

NOVEMBER 2016

# FUTURE OF PLANNING

State of the Art Innovations in  
Digital Planning.



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Future Cities Catapult have launched a programme that will explore how design, data and digital tools can update how planning is conducted in the U.K. and globally. Future of Planning aims to build a picture of a faster, more transparent and equitable planning system that delivers the kinds of homes, communities and cities we want.

This 'State of the Art' report provides an insight of how new technique and technologies are beginning to permeate the planning system, in the UK and internationally. It provides a mixed picture. In some areas tools and techniques that have been in academia or the private sector are being adopted by planning authorities and developers. However, innovation is sparse, with few places adopting digital and data driven techniques across all elements of the planning process.

It's also the case that there is no private sector monopoly on innovation in planning; it's clear that planning consultants, developers and (to a lesser extent) architects are still behind the curve in adopting data-driven and digitally-enabled tools to improve their engagement with the planning system. Similarly, no one country seems to have built the entire picture.

Over the coming months, we will be talking to different users of the planning system to work with them to identify the challenges of the current system and the opportunities to innovate. We will be launching an Open Call that will seek responses to the challenges and opportunities that we identify. We hope that the Future of Planning programme will begin to paint a picture of the near and far future planning system, then begin to build that vision.

**It is an age-old criticism that the planning system has been slow to embrace technology, remaining in a relative 'digital Stone Age'. While such blanket statements sweep across many discussions of the status quo, planning support systems (PSS)-technology-based solutions encompassing analysis, design, visualisation, communication, and participatory planning-have steadily evolved over the past decades. In recent years, with exciting technological movements such as Big Data and the Internet of Things, as well as market interest in Property Technology, the push for digital solutions in planning has intensified.**

With significant pressure on the planning system for reform and advances in technology, it is an opportune moment to contemplate systemic change, whether incremental or wholesale, and what the future of planning may look like. This report conducts a broad survey of innovations in digitally-enabled planning that are currently being developed or have been deployed in the UK and elsewhere. The following questions are considered throughout the report: What are the technologies, and how are they useful? Which stages of the planning and development process are the innovations particularly focused on? Which stages need more attention?

The report is divided into chapters. Chapter 2 explains the categories used to organise the innovations and provides background information on the planning and development process. Chapter 3 presents three to five innovations chosen to be highlighted under each category. Chapter 4 offers in-depth narratives into the successes of exemplary cities in digital planning. Chapter 5 concludes the report with final remarks.

Built environment professionals, including planners, in 5-10 years' time will have a completely different suite of powerful, interactive, visual, and data-driven tools available at their fingertips. This report serves as a sneak peek into that future, which has already begun to unfold.



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## 2.

# THE CATEGORIES

Innovations in digital planning and related areas can be innumerable depending on the scope defined. For instance, there is a large amount of research and development activity in the areas of urban data analytics or visualisation (e.g. 3D modelling and BIM) given recent technological advances and market trends. For the purposes of this research project, only those innovations that explicitly pertain to the planning and development process were catalogued. The research was conducted with a primary focus on the UK and complemented by outstanding examples taken from around the world.

## 2.1 THE CATEGORISATION PROCESS

The planning and development process was broken down into its constituent parts so that the innovations could be organised according to the stage of the process it related to. See below for a summary of the planning and development process, divided into two—plan making and site development (planning application) processes.

### 2.1.1 THE PLAN MAKING PROCESS



In the UK, local plans are prepared by local planning authorities (LPAs). This forms part of a process that is separate from, but interacts with, the planning application process undertaken by developers.

Local plans form the strategic approach and policies of an area against which planning applications are later decided. Strategies and development management policies are formulated by reference to and analysis of an evidence base. Traditionally, the evidence base is composed of a suite of thematic research reports that identify the various characteristics and needs of a local area. Themes usually include assessing needs for housing, employment, retail, environmental protection and a range of other topics.

The LPA then generally undertakes a 'call for sites', during which landowners and developers can propose to have their sites included within the local plan. It then carries out a sustainability appraisal of the sites that have been proposed. The most sustainable sites are selected to be included within the draft deposit version of the plan, which is then put forward to the public for a period of consultation. Plans can often be contentious, attracting mixed views from different interest groups and stakeholders. Therefore, it is important for planners to communicate clearly in order to help stakeholders and the general public understand the effects of any strategies or policies. Effective communication and engagement are vital to preventing unreasonable opposition to development and reactive 'Not In My Backyard (NIMBY)' responses to planned proposals.

Once consultation has been completed, the LPA considers any comments received before submitting a final draft of the plan to the Planning Inspectorate for examination. The allocated inspector tests the plan and makes recommendations on any changes to be made before it is adopted.

### 2.1.2 SITE DEVELOPMENT (PLANNING APPLICATION) PROCESS



In order to develop a site, planning permission must be granted by the LPA, with the exception of 'permitted development' - certain building works or changes of use that can be carried out without applying for planning permission because it has been given by a national grant of rights. Developers will undergo a series of steps in order to get their proposed schemes granted. This usually begins with the identification of a site, followed by some preliminary work to understand the site's potential in development terms with built environment professionals including architects, planners and, where relevant, other specialist sub-consultants if a site features any obvious constraints such as heritage or contamination. Depending on the nature of the scheme, the developer may then undertake pre-application discussions with the LPA, who will provide an indication of what would be desired or acceptable, given the site's context and the local plan's policy agenda.

Following pre-application discussions, the developer begins drafting an outline or a full planning application for the proposed scheme. This usually includes the designs of an architect and other designers together with any relevant site plans. The developer may choose to undertake their own consultation and communication with the public if the scheme is likely to be of interest or potentially contentious. During the drafting, any specialist input is also gathered from professional sub-consultants which might include transport, ecology, daylight and sunlight, heritage or any other topics deemed to be of interest given the site's context. Such reports are included within the planning application for the LPA's consideration.

Once an application is submitted to the LPA, the authority has a target to determine a decision within 8 weeks, or within 13 weeks for major or more complex schemes. During that time, the LPA undertakes a statutory consultation with the public and any relevant stakeholders, which may include other internal departments, other external bodies and amenity groups. The authority is required to notify local residents and businesses in writing and to place notices in conspicuous locations around the site to inform the public that an application has been submitted. Planning legislation in the UK stipulates that 'the decision must be taken in accordance with the development plan unless there are material considerations that indicate otherwise'.

During the determination period, the LPA also usually undertakes negotiations with the developer on any conditions to be attached to any potential permissions. These conditions normally focus on 'planning gain', to be obtained through CIL or section 106 agreements. These may include the provision of certain infrastructure on or around a site, or payments to allow for the requirements to be met elsewhere. It is also very common for negotiations on housing schemes to include the provision of affordable or social housing units in addition to market housing. Other conditions to be applied to a permission may include construction restrictions, provision of additional evidence, opening hours or licensing restrictions among others to minimise any impact on residents or businesses.

If permission is granted to the applicant by the LPA, it is usually conditional on the discharge of any and all conditions stipulated as part of the decision. Once all conditions have been discharged, the development can begin. If permission is refused by the LPA, the applicant may appeal the decision to the Secretary of State. The appeal is then managed by the Planning Inspectorate under a separate process on behalf of the Secretary of State, or 'called in' by the Secretary of State for decision (usually in the most complex or contentious of schemes).



