Urban Modelling / GIS / Urban Analytics / Social Network Analysis / BIM / Internet of Things / AI + ML / Prototyping etc….

MSc/MRes Spatial Data Science and Visualisation | MSc Smart Cities & Urban Analytics | MSc Connected Environments (2021 @ UCL East)

24 Post Docs, 4 Professors, 10 Lecturers, 18 PhD's, 100+ MSc Students

CONNECTED ENVIRONMENTS

RESOURCE EFFICIENT DESIGN + THINGS THAT THINK, A LITTLE

resource efficient design
doing stuff effectively with the least amount of friction and waste

data shadows

I believe our ability to continuously sense and monitor our built and natural environment is still at an emergent phase.

CONNECTED ENVIRONMENTS

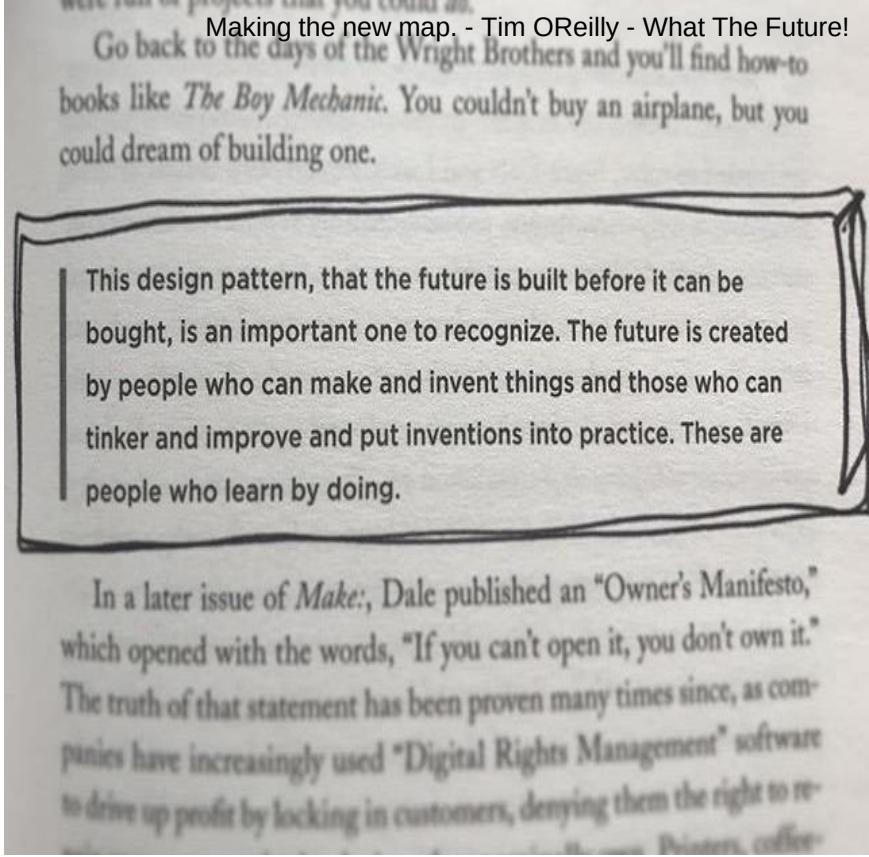
TO ADVANCE THE DIGITAL TECHNOLOGIES WE USE TO INSTRUMENT, OBSERVE AND AUGMENT OUR UNDERSTANDING OF THE BUILT + NATURAL ENVIRONMENT

EDGE COGNITIVE COMPUTING
Embedded AI on low power devices
- Human like
- Small AI
- Feedack

EXTRA SENSORY COMPUTING
novel methods for capturing data and humans receiving it
- AR / VR / MR
- Ultrasonic / DVS
- Bio-inspired

SPATIAL REASONING SYSTEMS
augment our world models with continuous POI
- Uncertainty + AI
- Data fusion
- BIM + POE

Making the new map. - Tim OReilly - What The Future!



Go back to the days of the Wright Brothers and you'll find how-to books like *The Boy Mechanic*. You couldn't buy an airplane, but you could dream of building one.

> This design pattern, that the future is built before it can be bought, is an important one to recognize. The future is created by people who can make and invent things and those who can tinker and improve and put inventions into practice. These are people who learn by doing.

In a later issue of *Make:*, Dale published an "Owner's Manifesto," which opened with the words, "If you can't open it, you don't own it." The truth of that statement has been proven many times since, as companies have increasingly used "Digital Rights Management" software to drive up profit by locking in customers, denying them the right to re-

MAKING - ORIGINATING - CONNECTING - LIVING

CONNECTED ENVIRONMENTS

Connected Environments focuses on the research challenges that relate to the infrastructure required to instrument our built and natural environments. It builds on the need for a skill set in programming, data capture and visualization, and prototyping with stakeholders to support the analysis of complex systems.

MAKING - ORIGINATING - CONNECTING - LIVING

CE1: Connected Devices (15)
Cultural and technical context of IoT in the built and natural environment. Technical architectures, critical perspectives, introduction to Arduino / RPi and making.

CE2: Mobile Systems & Interactions (15) (**Optional**) Designing Mobile Systems, Cross Platform Development, Machine Learning and AI, Bot Design, UX design

CE3: Making, Designing & Building Connected Sensor Systems (15)
Sensors, Embedded Systems, Hardware Design – Enclosures, Life Cycles of Hardware and Software

CE4: Web Architecture (15)
Intro to Web, Server Side Coding, Designing Systems, User Interaction // UX [Web] Deploying to Scale, Built Interactive System

CE5: Making sense with data (15) (**Optional**)
Real-Time Monitoring, AI and ML, interfaces, data fusion, communicating data to policy makers (MongoDb, Github, Python, Jupyter notebook, Google collaboratory)

CE6: Sensor Data Visualization (15)
Collecting and Mapping Data; Spatial Analysis; Data Visualization; VR / AR / MR, GPS and mobile apps, data science

CE7: Data, Ethics, Sustainability and Business (15)
Bias, data capture and processing, Open Data, GDPR, usage policies, provenance, urban procurement processes, smart city customers, community platforms, scaling and longevity – IoT Kite Mark

