

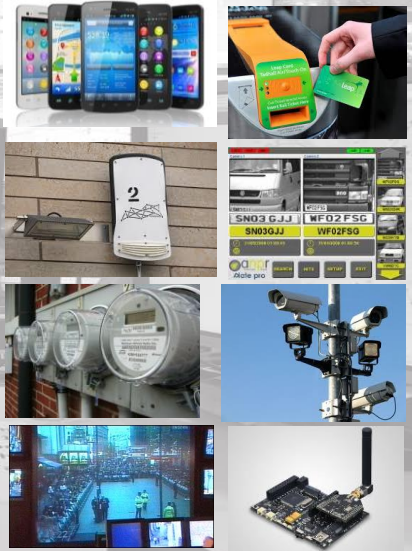
Data and the city

- Rich history of data being generated about cities
- Long had *data-informed urbanism*
- Urban data are a key input for:
 - understanding city life
 - solving urban problems
 - formulating policy and plans
 - guiding operational governance
 - modelling possible futures
 - tackling a diverse set of other issues
- Being complemented and replaced by *data-driven urbanism*



Smart city tech / urban big data

Domain	Example technologies
Government	E-government systems; online transactions; city operating systems; performance management systems; urban dashboards
Security and emergency services	Centralised control rooms; digital surveillance; predictive policing; coordinated emergency response
Transport	Intelligent transport systems; integrated ticketing; smart travel cards; bikeshare; real-time passenger information; smart parking; logistics management; transport apps
Energy	Smart grids; smart meters; energy usage apps; smart lighting
Waste	Compactor bins and dynamic routing/collection
Environment	Sensor networks (e.g., pollution, noise, weather; land movement; flood management)
Buildings	Building management systems; sensor networks
Homes	Smart meters; app controlled smart appliances
Civic	Various apps; open data; volunteered data/hacks



Urban big data

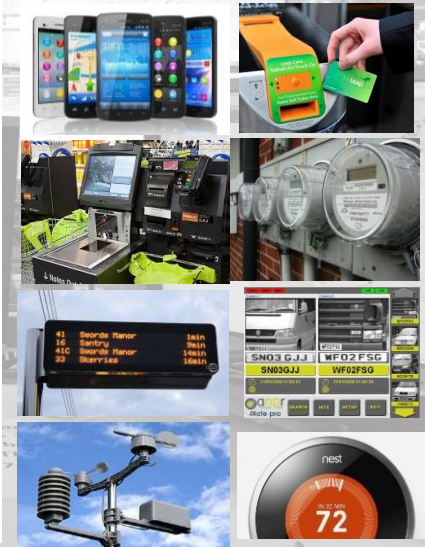
- **Directed**
 - Surveillance: CCTV, drones/satellite
 - Public admin records
- **Automated**
 - Automated surveillance
 - Digital devices
 - Sensors, actuators, transponders, meters (IoT)
 - Interactions and transactions
- **Volunteered**
 - Social media
 - Sousveillance/wearables
 - Crowdsourcing
 - Citizen science