In accordance with the above summary of the planning and development process, the following categories were extracted as key stages of the process, against which the innovations were catalogued:

- Evidence Base + Plan Making
- Plan Engagement
- Development Decisions
- Site Search + Appraisal
- Plan Monitoring
- Scheme Design + Communication

It is worth noting that, although the planning and development process can be broken down into separate stages as delineated above, the innovations to be introduced in the following chapters do not necessarily neatly fall into each category. This is primarily due to two reasons: first, the same tools can be used for two or more stages of the process, e.g. an infrastructure mapping application that forms part of an evidence base for a plan can also be utilised for site search and appraisal for development; second, the objective of many of the innovations is precisely to break the silos that divide and delay processes, and to combine and integrate as much as possible to simplify and cut costs, while generating valuable insights. These innovations span across a number of stages of the process, making it difficult to place them under just one. Thus, while the innovations are organised under a certain stage along the planning and development process, they are to be taken as loose categorisations, and many can potentially be argued for another category.



## 3.

# THE INNOVATIONS

In this chapter, three to five innovations are highlighted for each stage of the planning and development process, to provide a broad overview of the kinds of digital planning tools that are being developed and/or deployed (see the Appendix for a list of the rest of the innovations).

## 3.1 EVIDENCE BASE + PLAN MAKING

Evidence bases comprise surveys undertaken by the LPA or consultants to understand the topical needs of an area such as housing, employment or retail space. These surveys are drawn upon by the LPA as part of the plan making process. Once surveys have been undertaken, plans and policies are formulated to address the wants and needs of local communities. Innovations in this category centre around data aggregation, analysis, and visualisation used to inform policy, and the process of formulating policies more efficiently or effectively by the LPAs.

Currently, evidence base surveys are conducted manually by teams of professionals working in either LPAs or private consultancies and are therefore collected in an expensive and time-consuming manner. Services such as Experian® Good collect information and provide databases for particular topics such as retail. Most evidence bases are produced as reports and therefore quickly go out of date, creating uncertainty and room for debate on market needs for various land use types. This has severe implications for plans making, as plan making can be a long and arduous process, after which the evidence bases that informed it may no longer be accurate.

# 3.



Source: [maps.london.gov.uk/ima/](https://maps.london.gov.uk/ima/) - (2016) - screenshot by author

## INFRASTRUCTURE MAPPING APPLICATION FOR LONDON

Greater London Authority  
(London, UK)

[maps.london.gov.uk/ima/](https://maps.london.gov.uk/ima/)

The Infrastructure Mapping Application for London by the Greater London Authority aggregates all infrastructure related layers into a single platform: demographics (population, employment, skills), development (commercial, residential), context (Opportunity Areas, borough boundaries, Greenbelt, environment data, etc.), and infrastructure (transport, energy, water). It offers a number of filters that add depth and nuance to the data: scale (from Greater London down to borough level or user-drawn polygons), time (from 2015 to 2050), funding certainty (from 'speculative' and 'in business plan' to 'secured' and 'out to tender'). It offers real-time data with notifications, as well as charts, graphs, and analytics in addition to the interactive map. The overlay of datasets in the interactive map serves to save time spent researching disaggregated information and inform complex decision-making.



Source: [mappinggm.org.uk](https://mappinggm.org.uk) - (2016) - screenshot by author

## THE GREATER MANCHESTER SPATIAL FRAMEWORK DEVELOPMENT SITES MAP

Greater Manchester  
Combined Authority  
(Manchester, UK)

[mappinggm.org.uk/call-for-sites/development-sites.htm](https://mappinggm.org.uk/call-for-sites/development-sites.htm)

The Greater Manchester Spatial Framework Development Sites Map collates sites identified by the 10 Greater Manchester districts for development (future housing land supply, industry and warehousing land supply, and office land supply) and sites submitted by residents, businesses, land owners, and developers during the Winter 2015/16, Spring 2016, and Summer 2016 Call for Sites. Users are able to overlay road, water, and railway networks layers to better understand the suitability of the sites for development. Furthermore, on the same platform, users can submit additional sites that are not already included in the map by drawing their boundaries and providing requested information. The interactive map serves as a single, live platform for information on potential development sites in Greater Manchester.

# 3.

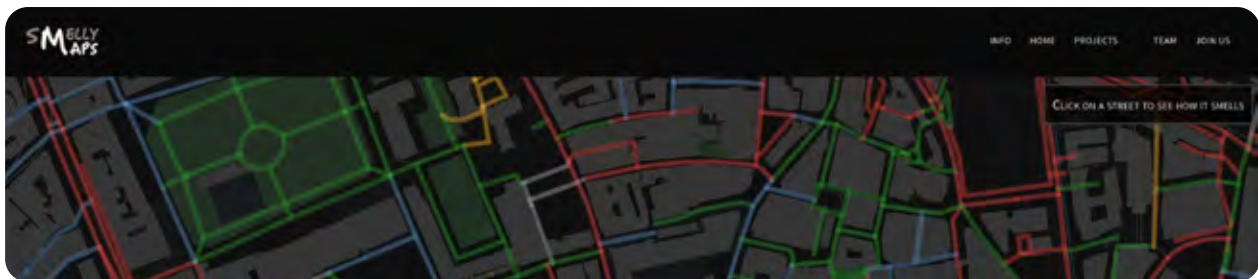


Source: www.stateofplace.co - (2016) - screenshot by author

### 3.1.3 STATE OF PLACE (Chicago, US)

[www.stateofplace.co/](http://www.stateofplace.co/)

State of Place is an urban data analytics startup that forecasts the value add of walkability. It offers a platform that calculates an area’s quality of place based on 290 built environment features, such as street trees, sidewalks, benches collected at the block-level, and aggregates the data into an index score between 0 and 100. Cities can then identify their assets and needs based on their profile, a breakdown of their index into 10 urban design dimensions, such as density, pedestrian amenities, and parks and public spaces. Based on such data, cities can then generate evidence-based urban design priorities to determine which changes will most likely maximise their return on investment, given existing conditions, goals, and feasibility considerations. Cities can also run scenario analysis to quantify how a development project could increase the index and identify proposals with the greatest impact. State of Place bridges the art of urban design with technology-enabled data-driven analysis.



Source: goodcitylife.org - (2016) - screenshot by author

### SMELLYMAPS GoodCityLife (Cambridge, UK)

[goodcitylife.org/smellymaps/index.html](http://goodcitylife.org/smellymaps/index.html)

The SmellyMaps project by Goodcitylife.org, a global group of researchers and practitioners interested in the emotional and sensorial layers of cities, maps urban smells by collecting social media data, using geo-referenced picture tags from Flickr and Instagram and geo-referenced tweets from Twitter. Applying Big Data, SmellyMaps categorises every street according to its smell - the five odour profiles being emissions, nature, food, animals, and waste - and demonstrates an innovative method of assessing a city’s assets and needs and utilising such data to inform planning policies and urban design interventions, such as air flow manipulation, provision of green space, and creation of pedestrian-friendly streets.

### 3.2 PLAN ENGAGEMENT

During the plan making process, it is important for the public and stakeholder groups to understand the vision and strategy for an area in order to have a chance to influence the plan, address their issues and concerns, and specify their desires. Innovations in this category help with the process of communicating plans and their impacts through dynamic and visual means, as well as engaging with the public and stakeholder groups in more appealing ways.

Currently the plan engagement process involves several consultation periods that require members of the public to express and submit their views via online portals, email, or post. Popular providers of online public consultation services in LPAs include Objective Corporation and Citizen Space, which provide a basic platform for uploading documents for review, collecting participants' views, and generating analytics. Responses received from consultees in other formats often have to be processed and associated with relevant policies or sites manually by officers, constituting a laborious task. To be aware of ongoing consultations, residents need to be on the LPA's database (having previously expressed interest), check the council's website, or read the local press, which leaves many groups out of the loop. In addition, policies maps, a statutory requirement that serves to communicate the plans, are often poorly presented and provide little guide as to what will go where; development plan allocated sites are generally indicated with 'red lines', filling local residents with fear of uncertainty.