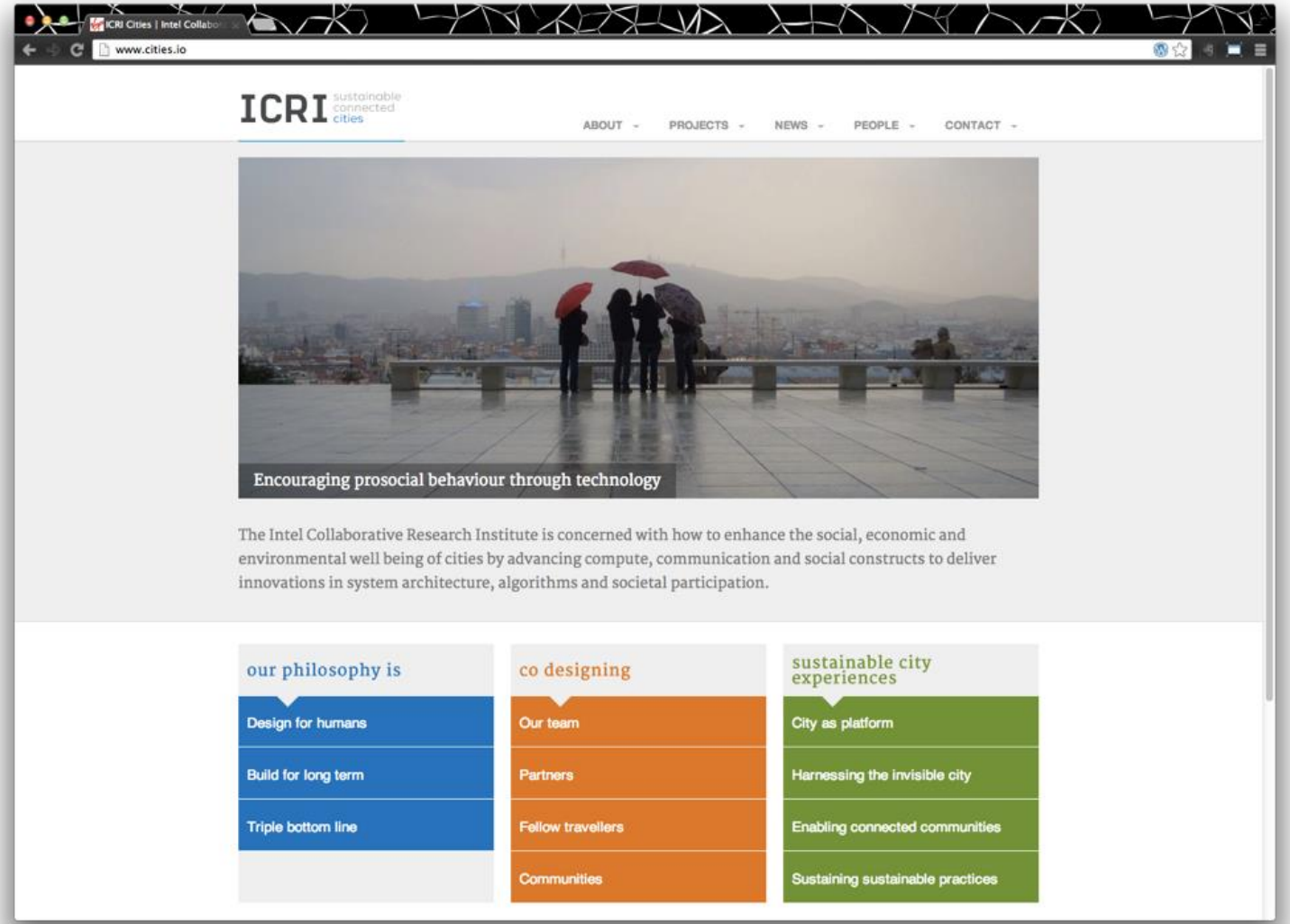
CE8: CE Group Prototype and Pitch (15)
Stakeholder engagement, service design, product prototyping, business modelling, pitching to investors.

CE9: Final Project / Dissertation (60)
Final individual project and dissertation.

“A Smart City is a city that integrates its systems - from local labour markets to financial markets, from local government to education, healthcare, transportation and utilities - to drive efficiency for the benefit of its inhabitants.”

Smart London Board
Smarter London Together Plan
@LDN_CDO
https://medium.com/@smartlondon

“A smarter city is a more collaborative, connected and responsive city. It enables greater data innovation to meet citizens’ needs.”


ICRI Cities | Intel Collabo
www.cities.io
ICRI sustainable connected cities
ABOUT
PROJECTS
NEWS
PEOPLE
CONTACT
Encouraging prosocial behaviour through technology
The Intel Collaborative Research Institute is concerned with how to enhance the social, economic and environmental well being of cities by advancing compute, communication and social constructs to deliver innovations in system architecture, algorithms and societal participation.
our philosophy is
Design for humans
Build for long term
Triple bottom line
co designing
Our team
Partners
Fellow travellers
Communities
sustainable city experiences
City as platform
Harnessing the invisible city
Enabling connected communities
Sustaining sustainable practices

ICRI Urban IoT delivers research activity to demonstrate the compute fabric needed to support an urban Internet of Things at city scale.

LONDON LIVING LAB

@ ICRI Urban IoT

The London Living Lab is located in the Queen Elizabeth Olympic Park (QEOP) in East London and surrounding boroughs Hackney, Newham, Tower Hamlets and Waltham Forest. This vast site was the main location for the London 2012 Olympic Games, and is now under redevelopment as a multi-use 'Smart Park'.

City elements including residential. commercial, cultural and leisure facilities are all found within this 560 acre space.

3 Key Challenges

Billion Device Challenge

POWER
Keeping nodes alive constantly for long operational periods.

COMMUNICATION
Managing radio communications in densely-populated network of sensing devices.

MANAGEABILITY
Orchestrating resource sharing on billion devices for multiple stakeholders.

Citizen Engagement

SENSE MAKING WITH CITIZENS
How to explicitly bring citizens into the loop of Urban IoT and support them as data prosumers; both consuming available urban data for personal / community gain, and providing valuable new data in the form of citizen experiences and feedback.

SOFT SENSING EXPERIENCES
How to implicitly bring citizens into the loop of Urban IoT and take into account their socially shared thoughts and experiences in urban spaces.

Creating Sustainable Ecosystems

PERFORMANCE IN USE ANALYSIS
Can we create a framework for analysis of "performance in use" for IoT technologies that enables the market to make decisions on investing in technology infrastructure.

CIRCULATORY DATA
What are the socio technical requirements to create federated data repositories in the park that support the use and reuse of data across all stakeholders in the QEOP living lab.

LPWA Network

ICRI Urban IoT have installed a LoRa (low power, wide area network) basestation at the top of the ArcelorMittal Orbit, a large sculptural structure and the highest point in the park. With proposed ranges of over 5kms, the LPWA network will provide the communicaton backbone to support the various use cases and IoT deployments throughout the QEOP. It will also provide a proof of concept for LPWA networking as an IoT solution.