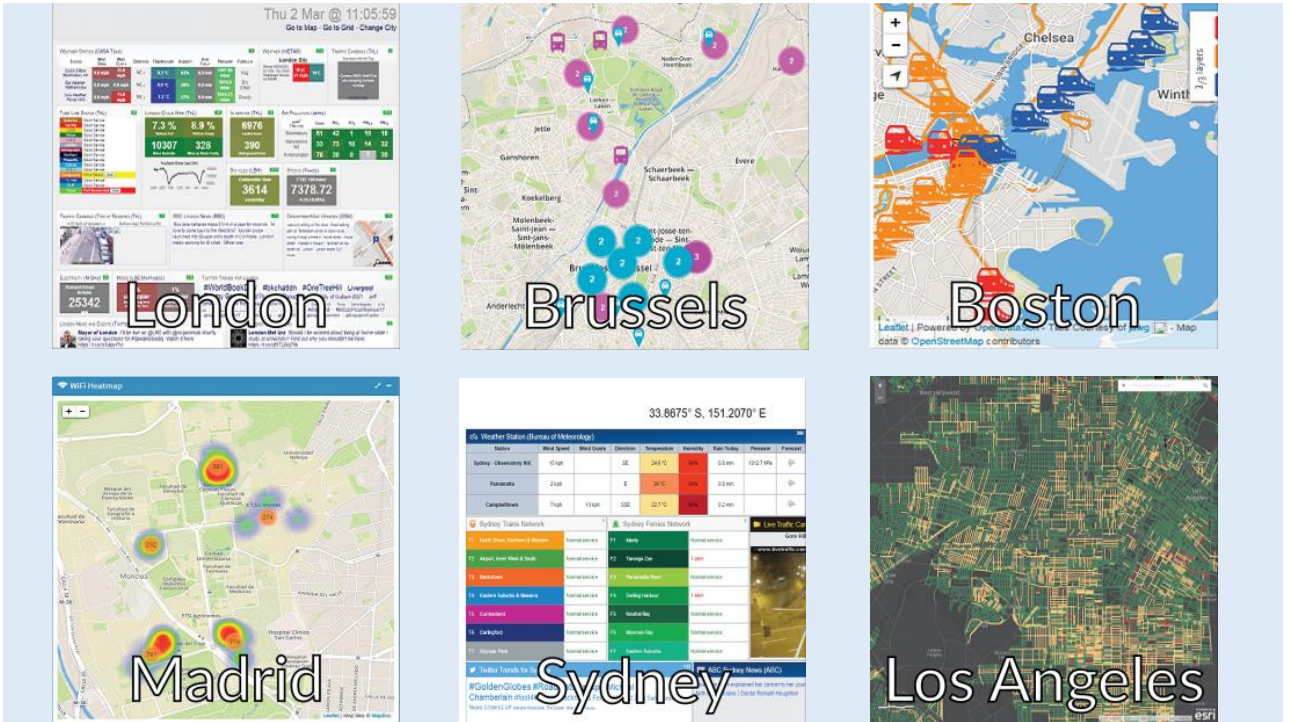




Urban big data

- Diverse range of public and private generation of fine-scale (uniquely indexical) data about citizens and places in real-time:
 - utilities
 - transport providers, logistics systems
 - environmental agencies
 - mobile phone operators
 - app developers
 - social media sites
 - travel and accommodation websites
 - home appliances and entertainment systems
 - financial institutions and retail chains
 - private surveillance and security firms
 - remote sensing, aerial surveying
 - emergency services
- Producing a data deluge that can be combined, analyzed, acted upon





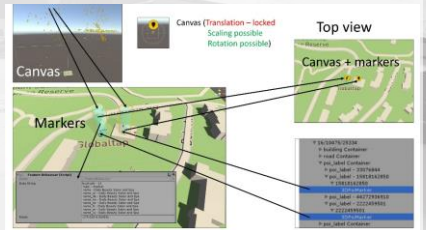
Urban Dashboards

- Dashboards provide a visual means to organize and interact with data
- Act as cognitive tools that improve a user's 'span of control' over voluminous, varied and quickly transitioning data
- Enable a user to explore the characteristics and structure of datasets and interpret trends
- Power and utility of urban dashboards are their claims:
 - to show in detail and often in real-time the state of play of cities
 - to translate the messiness and complexities of cities into rational, detailed, systematic, ordered forms of knowledge
 - to enable us to know the city *as it actually is* through objective, trustworthy, factual data



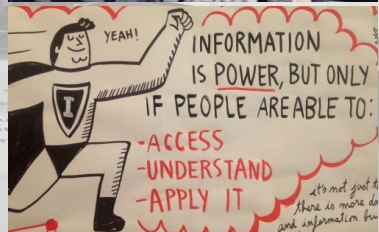
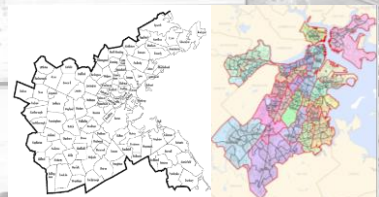
BCD/Critical data studies

- Critically reflect on city dashboards through six issues:
 - epistemology
 - scope and access
 - veracity and validity
 - usability and literacy
 - use and utility
 - ethics
- Posed as six questions designed to expose the *politics* and *praxes* of city dashboards
- Heuristic for examining other data-driven technologies



How comprehensive and open are city dashboards?

