P ARCHITECTURE & URBAN PLANNING
TERRITORIAL ORGANISATION
LANDSCAPE ECOLOGY
MOBILITY & TRANSPORTATION PLANNING
A/P ARCHITECTURE & TERRITORIAL PLANNING
SIMULATION PLATFORM


City "is" Realtime
DATA INTERACTIONS IN REALTIME CITY
eCAADe 2015, Vienna
USA
Canada
UK
France
Italy
Netherlands
Spain
Germany
Australia
Finland
31
23
23
11
10
9
7
7
4
0
5
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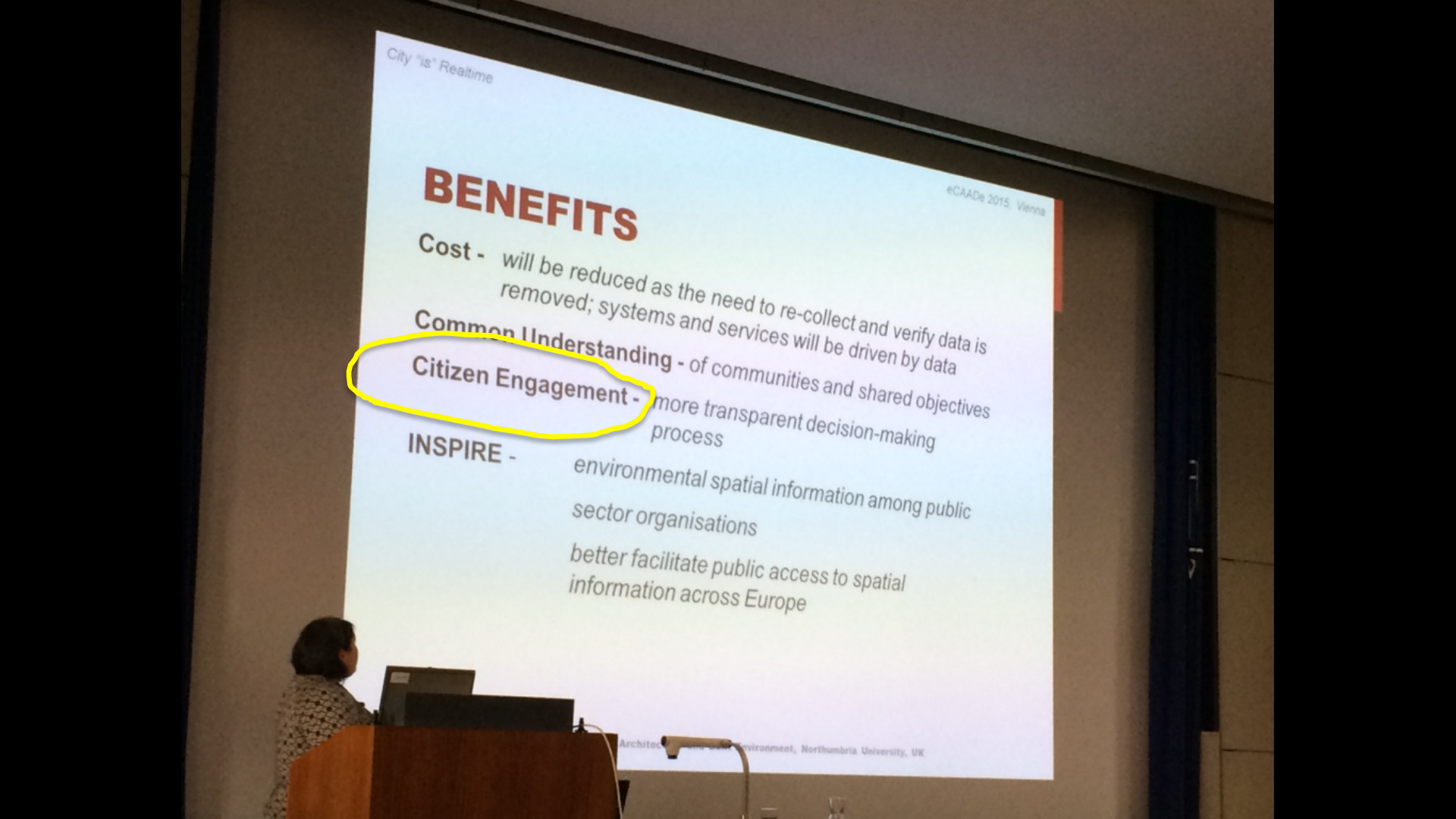
15
20
25
30
Social Media
Mobile Applications
Open Data
City Dashboards
Level Open Data Availability -83% of the City Level open data
countries
Environment, Northumbria University, UK


City "is" Realtime
eCAADe 2015, Vienna
BENEFITS
Cost - will be reduced as the need to re-collect and verify data is removed; systems and services will be driven by data
Common Understanding - of communities and shared objectives
Citizen Engagement - more transparent decision-making process
INSPIRE - environmental spatial information among public sector organisations
better facilitate public access to spatial information across Europe
Northumbria University, UK

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Quote from „The Responsive City“

“What’s really interesting is that people have said when they call in, they feel like they’re complaining. When they use mobile, they feel like they’re helping.”