Sensing Use-Cases

Real-time Bat Species Classification Network

Park operators must meet biodiversity and environmental targets and support a variety of plant and animal species. Bats are a good indicator species as to the general health of biodiversity in the surrounding area, hence monitoring bat activity is important. This is currently done manually by a team of ecologists and is a labour and time intensive process. At ICRI Urban IoT, we are developing an edge device platform that can process high-frequency data (up to 192kHz sample rate) in real-time to provide a more autonomous solution to bat activity monitoring.

Microclimate Monitoring

The QEOP is a diverse space where built and natural environments meet and coexist. Wetlands areas with an abundance of plant and animal life back onto residential and commercial buildings, many of which are currently under construction. Park operators need to understand the complex park environment at hyper-local levels. The ICRI Urban IoT are developing a large network of energy neutral microclimate sensors which will provide an at-scale proof of concept for energy harvesting and urban sensing.

Water Monitoring

The QEOP has a variety of different waterways including the River Lee, various canals and a 'Wetlands' area, which are essential to the biodiversity of the park. Occurences such as algae blooms are a common problem when water conditions are poor and are detrimental to the park ecosystem. Here, we aim to develop a water sensing network that will span across park waterways, monitoring water conditions and notifying park operators ahead of time - hence providing a preventative measure.

AIR QUALITY

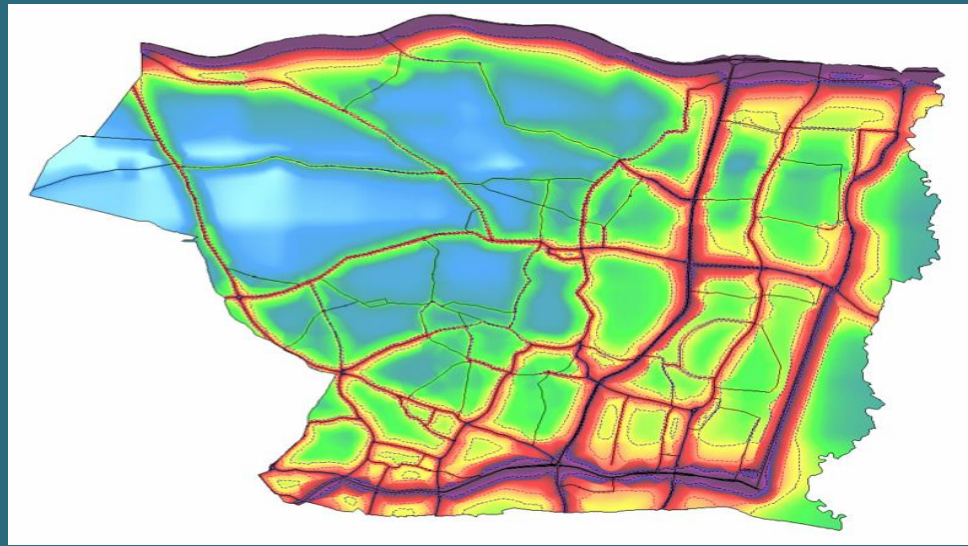
OPERATIONAL COST

Balancing BOM cost + technician time. Install cost significant, field maintenance expensive, infrastructure hard to access

Lessons learnt:

Pilot to test creases in system that 2x cost

Product ≠ original brief > Service (Bosch)



Air Pollution Monitoring Solution by Intel and Bosch Provides Intellig...

INTERNET OF SCHOOL THINGS

A MEANS TO AN END

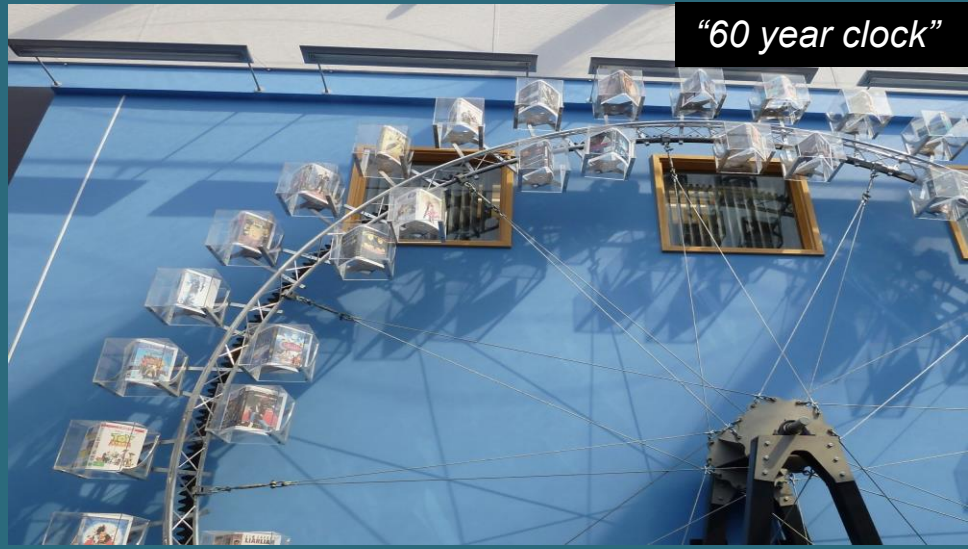
Enfield wanted 100 AQ devices, they have 100 schools. Connecting with existing infrastructure / social structures provides tactical means of engagement + national scale.

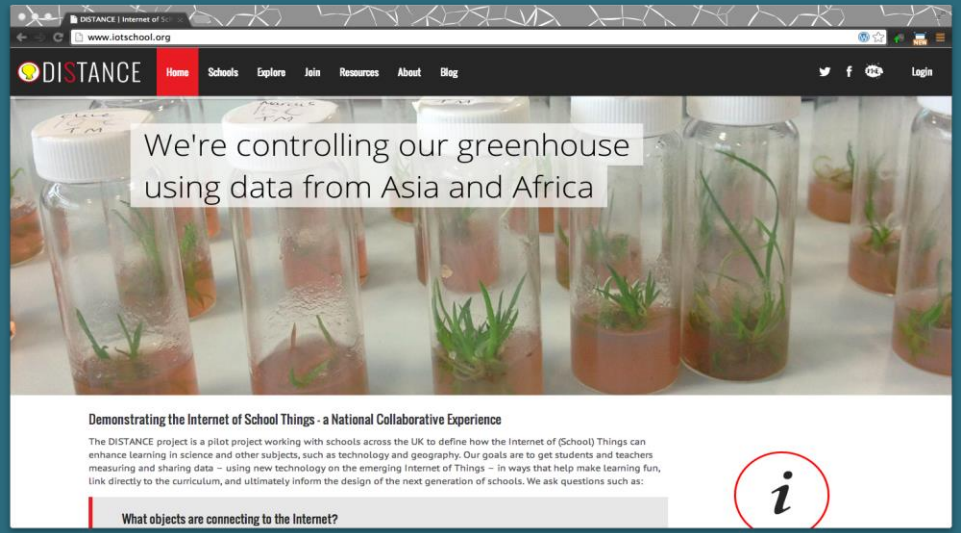
Lessons learnt:

Operational win win.