# 3.



Source: www.adelaidecitycouncil.com - (2016) - screenshot by author

## ADELAIDE 3D CITY MODEL

Adelaide City Council  
(Adelaide, Australia)

[www.adelaidecitycouncil.com/planning-development/city-planning/3d-city-model/](http://www.adelaidecitycouncil.com/planning-development/city-planning/3d-city-model/)

Adelaide 3D City Model was created by Adelaide City Council to visualise the City's future, particularly in relation to land use planning and growth scenarios. The digital 3D Model is intended to: provide a tool for public consultations by visualising transport and other planning matters; offer architects and designers 3D model data to help develop schemes tested in a simulated real-world environment; assist planners in assessing planning applications; illustrate the location of heritage sites and other important public facilities and attractions, integrating supporting texts and images; and allow collaboration among government agencies and other organisations in transport, planning, and design projects. In particular, the 3D Model communicates the zoning plan as well as planned developments, enabling users to visualise the city's vision and contemplated changes.



Source: www.ura.gov.sg - (2016) - screenshot by author

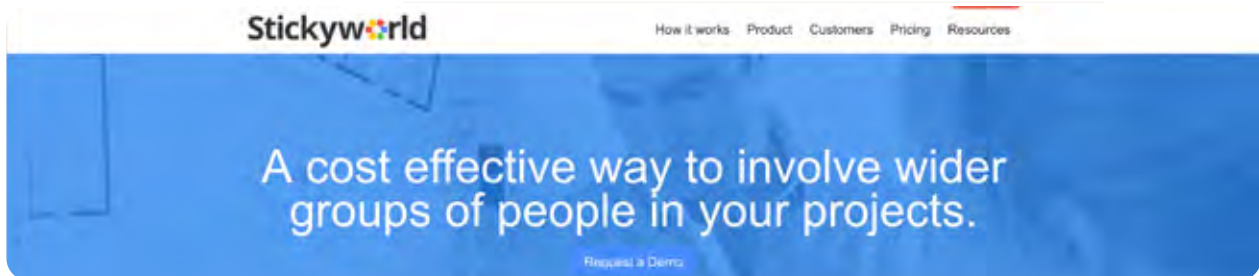
## URA SPACE

Urban Redevelopment  
Authority (Singapore)

[www.ura.gov.sg/maps/?service=MP](http://www.ura.gov.sg/maps/?service=MP)

URA SPACE is a centralised integrated map portal developed by the Urban Redevelopment Authority of Singapore (URA) that comprises a variety of mapping services and information, including timestamped masterplans (2014, 2008, 2003, and links to associated written statements), controls maps (Parks & Waterbodies Plan, Landed Housing Areas Plan, Building Height Plan, Activity Generating Uses Plan, Street Block, Urban Design Area, Conservation & Monuments Plan), as well as a 3D model of the city, all on a single platform. Users are able to overlay the 3D model on top of their base map or plan of choice, which enables them to understand the interplay between what had been planned or what constraints existed and what has been built.

## 3.



Source: info.stickyworld.com - (2016) - screenshot by author

## STICKYWORLD

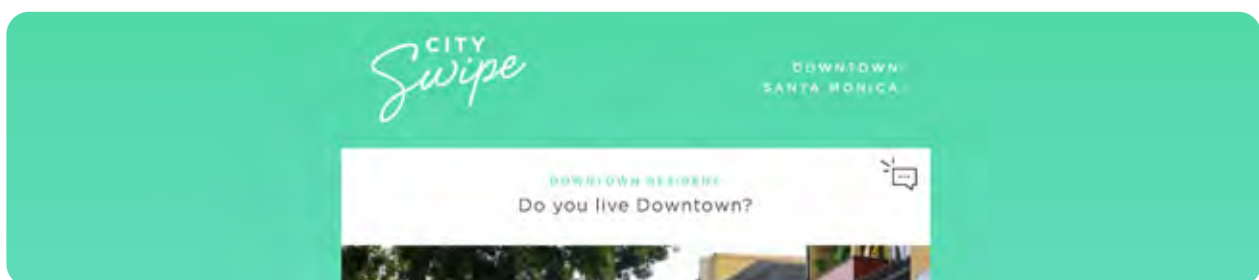
(London, UK)

[info.stickyworld.com](http://info.stickyworld.com)

Stickyworld is a service that allows clients to publish multi-media participatory websites for engaging with citizens or stakeholders. Stickyworld seamlessly supports media such as photos, videos, maps, 360 panoramas, and pdfs, so that projects and schemes are communicated as visually as possible, enhancing understanding and encouraging more accurate and meaningful feedback.

Participants can add comments on the project in general or on a detail, zooming into a specific area of a map or a photo and 'sticking' their comments where applicable; they can also choose to be alerted via email so that they are kept in the loop throughout the lifecycle of the project. Organisers are able to generate reports on engagement metrics, deliberate results, and inform the participants about the decisions and/or next steps.

Stickyworld offers mobile as well as web interface, so that people can use it on-the-go. It essentially brings the familiar social-media-type experience to the world of consultation and engagement, so that demographics currently missed in the traditional consultation process (town hall meetings, responses collected via phone, post, or email, etc.) are captured and the process is managed more efficiently—minimising administrative costs (e.g. manual processing of consultation responses) and generating data in the process. It has been used by Canterbury City Council and Wandsworth Council. Stickyworld represents a movement towards a more visual, intuitive, and engaging communication platform.



Source: www.dtsmcityswipe.com - (2016) - screenshot by author

## CITY SWIPE

Downtown Santa Monica, Inc. (Santa Monica, CA, USA)

[www.dtsmcityswipe.com](http://www.dtsmcityswipe.com)

City Swipe is a new digital tool employed by Downtown Santa Monica, Inc., the non-profit that manages Santa Monica's downtown area, to learn citizens' preferences and concerns about the city's urban core.

Data collected through the platform will inform the city planners' work to update the Downtown Community Plan (DCP), which will lay out the area's future for the next 20 years in terms of improved mobility, affordable housing, public open spaces, among others.

City Swipe allows users to swipe left or right, like the popular dating app 'Tinder', to express their views on various planning, design, and programming matters, such as cycling infrastructure and preferred street furniture or programmed events, communicated via photos. It also allows users to make comments should they wish to elaborate further. City Swipe makes public engagement for plan making simple and fun. SmellyMaps categorises every street according to its smell - the five odour profiles being emissions, nature, food, animals, and waste - and demonstrates an innovative method of assessing a city's assets and needs and utilising such data to inform planning policies and urban design interventions, such as air flow manipulation, provision of green space, and creation of pedestrian-friendly streets.