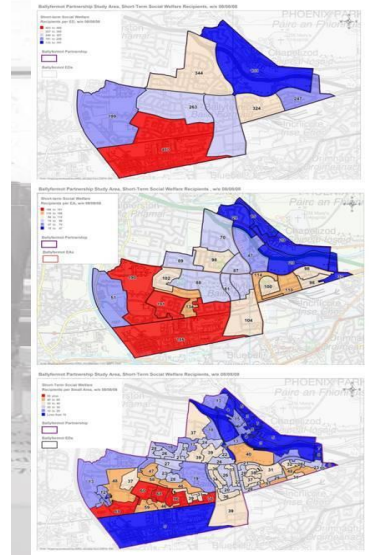
- **Scope and access**
- Dashboards process and display quantitative data that are generated recurrently so can be tracked over time/space
- Enormous amount of information about cities absent
- Ignores the metaphysical aspects and intangibilities of urban life
- Significant gaps and silences in the data that are displayed
- Is the dashboard open for public viewing? Are data generated are available for re-use?
- Level of openness varies across administrations and places
- Access to data a significant issue in the building of the Dublin Dashboard
- Even when data are available there are often issues related to data measurement, data formats and media, metadata, data standards, modes of sharing





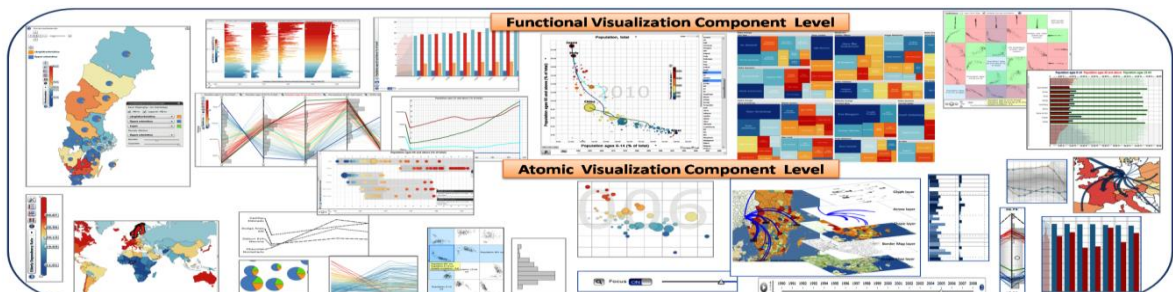
To what extent can we trust city dashboards?

- **Veracity and validity**
- Data quality
- Appropriateness of the method used and other methodological issues
- Validity of the analysis and interpretation
- Instrument and human error and bias; abstraction, representation, generalisation and calibration
- Data shaped by technical instruments of varying specification and parameters, handling procedures, scientific norms and standards, scientist behaviour and organisational processes
- Often published without metadata: measurement, sampling frame, handling, veracity (accuracy, fidelity), uncertainty, error, bias, reliability, calibration, lineage
- Rarely are the algorithmic black-boxes exposed so that calculations are open to scrutiny
- There are issues such as MAUP and other ecological fallacies that shape interpretation



How comprehensible and useable are city dashboards?

- **Usability and literacy**
- Assumption enable urban data to be explored and analyzed in an easily digestible and intuitive way without the need for specialist skills or knowledge
- There are three practical issues – navigation of site, use of tools, and data/analytics literacy
- Sometimes not at all clear how to display data, change data layers, perform analysis, interact with data
- Data and analytic literacy is highly variable
- Affect use and utility





The BCD Project

- Funded by SFI for 4 years
- Fundamental and applied research
- 4 work packages
 1. Data access, quality and standards
 2. Multi-modal interaction
 3. Data analytics and modelling
 4. Data literacy and outreach
- Open science, open source, open data
- Low cost, low maintenance
- Inform best practice; specify framework
- Lighthouse/follower model: Dublin/Cork
- Partners: Four Dublin LAs; Two Cork LAs; CSO; OSI