Technology is a means to an end.

Education context + kids as Trojan horses.





ORGANICITY.EU

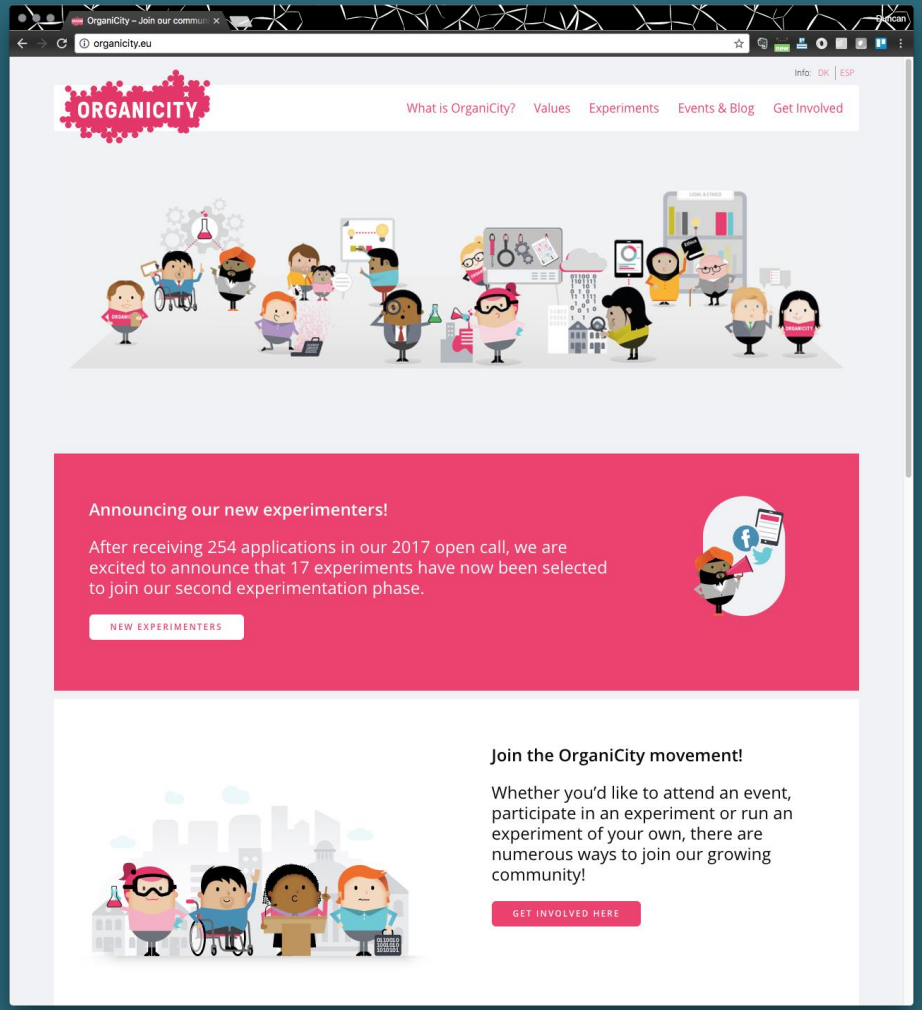
EXPERIMENTATION AS A SERVICE

Experimentation made easy - platform experience
Tools for co-creation – tech + social enablers
Ethics and privacy - model experimental agreement
Legal / IP - reference design / experimental agreement

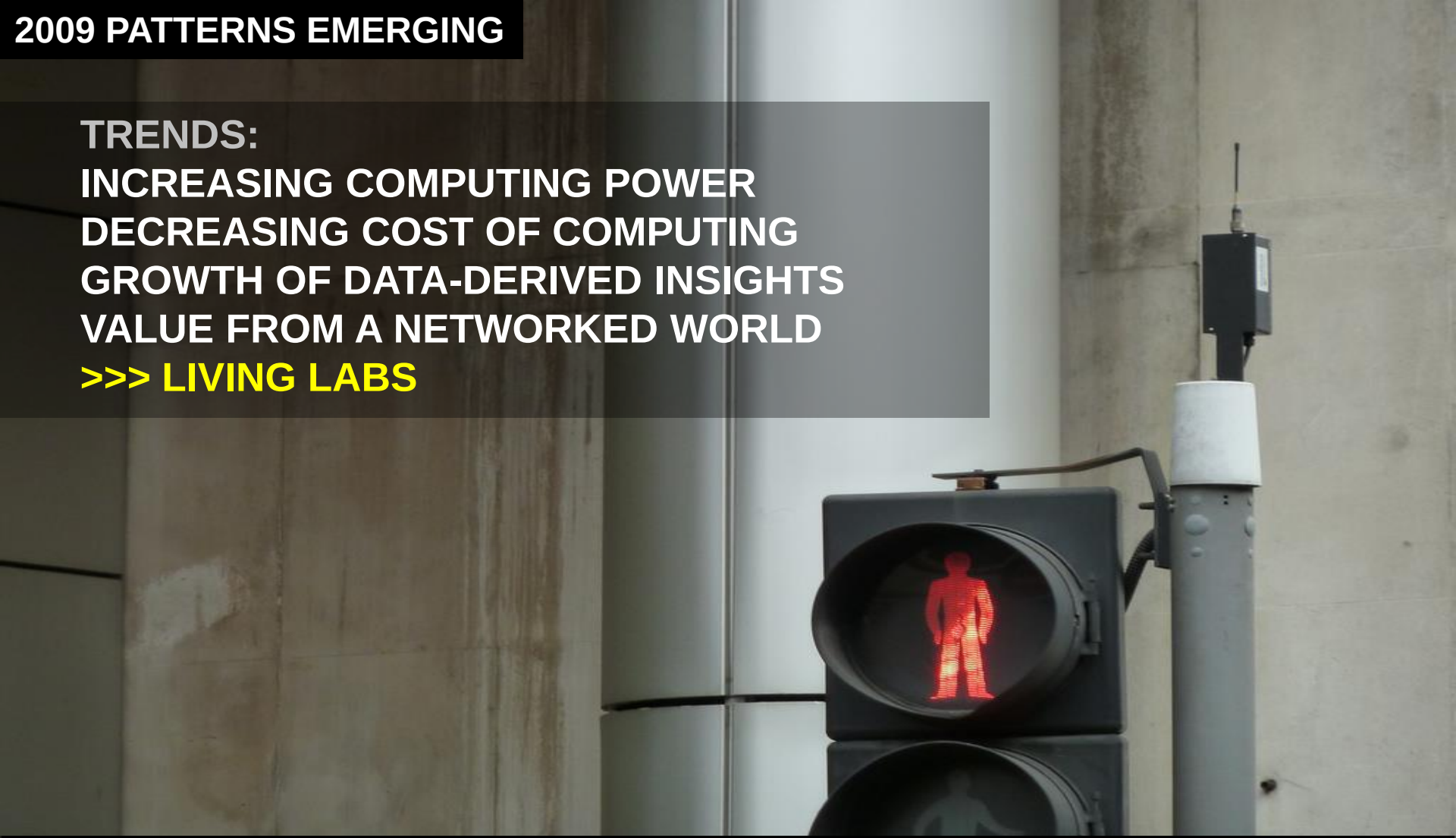
Lessons learnt:

Cost in delivering service design not platform.

Engagement takes time + needs resources.



2009 PATTERNS EMERGING



TRENDS:

INCREASING COMPUTING POWER
DECREASING COST OF COMPUTING
GROWTH OF DATA-DERIVED INSIGHTS
VALUE FROM A NETWORKED WORLD
>>> LIVING LABS

CONNECTED ENVIRONMENTS

TO ADVANCE THE DIGITAL TECHNOLOGIES WE USE TO INSTRUMENT, OBSERVE AND AUGMENT OUR UNDERSTANDING OF THE BUILT + NATURAL ENVIRONMENT

AI AT EDGE – EXTRA SENSORY – SPATIAL REASONING

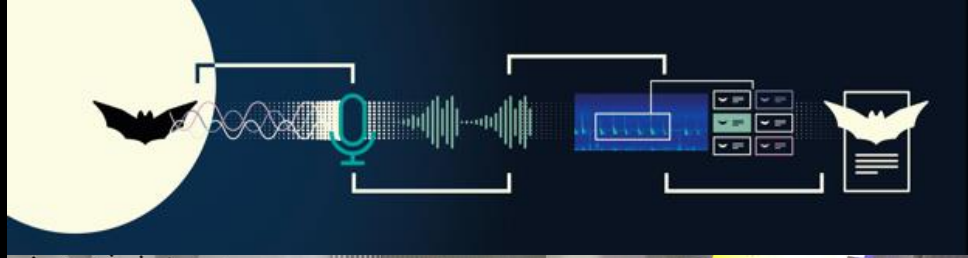
Pool Street West: Future Living Institute

Exploring global challenges such as planetary sustainability, understanding nature, environment and urbanisation, and social inclusivity. It will comprise:

Centre for Robotics & Autonomous Systems
Global Disability Innovation Hub
Nature-Smart Cities Labs and Park as a 'living lab'
Culture Lab + London Memory Archive
Urban Room + Global Future Cities Co-Labs

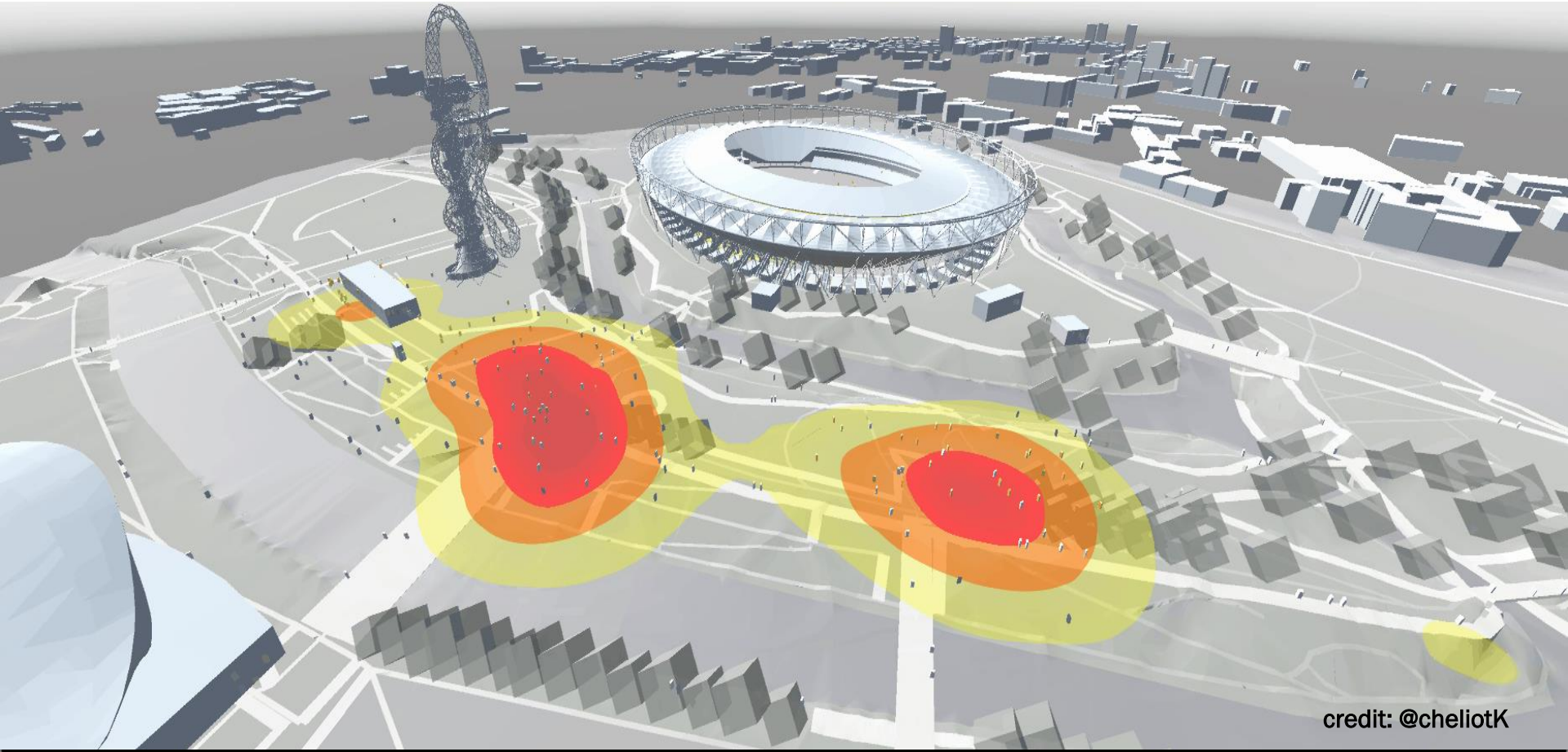
photo: https://www.queenelizabetholympicpark.co.uk/