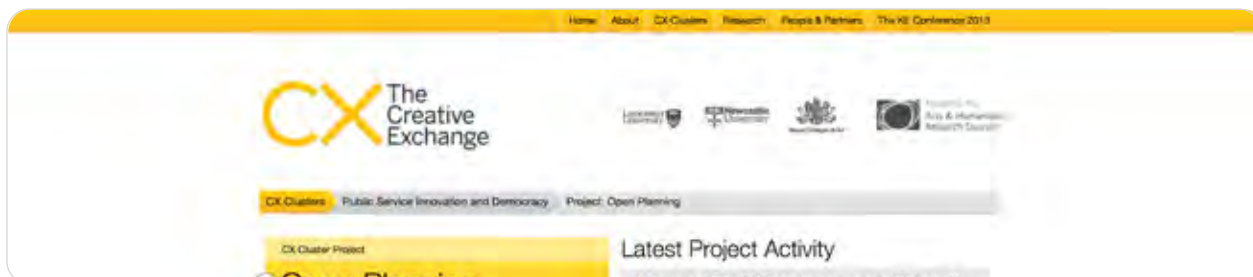
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### 3.3 DEVELOPMENT DECISIONS

Development decisions broadly cover planning application administration from the point of submission by the applicant to decision-making by the LPAs. Innovations in this category include tools that help LPAs make decisions on schemes as quickly and effectively as possible, as well as tools that facilitate communication about planning applications and decisions between LPAs and the public and stakeholders.

Basic digital tools are in place for planning application administration. In 2014, over 80% of planning applications were submitted online through the Planning Portal (a joint venture between the Department of Communities and Local Government and TerraQuest) and then distributed to LPAs. The Planning Portal currently handles around 2,000 applications a day ; where no online service exists, applications are submitted in paper form. LPAs manage planning application information using software packages of their choice, such as those offered by Idox or Northgate Public Services; across the UK, over 200 authorities use the Idox Public Access Service . In terms of site notices of and consultations on planning applications, LPAs use a range of methods, from laminated paper notices tied to lamp posts or letters, to online planning records service that allow interested parties to view and comment.

## 3.



Source: [thecreativeexchange.org](http://thecreativeexchange.org) - (2016) - screenshot by author

## OPEN PLANNING

The Creative Exchange  
(Lancaster, UK)

[thecreativeexchange.org/projects/open-planning](http://thecreativeexchange.org/projects/open-planning)

Open Planning is a smartphone app developed as a project with The Creative Exchange, one of four Knowledge Exchange Hubs funded by the Arts and Humanities Research Council and a collaboration between Lancaster University, Newcastle University, and the Royal College of Art, combining expertise in designing experiences, digital prototyping, and communication innovation. The app displays current planning applications on a map, and users are able to access relevant information, respond to the applications, leave comments and discuss with other residents, share on social media, as well as receive notifications for applications in their areas of interest. The app, built by Red Ninja Studios, has been tested using data from Liverpool City Council and volunteers from social enterprise Engage Liverpool. However, a challenge has been to secure planning information in a consistent format. Being able to receive planning data as APIs from local authorities would enable the app to display a live feed of information, but councils present planning data in different formats, which are held by third parties.



Source: [www.gov.je](http://www.gov.je) - (2016) - screenshot by author

## ST HELIER IN 3D

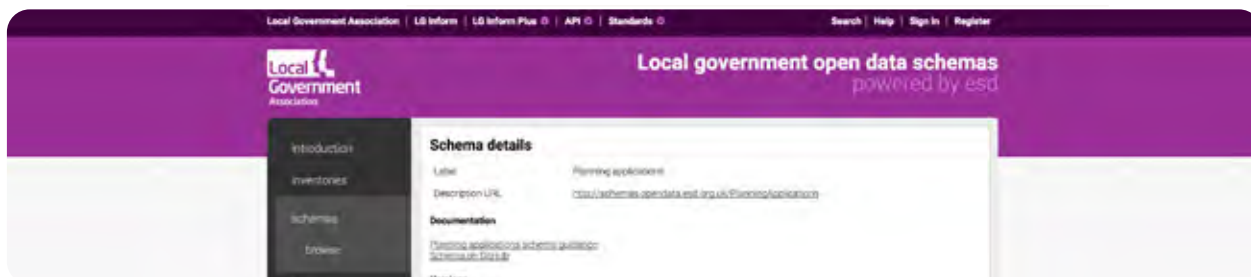
States of Jersey  
(St Helier, Jersey)

[www.gov.je/PlanningBuilding/JerseyMappingService/Pages/StHelier3D.aspx](http://www.gov.je/PlanningBuilding/JerseyMappingService/Pages/StHelier3D.aspx)

St Helier in 3D is a 3D model created by the States of Jersey using aerial photography and ground level photo surveys. A visual representation of St Helier, the 3D model can be used to assess the impact of heights, orientation, and design on a site or surrounding area. Planning officers use it to analyse proposed developments by animating them in 3D and viewing them from a variety of aspects—ground level, mid height, bird's eye view.

While the functionalities are nothing extraordinary compared to other 3D models, St Helier in 3D's application to development decisions hints at a future in which local authorities will be equipped to make decisions on planning applications that are more evidence-based and data-driven based on visual models incorporating quality datasets and sophisticated algorithms. The States of Jersey have plans to extend the coverage of the 3D model from the town area of St Helier and the Airport to the entire island.





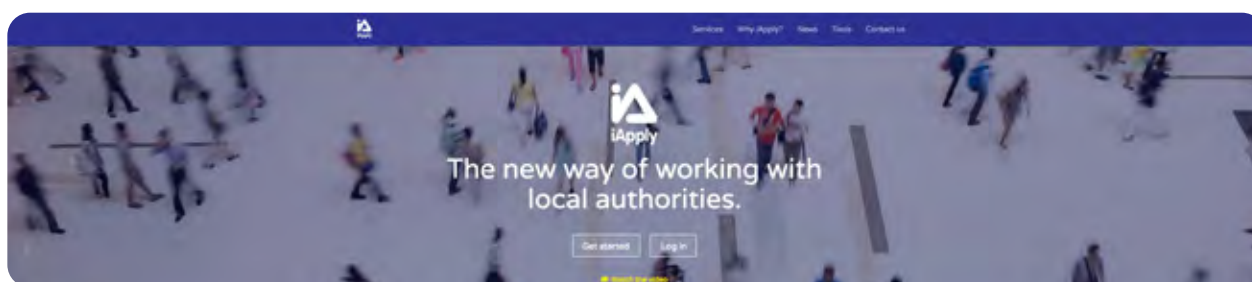
Source: [schemas.opendata.esd.org.uk](https://schemas.opendata.esd.org.uk) - (2016) - screenshot by author

## STANDARDISATION OF PLANNING APPLICATION DATA

Hampshire County Council  
| Surrey GIS Forum c/o  
Guildford Borough Council  
(UK)

[schemas.opendata.esd.org.uk/PlanningApplications/LocalOpenDataIncentiveScheme/PlanningApplicationsSchemaGuidance.pdf?v=0.37](https://schemas.opendata.esd.org.uk/PlanningApplications/LocalOpenDataIncentiveScheme/PlanningApplicationsSchemaGuidance.pdf?v=0.37)

A potential gateway to innovation that has not caught on amongst planning authorities due to time and resource constraints, among others, has been the push towards standardisation of planning application data, which was experimented with in Hampshire and Surrey. The Hampshire Hub, a partnership of 21 organisations working together to create a single local information system and network for improved decision-making, was awarded funding from the Department for Business Innovation and Skills in 2013 to create a linked and open version of planning authorities' public registers. The innovative project consisted of development of data standards, collation and publication of data into a linked format, and visualisation of the data to create a tool for the public to easily access and engage with planning data. Three Hampshire authorities published their data to the data standards by the time of the project's evaluation report (February 2015); Surrey modelled its data schema on the national planning application open data schema devised by Hampshire, and four authorities at the time of the evaluation report (September 2015), with three more planned, followed suit. While the potential benefits of machine-readable, clean planning application data across local planning authority boundaries have been widely acknowledged, it has not been prioritised in practice due to constraints on local authority capacity.