dashboards.maynoothuniversity.ie

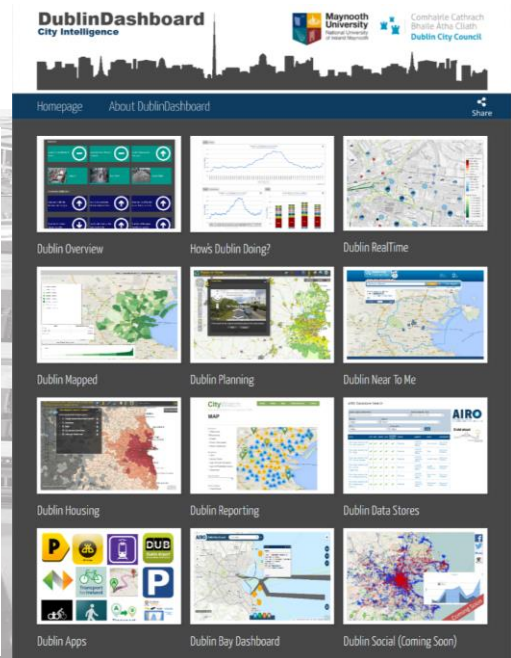
dashboards@mu.ie

[@dashbuild](https://twitter.com/dashbuild)



Dublin Dashboard

- Funded by ERC & SFI
- Launched in 2014
- real-time information
- interactive maps/graphs
- location-based services
- indicator trends
- open and big data
- city reporting
- Interactive data viz, maps, LBS, query tools, benchmarking
- dublindashboard.ie



dashboards.maynoothuniversity.ie

dashboards@mu.ie

[@dashbuild](https://twitter.com/dashbuild)

Cork Dashboard

- Funded by SFI
- Launched in 2017
- Data types:
 - Public administration;
 - Official statistics;
 - Operational;
 - Scientific;
 - Crowdsourced;
 - Locative and social media data;
 - Derived
- corkdashboard.ie

dashboards.maynoothuniversity.ie

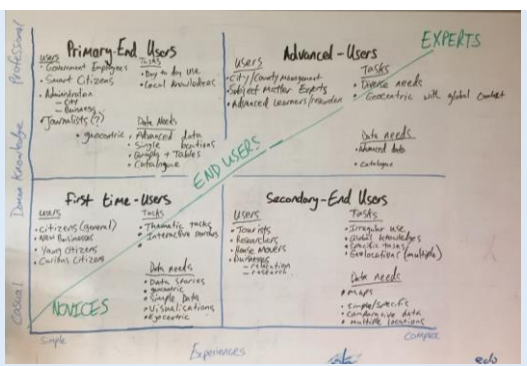
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@dashbill

The screenshot shows the Cork Dashboard homepage with a navigation menu (Home Page, About) and several data visualization sections:

- Explore:** Best Time Maps, Data Trends, Mapped Data, Planning, Housing, Citizen Reporting, Cork Data Store, Coastline, Software & Apps.
- Cork in Real Time:** Live Environment, Current AQI Quality Index for Health for Cork, City is Good.
- Data of a Glance:** Average Residential Rent, Average House Price, Planning Applications, County, A Twitter List by @CorkDashboard.
- Traffic & Travel:** A map showing traffic and travel data.
- Weather:** Latest forecast for Mon Apr 23 2018.
- Live Traffic: Cam:** Current live traffic camera feed.

Personas



Josh Davis "A Curious Mind"
 Age: 29-34
 Occupation: High Water Survival
 Education: Doctorate Degree
 Experience: Environmental Science
 Family Status: Single with no children
 Location: Birmingham
 Core Interest: Generalist
 Challenge: Nature & photography
 Interests: Home & mobile Android & iOS, Photo & Travel
 Operating System: Linux
 Platform Types: Mobile
 Dashboard Experience: Casual
 Domain Knowledge: Simple

Experience & skills:
 Josh is a curious mind, he has worked the hardest ever or more before. He originally found the dashboard through other people using it and he was a skeptic but he started with looking at thematic data having said that he understood the degree.

Interacting with Josh:
 Josh explains the site to see what the dashboard can do for him and he is really interested in it because he sees how the data is interesting to his community, he explores other themes based upon what he learns from his interests.

Typical Tasks for Josh:
 Josh usually lands on the home page from Google. He likes to browse the environmental theme pages to get help him make plans for photography trips around Dublin.