CONNECTED ENVIRONMENTS
from bridges to bats

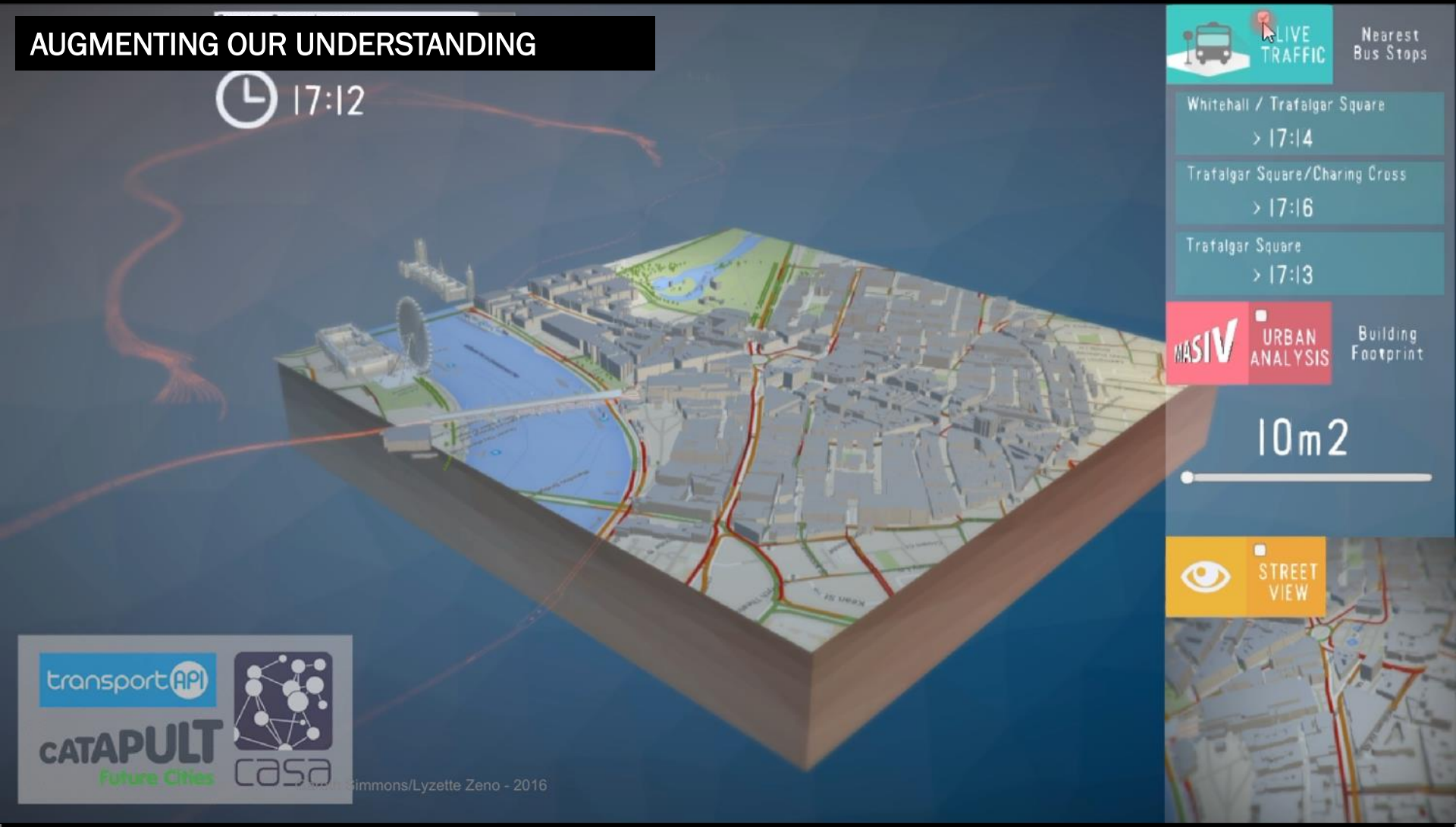


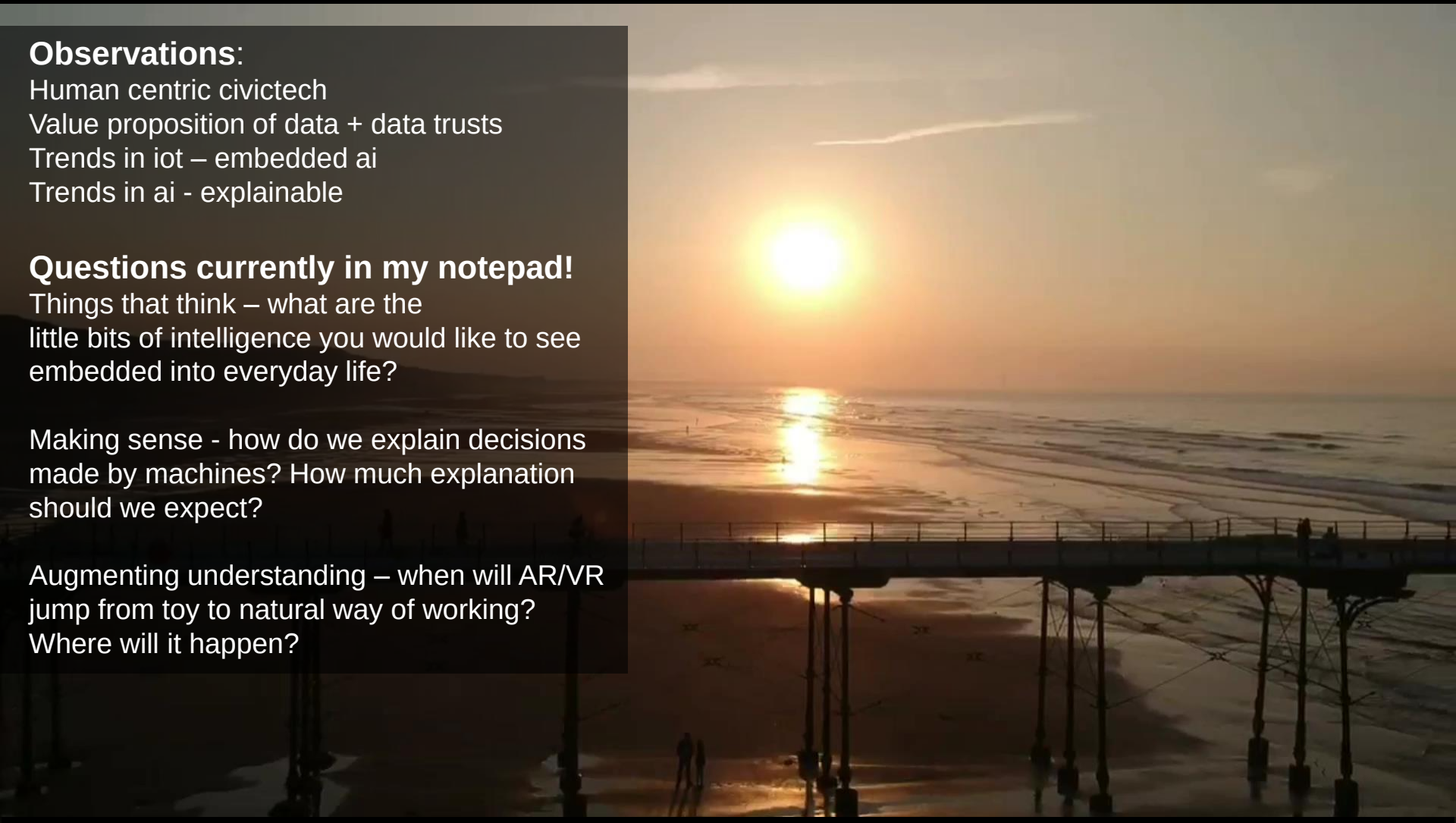
SYNCHRONOUS
LATERAL
EXCITATION

SUPER REAL-TIME MODELS



AUGMENTING OUR UNDERSTANDING





Observations:
Human centric civictech
Value proposition of data + data trusts
Trends in iot – embedded ai
Trends in ai - explainable

Questions currently in my notepad!
Things that think – what are the
little bits of intelligence you would like to see
embedded into everyday life?

Making sense - how do we explain decisions made by machines? How much explanation should we expect?

Augmenting understanding – when will AR/VR jump from toy to natural way of working?
Where will it happen?

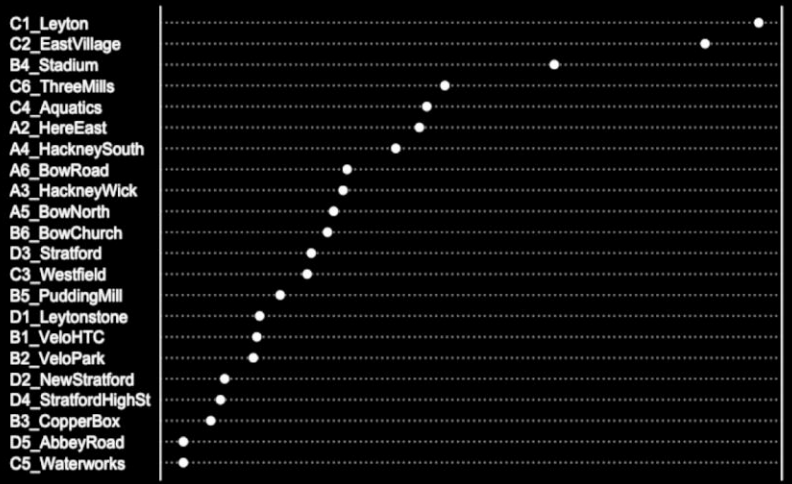
2013 ENGAGEMENT AS SENSING

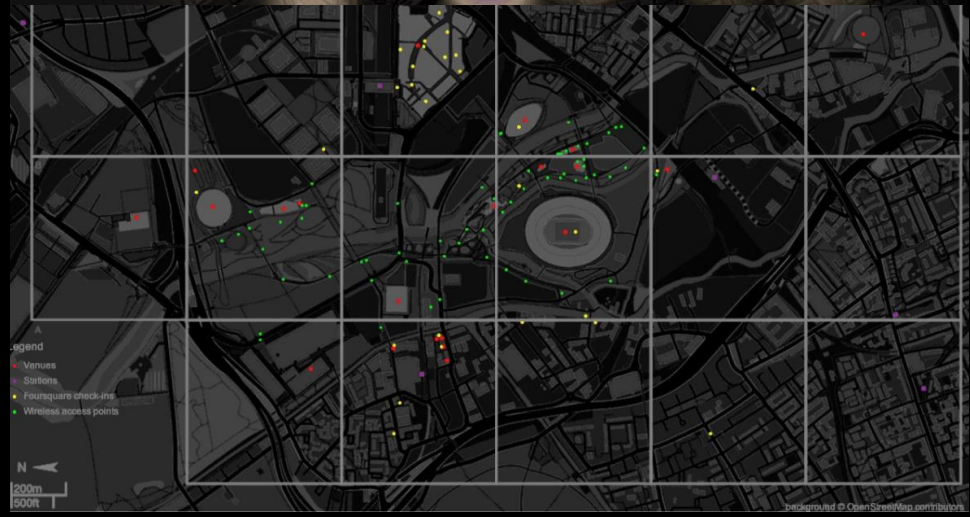
http://visualisingmillroad.com/

2015 SOCIAL STREAMS + BIG DATA TOOLKIT

Narcissism

Sentiment analysis – positive emotion, aggressive, affection, anxiety, social, moral etc





SHAZAM FOR BATS

Ultrasonic – http://www.batslondon.com/

2016 SERVICE DESIGN + HUMAN PLATFORM

organicity.eu

ORGANICITY

What is OrganiCity? Values Experiments Events & Blog Get Involved

WHAT ARE THE ORGANICITY SERVICE PILLARS?

The OrganiCity service framework is built upon four pillars.

Systematic experimentation

The service provides guidance, resources and tools for evaluating experimentation results at a small scale before iteration and expansion.

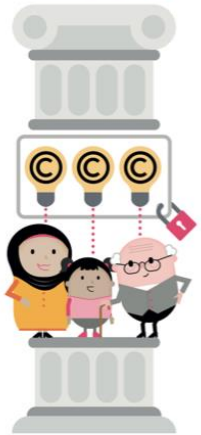
Co-creation

The service provides a framework for developing collaborative processes around engagement, discussion and ideation.