Source: [iapply.co.uk](https://iapply.co.uk) - (2016) - screenshot by author

## iAPPLY

Idox Software Ltd.  
(Reading, UK)

[iapply.co.uk](https://iapply.co.uk)

iApply is a planning application submission portal launched by Idox Group in 2015, allowing individuals and large corporations alike to benefit from a streamlined application process. iApply simplifies the submission process by providing every required form, bulk uploads, and collaborative features facilitating sharing of applications with colleagues and clients. Furthermore, iApply enables application tracking throughout the entire application process, reducing time wasted investigating progress for both the applicant and the local authority. There are also a number of supporting resources and guidance tools available, including a search function for locating planning applications across the UK. iApply intends to expand its service to be the single place for common transactions across all local authorities.

### 3.4 PLAN MONITORING

When a development plan is adopted, it is important for the LPA to ensure it is meeting the needs it set out to address. Plan monitoring is usually done by the LPA and can involve an annual survey of all the sites in a local plan to check their stages of development, as well as other relevant additional studies. LPAs use key performance indicators, such as the number of developments permitted, started, and completed to monitor progress. They also track the number of units of housing delivered and other topical KPIs, such as development within green belt areas. This category therefore features innovations that help LPAs and developers assess and understand the progress of the plan.

Currently, there are few digital planning innovations that deal with this stage of the planning process. Plan and development monitoring data is not neatly aggregated or readily accessible, with much data being privately held by construction market intelligence firms such as Glenigan and Barbour ABI, who use the data to provide the construction industry with leads for development projects, not to monitor plans.



# 3.



Source: maps.london.gov.uk/map - (2016) - screenshot by author

## LONDON DEVELOPMENT DATABASE

Greater London Authority  
(London, UK)

[maps.london.gov.uk/map/?!dd](https://maps.london.gov.uk/map/?!dd)

The London Development Database (LDD) managed by the Greater London Authority aggregates all residential and major non-residential (1,000 sqm+) applications and developments in London, which are submitted by the 33 London local authorities on a monthly basis. The system monitors a wide range of datasets: progress of developments, including dates of completion when units are ready for occupation; all residential development, including house-to-flat conversions through to large-scale housing developments and estate renewal projects; and even records on tenure, floor space, and bedroom numbers. It has been used alongside Census 2011 data to provide population yield estimates for each output area. The LDD comes with a map view that enables users to search the database by locality using name or postcode; the data can be shown on the map as individual permissions or aggregated as ward or borough totals, in either case allowing for a quick visual comprehension of the data. The LDD as a database and platform exhorts local authorities to produce and report accurate data, which in turn increases transparency and serves as future evidence base.



Source: www.bartlett.ucl.ac.uk - (2016) - screenshot by author

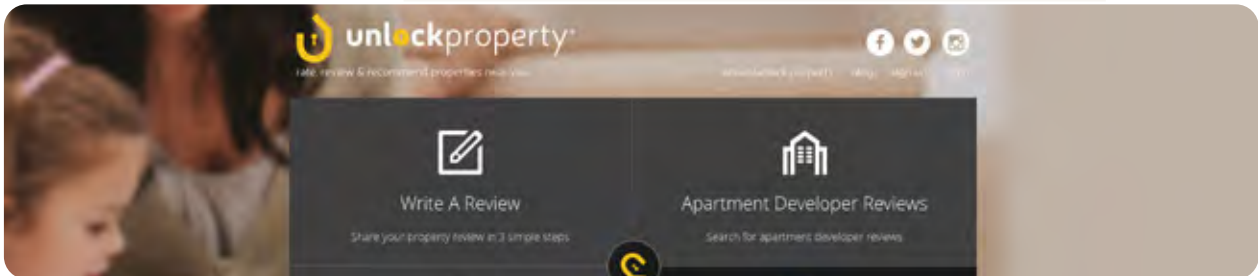
## TOWARDS THE DEVELOPMENT OF A MONITORING SYSTEM FOR PLANNING POLICY

Claire Daniel, Centre for Advanced Spatial Analysis,  
UCL (London, UK)

[www.bartlett.ucl.ac.uk/casa](https://www.bartlett.ucl.ac.uk/casa)

Claire Daniel, urban planner and data scientist, has developed a prototype of a monitoring system for planning policy. Her research explores how the planning system could utilise the technology for storing, processing, and displaying Big Data in an automated and continuous manner for purposes of development monitoring. The prototype utilises land use data as the base case reflecting the status quo, inputs development data to introduce the changes, and juxtaposes the data with infrastructure and services data to measure how the changes meet policy objectives. The results of the data analytics are then visually communicated using mapping. The prototype automates the cleaning and extraction of development data (e.g. type and number of dwelling units), which makes processing of expansive development data possible. While the innovation does not entirely disentangle the complexity of defining success against planning policies and objectives, it does potentially provide a standardised visual platform to compare development outcomes spatially and temporally.

## 3.



Source: unlockproperty.com.au - (2016) - screenshot by author

## UNLOCK PROPERTY Australia

[unlockproperty.com.au](http://unlockproperty.com.au)

Unlock Property is an online platform where people can rate and review apartment developers, house builders, and apartment buildings in Australia - the Yelp for residential property developers and builders. Apartment developers and house builders are recommended or critiqued by users based on the quality of the products and services delivered, to which feedback they can respond. As there hardly are any popular platforms for rating developers and builders and holding them publicly accountable for their projects, Unlock Property, filling in the void utilising digital means, can be considered an innovation. As local development plan documents are effectively delivered by developers and house builders, platforms such as Unlock Property can serve as one of the mechanisms to monitor and evaluate the quality of plan delivery.

### 3.5 SITE SEARCH + APPRAISAL

Developers identify and appraise sites suitable for development. Site search and appraisal is relevant to LPAs as well in conducting sustainability appraisals, selecting sites to include in the plan, and drafting the plan in general. Appraisal is also important to LPAs during the development decisions process, as they need to undertake efforts to better understand a site's context to inform any decisions or conditions. This category contains innovations that help to make identification and appraisal of development sites more efficient and effective, as well as innovations that aid in the preparation of a planning application.

Traditionally, finding sites for development has been a challenging, laborious and expensive process that demands significant professional time from land agents, surveyors, and planning consultants. Sites are normally found through connections with agents or through adverts in the press such as the Estates Gazette. Appraising a site for its development potential is almost entirely a manual process undertaken by professionals that work together to examine the site's context and accessibility, the local development plan, planning history, and any heritage or environmental constraints such as contamination or flood risk. Where necessary, sub-consultants will be appointed to provide further evidence on constraints and how they will be mitigated during the development process.



# 3.



Source: www.landinsight.io - (2016) - screenshot by author

**LAND INSIGHT**  
Land Technologies  
(London, UK)

[www.landinsight.io](http://www.landinsight.io)

Land Insight provides a suite of data and information on land ownership, environmental constraints (such as flooding and listed buildings), and planning history on a single map-based platform, allowing users to instantly identify who owns a site or has interest, its current use and history, and the council’s development decisions on nearby sites. Land Insight aggregates the core data needed for a preliminary viability assessment, offering a tool to assess what kind of development is likely to receive planning permission and reducing the costs and information asymmetry involved in site search and appraisal.