Reasons for Josh to return:
 Consuming data stories, Learning about Dublin.

Josh's Story: "I hate to always come back to aesthetics, but..."
 Josh has had casual experiences with city dashboards in the past and has a simple understanding of the city dashboard domain. He does not have any knowledge about some of the more specific data sets or the general meaning of the data in a larger context. He struggles with the application of real data for actionable urban activities and the broader concepts and relationships that exist between data themes. However, Josh is a curious semi-professional who is educated and tech-savvy. An individual who has the capacity to grasp the use of city dashboards, but only in certain circumstances. Any analysis that Josh has experience in is related to city specific data, and he is learning to navigate and explore them, can be allowed in the presentation of thematic, intuitive, and repetitive visuals that will encourage him to explore upon extended periods of exploration. That is, by maintaining consistency throughout the dashboard. Furthermore, the ability that the dashboard presents will help Josh to contextualize the data and build upon to current knowledge of data relationships.

Jane Quinn "Science News"
 Age: 34-44
 Occupation: Molecular Degree
 Education: Biology
 Experience: Living with Partner & 3 kids
 Location: Mully Cheryck
 Challenge: Mully Cheryck
 Interests: Mully Cheryck
 Operating System: Office
 Platform Types: Windows 7
 Dashboard Experience: Professional
 Domain Knowledge: Simple

Experience & skills:
 Jane uses the dashboard regularly at the local county council (CC). She is familiar with data stories and the thematic data content. She regularly explores new data sets, routinely following links to data sources to check their validity, and makes use of visualizations in her monthly reports.

Interacting with Jane:
 Jane asks the user with specific tasks and goals in mind. She learned about the site from a training session that she attended through work. Jane stated that if she has to undertake a new line of enquiry, she can use the "tasks" page to learn new skills.

Typical Tasks for Jane:
 Jane has the main award in her "tasks" bookmarks folder in Chrome. She keeps a list open for reference throughout the day.

Jane's Story: "Crisp and clean designs will up to date data."
 Jane has professional experience with city dashboards, but has a simpler understanding of the city dashboard domain as a whole. Jane is familiar with most city-specific systems and has used some of the data tools. However, she does not access in-depth data in a regular basis. Jane has regular tasks to perform for a city-specific location. This gives her explicit expectations of a system and a comprehensive understanding of task-driven applications. These motivations give her an advantage over new users, but she still has difficulty learning new menu structures and navigating to datasets as unfamiliar or overly complex pages. Jane overcomes these issues by systematically following menu patterns and page structures. She approaches complex and occasionally intimidating user and an effective web-design and data visualization methodologies. These approaches help in creating professional-looking data that are easy to remember and implement in both the regular and occasionally explorative tasks she has to perform. Jane uses the online training and help pages, but only if they are quickly accessed, well-organized, and easy-to-use.

Geoff Flowers "The Prof"
 Age: 40-44
 Occupation: Senior Lecturer
 Education: BSc (Hons) Social Science
 City Management
 Family Status: Married / 3 children
 Location: Donaghadee / Inverness
 Challenge: Digital Technology
 Interests: Office / Field
 Operating System: Linux
 Platform Types: Linux / Android
 User Group Type: Advanced
 Dashboard Experience: Professional
 Domain Knowledge: Complex

Experience & skills:
 Geoff uses City Dashboards to make decisions that are informed and therefore focuses on the reliability and usability of the data he is presented with. With work, new projects and plans come on or the end of the day, Geoff wants access to diverse city data sets so that he can investigate them in different ways.

Interacting with Geoff:
 Geoff accesses multiple dashboards from work and sometimes when travelling abroad. He needs to be able to access and compare different data types as well as being able to explore any new data sets as they are made available, often on a global scale.

Typical Tasks for Geoff:
 Geoff typically needs to communicate and comment upon high impact projects based upon his research. He is familiar with multiple data types and uses multiple data comparison tools. He needs to compare cities in Ireland with other European locations, which isn't really facilitated elsewhere. Geoff needs to be able to create and customize data visualizations and compare his findings to other broader surfaces.