Chris Osgood on the Boston City App “Citizens Connect” and the Boston CRM system, page 28

Teaching the Science of Cities

New Teaching Formats


Citizen Design Science

Towards citizen design science

Design science exists since the 1960's when scientists tried to find a description for the processes in the human brain when designers design. This turned out to be much more difficult than anticipated, and until today, there is no complete description of the human design process. **We want to propose Citizen Design Science as a concept that adds the strength of thousands of citizens in terms of observation, human cognition, experience and local knowledge into a scientific framework.**

Towards citizen design science

As Citizen Design Science we describe the combination of citizen science and of design science. With Citizen Science, citizens of all ages and backgrounds support scientists by either collecting or analysing data and observations. Citizens, working with scientific methods under the guidance of scientists, collect data on birds and their habitat; or citizens, interested in the functioning of the universe, analyse millions of images sent by satellites observing outer space. In both cases, the Internet is crucial: millions of individual observations turn into a flow of data and information beneficial for science. We want to achieve something similar for design: **Millions of individual observations turning into a rich flow of data and information to improve the planning and functioning of a city.**

Towards citizen design science

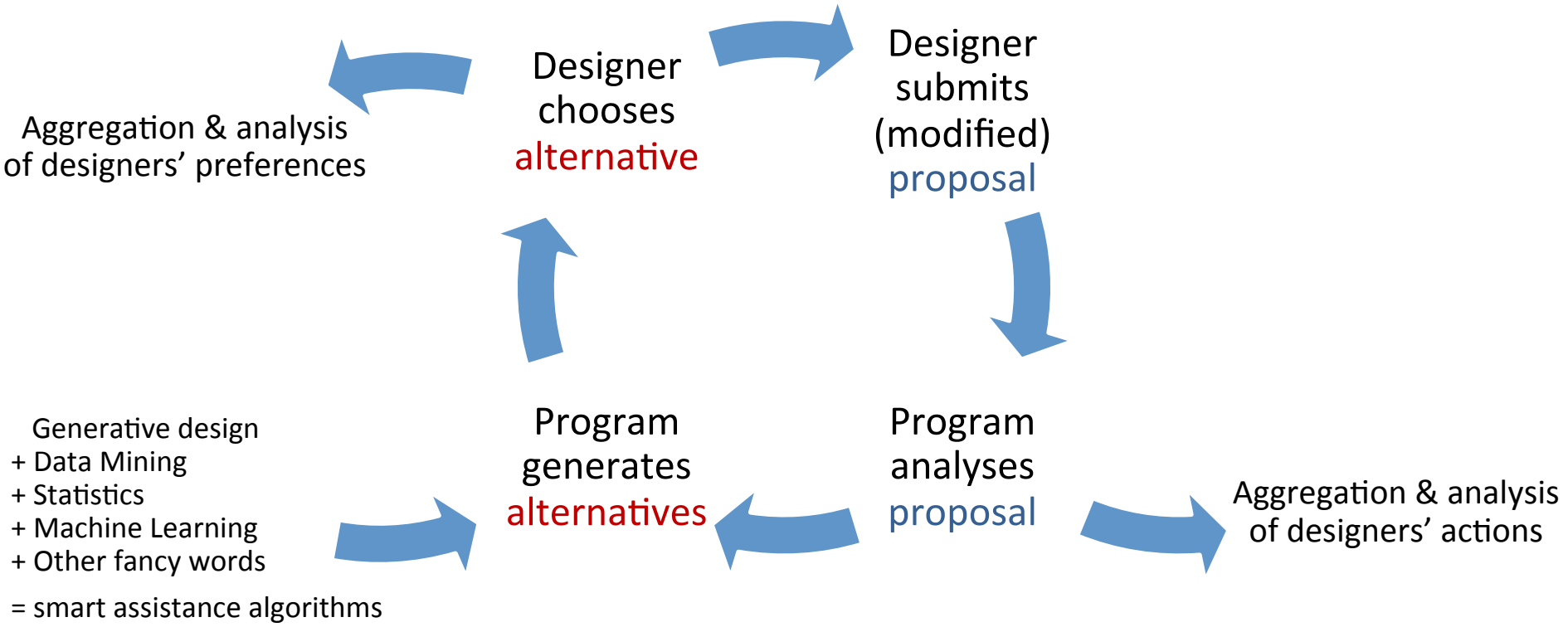
Inspired by recommender systems (e.g. Last.fm, Pandora radio, Amazon.com, Facebook, LinkedIn):
content-based or collaborative filtering, implicit data collection.

Inspired by machine-learned ranking (e.g. yahoo.com, streetscore.media.mit.edu):
finding and replicating statistical dependencies between available data and users' response

Inspired by generative design

We could ask citizens what they do not like or want to improve by providing them simplified design tools.

Design & feedback loop



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Content

- Urban Science
- A Conversation: Citizen Design Science
- An Example: Cooler Calmer Singapore → next lecture
- Conclusions

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Conclusions

- Urban science has been an active area of research since the 1960s
- From the beginning, there was a mismatch between top down decisions and the capability of the population to react appropriately
- Citizen Design Science is our proposal to combine the advantages off evidence-based long-term planning and the design capabilities and experiences of citizens