Source: www.urbanintel.io - (2016) - screenshot by author

**HOWARD**  
Urban Intelligence  
(London, UK)

[www.urbanintel.io](http://www.urbanintel.io)

Howard is an online platform that offers planning policy information service to built environment professionals. It aggregates planning policy documents from local planning authorities and digitises them, cutting through professionals’ cost and inconvenience of locating the documents currently provided in PDF formats on council websites. Users are able to search through multiple policy documents at once, from the national to the neighbourhood level, by specific keywords or indices. Urban Intelligence is currently developing an interactive planning policy map that goes beyond local planning authority boundaries that will allow users to draw a polygon on the map, view all planning policies relevant to their site of interest, and delve into the policy documents on the same interface. Howard currently has coverage of the Greater London area and plans to incorporate major cities and eventually the whole of UK.

# 3.

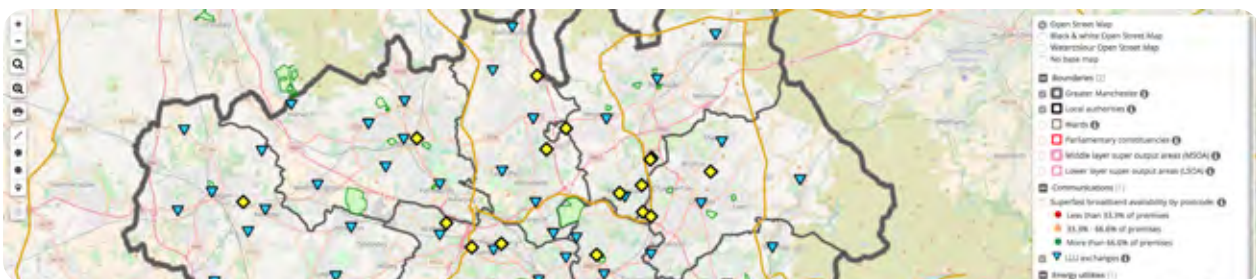


Source: metro.flux.io/metro - (2016) - screenshot by author

**FLUX METRO**  
 Flux Factory, Inc. (San Francisco, CA, USA)

[metro.flux.io/metro/](http://metro.flux.io/metro/)

Flux Metro is a software and data solution that integrates zoning information, building models, and viability tools into a 3D virtual environment. Backed by investors including Google Ventures, Flux Factory has developed a prototype covering a sample area of Austin, Texas. The service allows users to interact with building plots to understand parcel information and relevant zoning codes. Furthermore, it incorporates details on maximum dimensions to allow developers to understand development potential, and viability algorithms to predict profitability outcomes in given scenarios. The 3D model, provided by CyberCity3D, allows developers to visualise a site's context and constraints, including building heights and shadows. While it has been hailed as an innovation in digital planning, the Flux Metro project has temporarily been paused due to the challenges of keeping the model up-to-date without a reliable stream of data, including urban development and zoning regulations.



Source: mappinggm.org.uk - (2016) - screenshot by author

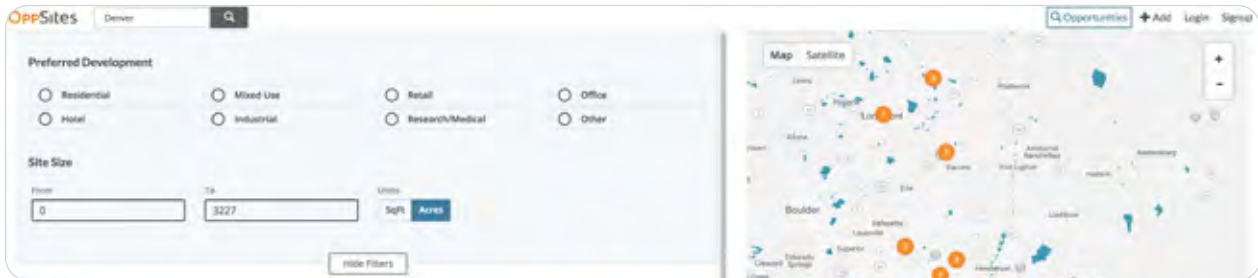
**GREATER MANCHESTER OPEN DATA INFRASTRUCTURE MAP**

Greater Manchester Combined Authority (Manchester, UK)

[mappinggm.org.uk/gmodin/](http://mappinggm.org.uk/gmodin/)

The Greater Manchester Open Data Infrastructure Map is an open map containing data on public and private infrastructure. The map aggregates numerous local, regional, and national datasets, such as energy utilities, heritage assets, water and waste water, transport, residential property prices, brownfield sites, and many more, offering a broad overview of Greater Manchester's physical, social, and green infrastructure. The map aims to provide built environment professionals with infrastructure and housing related information on a single platform to aid developers in comprehending local infrastructure and conducting cost-benefit analysis for new developments, thereby enabling better decision-making in the pre-planning process.

## 3.



Source: oppsites.com - (2016) - screenshot by author

**OPPSITES**  
Oakland, CA, USA

[oppsites.com](https://www.oppsites.com)

OppSites is a platform that directly connects supply (cities and municipalities wishing to attract investment) with demand (investment community looking for development opportunities). On OppSites, cities post their underutilised districts and sites and share local knowledge about the desired developments, and investors and developers find such underexposed real estate opportunities and gain local knowledge and insight into the market. Cities gain the exposure for their sites that may otherwise go unnoticed and are simultaneously able to put forth community goals and leverage local assets. Investors and developers are able to reduce risk, time, and resources poured into finding and securing a site.



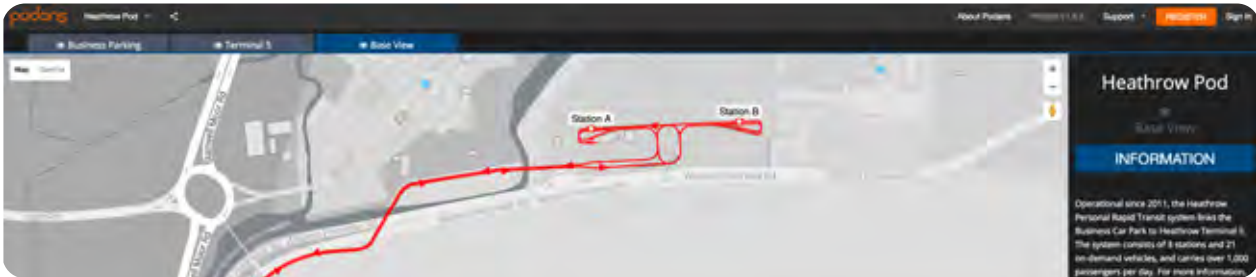
### 3.6 SCHEME DESIGN + COMMUNICATION

Schemes need to be designed based on data and evidence, and undergo the iterative process of testing for soundness and revising if necessary. Communication of schemes enables the public to understand a development proposal and its impacts, and helps them to decide whether it will be good for the area or not. This category concerns innovations that offer technological solutions to designing schemes and communicating them with the public; they include tools for collaborative design, visualisation, scenario analysis, and consultation.

Currently, scheme design occurs in silos, with engineers, planners, and architects working on separate platforms using their own data, incurring delays in feedback loops and iterations. Regarding communication with the public, schemes are normally presented through the use of physical 3D models, artists' impressions, and computer-generated imagery at public events organised by the developer and websites created for the proposed scheme. These methods of communication generally paint an ideal image of the scheme that may be far removed from the finished result. This distance from reality can create a feeling of disillusionment when the outcomes differ from expectations.



# 3.



Source: www.podaris.com - (2016) - screenshot by author

**PODARIS**  
London, UK

[www.podaris.com](http://www.podaris.com)

Podaris is an online collaboration platform for transport infrastructure planning, engineering, and public engagement. Podaris allows users to design any kind of fixed-infrastructure transport systems, from cycle paths to rail, using advanced parametric modelling tools, which can then calculate the travel time, capacity, and physical footprint of the designs and allow for quick and accurate cost-benefit analysis and adjustments. Furthermore, Podaris enables real-time collaboration on the browser, shortening feedback cycles among planners, engineers, and stakeholders from months to milliseconds, which is crucial for large-scale infrastructure projects that are prone to years-long delays.