Geoff's Story: "Entire me to dig deeper and do more."
 Geoff continues him an advanced user. He has many previous professional experiences with city dashboards and has a complex knowledge of the different types of data available in the city dashboard domain. He is familiar with the data sets available in the city dashboard to present a given activity, in terms of both general and specific tasks. Geoff expects a city dashboard to present a wide range of data sets. He is familiar with the data sets available in the city dashboard and he expects to be able to create and customize data visualizations and compare his findings to other broader surfaces. He is familiar with the data sets available in the city dashboard and he expects to be able to create and customize data visualizations and compare his findings to other broader surfaces.



Dashboard re-design

Explanative
(communication of insights)

Increasing Visualization Complexity

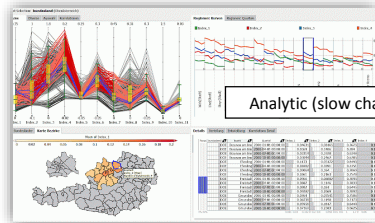
Explorative
(discovery of patterns)



Data stories



Dashboard (fast chart)



Analytic (slow chart)

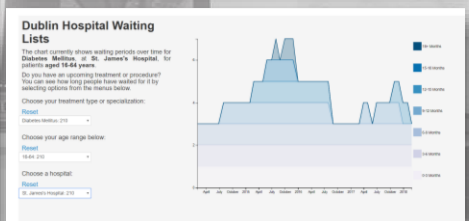
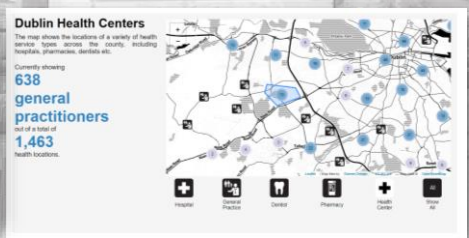
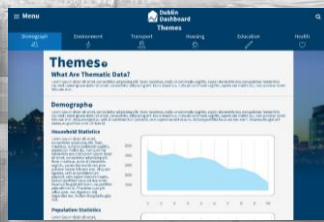
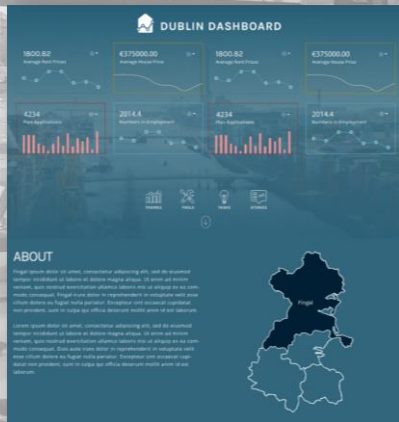
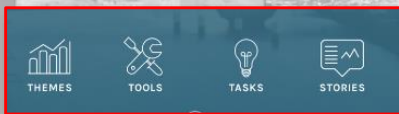
Novice | Casual