Federated ethics and privacy

The service provides end-to-end protection for users and data subjects.

Management of liability and intellectual property rights



The service provides a framework of legal protections for those collaborating in the innovation process.

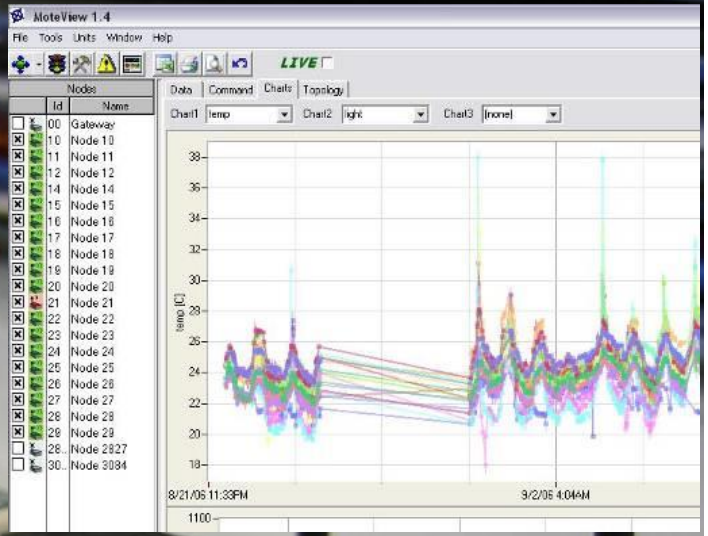
Announcing ou

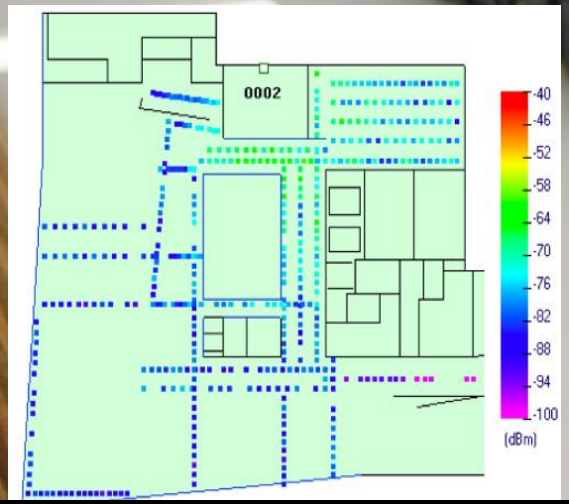
After receiving
excited to anno
to join our secc

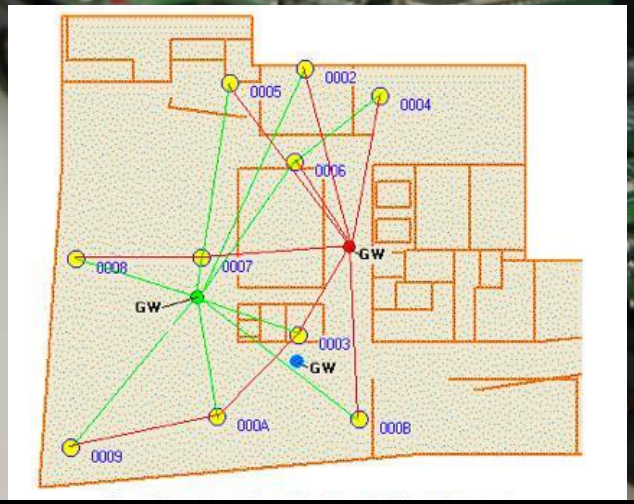
NEW EXPERIMENTS

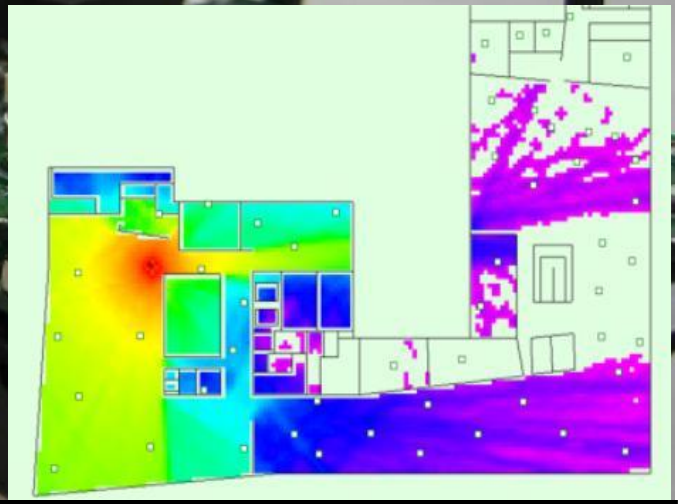
numerous ways to join our growing community!

2006 EMERGENT TECHNOLOGY

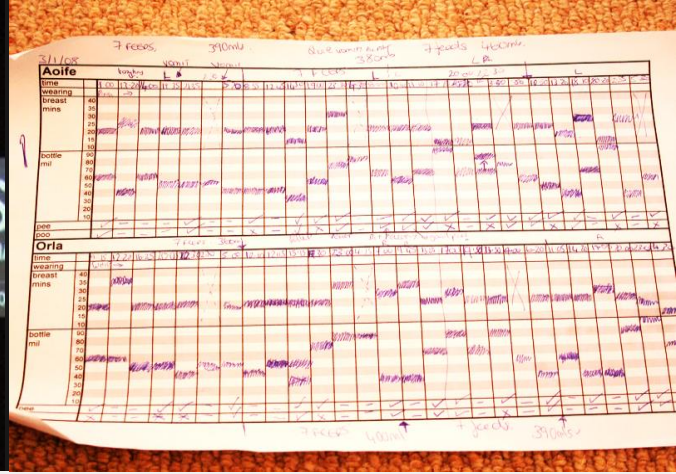


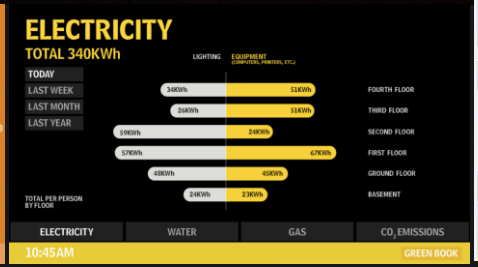






2007 ACTING ON DATA SHADOWS





2009 DATA SHADOWS AS CONVERSATION STARTER

SMART POP UP RETAIL

Gonzalo Garcia-Perate (EngD CASE) – hinteractions, collective intelligence