Source: www.siemens.com - (2016) - screenshot by author

**CITY LIFE MANAGEMENT**  
Siemens (US | Germany)

[www.siemens.com/innovation/en/home/pictures-of-the-future/infrastructure-and-finance/livable-and-sustainable-cities-virtual-urban-planning.html](http://www.siemens.com/innovation/en/home/pictures-of-the-future/infrastructure-and-finance/livable-and-sustainable-cities-virtual-urban-planning.html)

Siemens Corporate Technology scientists in Princeton, NJ, US, and Munich, Germany, have developed the City Life Management (CLM) project, modelled on the practice of central management of all data in product lifecycle management (PLM) in other industries. It can be described as a 3D masterplanning platform on which users can, for instance, virtually insert a building on a site and instantly generate data resulting from such development, such as projected energy demands, impact on traffic flows, air pollution, etc.

Utilising the company's experience and expertise in planning, constructing, and operating various utility systems and transportation infrastructures, Siemens has mathematically modelled the physical behaviour of these systems so that, combined with data being made available by cities on demographics, transport requirements, and energy consumption, CLM could be used by urban planners to simulate both short-term and long-term impact of proposed changes. CLM offers a tool that allows planners to devise evidence-based schemes, consider realistic future scenarios, and quickly explore alternative schemes if needed.

# 3.



Source: urbanplanar.com - (2016) - screenshot by author

## URBANPLANAR

Linknode | Heriot-Watt University (Glasgow, UK)

[urbanplanar.com](http://urbanplanar.com)

UrbanPlanAR seeks to revolutionise communication and engagement within urban planning and design by creating a mobile augmented/hybrid reality platform for architectural visualisation. It enables real-time in-field visualisation of a proposed development from any location using 3D data and augmented reality on mobile tablets. In other words, a user can stand in front of a development site that is yet to be demolished or developed, hold up his mobile tablet, and visualise the proposed development seamlessly integrated in augmented/hybrid reality. The solution will implement state-of-the-art urban location tracking and integrate technology to enable a smooth workflow with Building Information Modelling (BIM). Such information taken on-site will better aid contextual understanding and decision-making by planners, developers, and communities.



Source: cityplanneronline.com/site - (2016) - screenshot by author

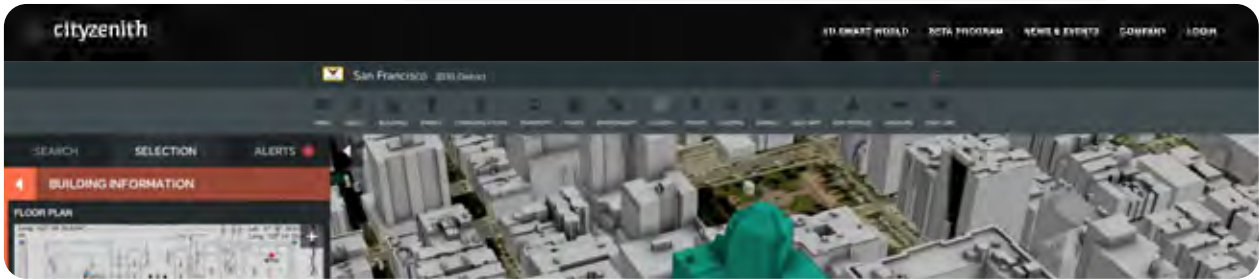
## CITYPLANNER

Agency9 (Stockholm, Sweden)

[cityplanneronline.com/site/](http://cityplanneronline.com/site/)

CityPlanner is a completely web-based and plugin-free cloud service that allows users to visualise 2D, 3D, and GIS data in a 3D world. Users can upload 3D models, vector data, images, videos, documents, CAD, BIM, WMS, and more and share internally for project management purposes or publish publicly.

At its core, CityPlanner is a powerful 3D rendering engine that supports massive 3D worlds as streaming data; this enables visualisation from the national level to the street level. It has been used by cities in Nordic countries to visualise local plans and infrastructure projects as well as to host consultations, for which participants are able to comment on specific details of the 3D models, whether they are of architectural designs, schemes of various scales, or entire local plans.



Source: [www.cityzenith.com](http://www.cityzenith.com) - (2016) - screenshot by author

5D Smart World is Cityzenith's 'Big Data Platform for the Built Environment', which offers 3D parametric models of cities with a wide range of real-time information—open, shared, and closed, as well as both static and dynamic—and provides personalised intelligence metrics most relevant to the users. Built environment professionals such as architects, engineers, and planners are able to navigate through the torrent of aggregated data, from the site context level to the individual floor level, using the platform's 3D geospatial user interface and high-performance gaming engine with advanced search and analytics functionalities. The BETA User Program will test the product with over 1,000 beta users, including urban planners.

## 4.

## EXEMPLARY CITIES

## 4.1 BRISTOL



PERHAPS MOST IMPORTANTLY, AN ENTREPRENEURIAL CULTURE WITHIN THE CITY COUNCIL SPEARHEADED BY INDIVIDUALS SUCH AS PETE INSOLE, PRINCIPAL HISTORIC ENVIRONMENT OFFICER, SEEMS TO BE THE DRIVING FORCE BEHIND BRISTOL'S INNOVATIONS IN DIGITAL PLANNING AS WELL AS THE KEY TO SECURING FUNDING THROUGH PROACTIVE PARTNERSHIP-SEEKING.

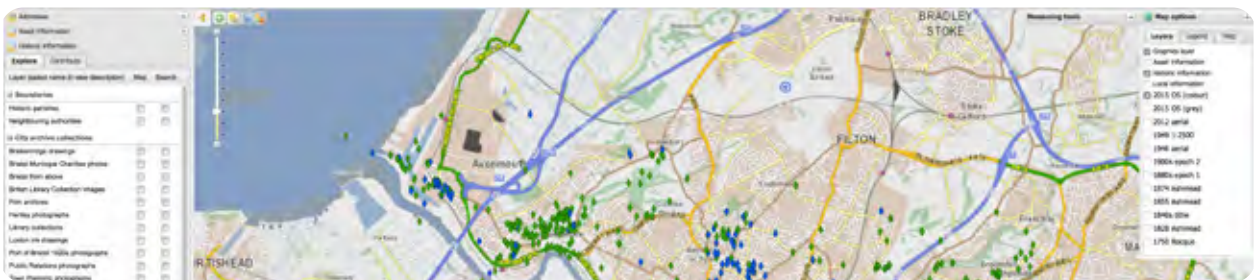
The City of Bristol has steadily been a pioneer of new ways to improve the built environment, implementing the Legible City initiative with its recognisable wayfinding monoliths ahead of anyone else before it was replicated in London and other global cities such as New York and Moscow. They are equally ambitious in digital planning - looking to utilise data and digital platforms to improve services and public engagement.

According to Bristol City Council's City Design Group comprising multidisciplinary professionals, Bristol benefits from being a sizeable city authority, as opposed to a smaller district council, as it is better positioned to receive support and attract funding for its ambitious initiatives. It also benefits from a network of collaborators, from Bristol Futures (Bristol City Council's multi-million-pound smart city programme that explores a host of technologies, from driverless cars to open data), local universities such as the University of Bristol and the University of the West of England, and companies of all sizes in the city (from Calvium, a small app building company, to Toshiba, who is working with the Council to deploy sensors).