Advanced | Professional

Increasing Contextual Information

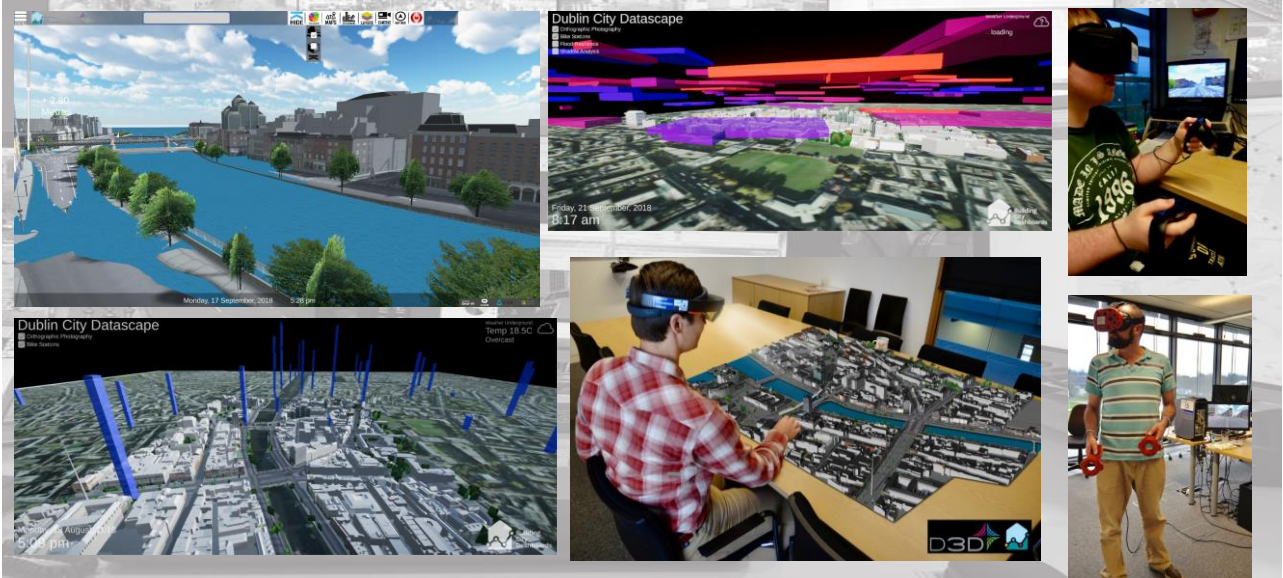


Dashboard re-design

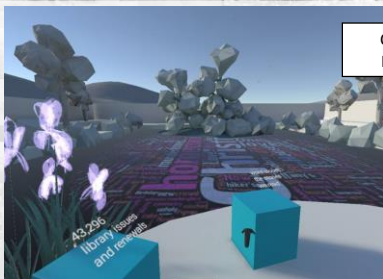




VR/AR/Web3GL



Working with data artists



Cordula Hansen



Jeffery Weeter



Maria Mencia



Conor McGarrigle

- Creative interpretations of urban data by four artistic collaborators
- 'Writer in residence': data stories



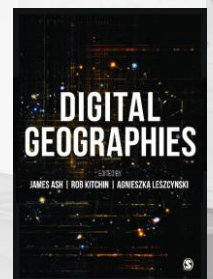
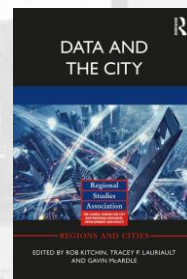
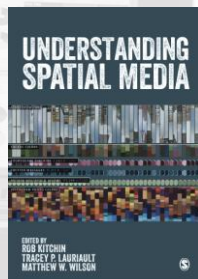
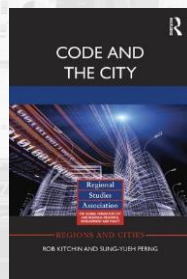
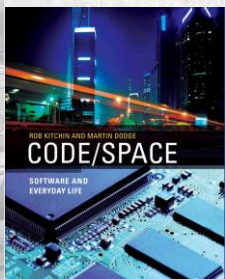
Conclusion

- Urban data is proliferating, as are ways to make sense and act on those data
- City dashboards are one way to collate, process, visualize, analyze and share urban data, and are becoming more common
- How do we create city dashboards that are effective at communicating about the city at the same time as heeding critiques?
- We advocate:
 - re-imagining dashboards, explicitly recognizing their inherent politics, praxes and contingencies
 - designing based on user feedback, design principles, openness and reproducibility



Rob.Kitchin@mu.ie
@robkitchin

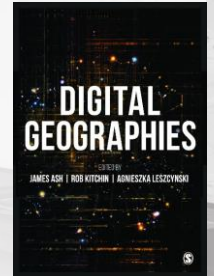
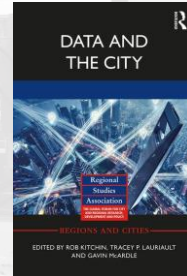
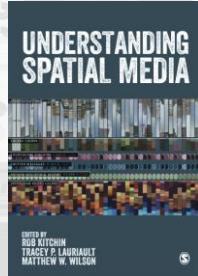
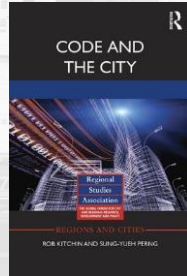
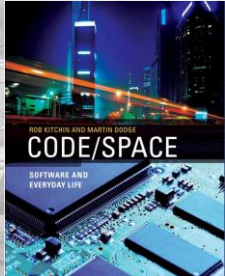
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