# 4.



Source: maps.bristol.gov.uk - (2016) - screenshot by author



Source: maps.bristol.gov.uk - (2016) - screenshot by author

## KNOW YOUR PLACE

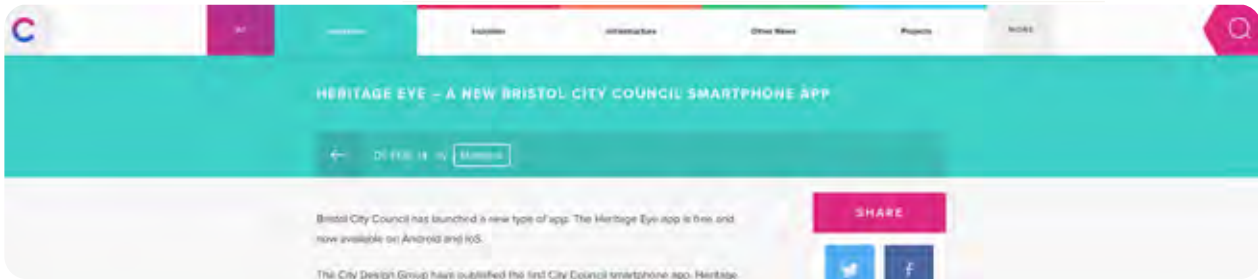
Evidence Base + Plan Making, Site Search + Appraisal

[maps.bristol.gov.uk/kyp/?edition=](https://maps.bristol.gov.uk/kyp/?edition=)

[maps.bristol.gov.uk/knowyourplace/](https://maps.bristol.gov.uk/knowyourplace/)

Know Your Place is Bristol City Council's award-winning online map that integrates information on historic Bristol, from Historic Environment Record layers, such as conservation areas, heritage assets, and listed buildings, to layers from public contributions, such as LGBT life and oral histories. Public contributions were initially taken digitally using a map-based data collection method, and once gaps in the submissions were identified, the City Design Group team went out to those places to obtain the missing stories. Know Your Place was led by Pete Insole, who, inspired by the Cheshire Archives' Tithe Maps, wanted to activate historic maps' use and realised the technology now existed to bring them to the people. Securing funds from English Heritage (now Historic England) to digitise the historic maps and bringing on board the Council's GIS experts as well as the University of Bristol, Pete was able to bring Know Your Place Bristol to fruition. Now, an ambitious digital mapping project covering the historic counties of Gloucestershire, Somerset, Wiltshire, and the former Avon area called 'Know Your Place West of England' has been launched and, when completed, will offer unprecedented online access, including via a mobile app, to historic maps, onto which users can add their own local information, together building a rich community map of local heritage. Know Your Place maps aggregate data, reducing research time and cost, and invite citizen engagement while enriching local knowledge.

# 4.



Source: www.connectingbristol.org - (2016) - screenshot by author

## HERITAGE EYE

Evidence Base  
+ Plan Making

[www.connectingbristol.org/heritage-eye-a-new-bristol-city-council-smartphone-app/](http://www.connectingbristol.org/heritage-eye-a-new-bristol-city-council-smartphone-app/)

Heritage Eye is a smartphone app—the City Council’s first app, in fact—that allows members of the public to conduct their own Listed Building survey and assess whether the structure is suffering from neglect or abuse. Completed surveys are submitted to Know Your Place for confirmation by Conservation Officers at the City Council. Funded by English Heritage and developed by Calvium software developers, Heritage Eye enables members of the public to participate in managing and documenting the city’s heritage as well as maintaining Bristol’s buildings at risk register.



Source: designbristol.ning.com - (2016) - screenshot by author

## DESIGN BRISTOL

Evidence Base + Plan Making, Plan Engagement

[designbristol.ning.com](http://designbristol.ning.com)

Design Bristol, another initiative of the City Design Group, is an online forum for anyone involved or interested in achieving quality place-making in Bristol. The aim of the platform is to build a network of people who are passionate about the quality of design in the city and support them in becoming advocates for the future design of the city by providing information and a space to connect. Users can post photos and participate in discussions.

## 4.2 PLYMOUTH



**“THE PLYMOUTH CITY COUNCIL HAS A ‘REAL CULTURE OF INNOVATION’**

**Hannah Sloggett,**  
Neighbourhood Planning  
Manager at the Plymouth  
City Council

Plymouth leads as an innovator in digital planning, having fostered a strong collaborative network among the Council, the local tech community (Digital Plymouth, a community consisting of 150+ local digital businesses and organisations), the local universities (Plymouth University, in particular its Institute of Digital Art and Technology), and the community and voluntary sectors (Plymouth Octopus Project).

The Plymouth City Council has a ‘real culture of innovation,’ according to Hannah Sloggett, Neighbourhood Planning Manager at the Plymouth City Council, and such culture and initiative have not gone unnoticed, as the Council has won national and regional awards for excellence in planning. The Council has been able to demonstrate the value of their digital innovations, not only in cost reduction (e.g. in printing or administrative costs), but also in improved quality of public engagement, increased buy-ins from other organisations, and an enhanced national profile. The two innovations below epitomise Plymouth’s creative approach and ongoing success in exploring digital planning.





Source: [www.theplymouthplan.co.uk](http://www.theplymouthplan.co.uk) - (2016) - screenshot by author

## THE PLYMOUTH PLAN 2011-2031

Evidence Base + Plan  
Making, Plan Engagement,  
Plan Monitoring

The Plymouth Plan 2011-2031 is the current strategic planning document for the city, which has won national and regional awards for its innovative approach to engaging the public and plan making. Plymouth City Council has thought outside the box (both digital and non-digital) for every single step of the plan making process: they travelled around the city with a sofa inviting members of the public to chat with them about the future of Plymouth and now have a podcast on the Local Plan called 'Sound Like a Plan'.

[www.theplymouthplan.co.uk](http://www.theplymouthplan.co.uk)

Process aside, the product of such a refreshing approach is a Local Plan that is not a pdf document, but a separate interactive website: [www.theplymouthplan.co.uk](http://www.theplymouthplan.co.uk). Citizens can easily access the website and browse the Local Plan as it is relevant to them, as they are able to filter the document based on their status (resident, business, investor, etc.) and their interests (economy, arts and culture, living and housing, etc.). Created in partnership with a local gaming company, the website is visually attractive and interactive. Users are able to express their support for policies or share them on social media. Furthermore, there is a tab that plans to track the progress of the plan, as the Council is brainstorming ambitious ideas to use near-live datasets to monitor what is being delivered in accordance with the plan. The Plymouth Plan 2011-2031 goes above and beyond the standard offering by most local authorities, which is local plans uploaded onto the council websites in pdf format.



Source: [www.crowdfunder.co.uk](http://www.crowdfunder.co.uk) - (2016) - screenshot by author

## CROWDFUND PLYMOUTH

Evidence Base + Plan Making, Plan Engagement, Plan Monitoring

[www.crowdfunder.co.uk/crowdfundplymouth/funding/](http://www.crowdfunder.co.uk/crowdfundplymouth/funding/)

Crowdfund Plymouth, in partnership with Plymouth City Council and Plymouth University, is a long-term strategic online crowdfunding campaign that aims to raise £250,000 for community groups, startup businesses, charities and individuals for Plymouth and the wider community. Individuals as well as organisations can pledge in support of projects in Plymouth.

The Council has committed £60,000 in match funding received through the Community Infrastructure Levy (CIL) towards the campaign, in an effort to democratise the distribution of the neighbourhood portion of CIL and to make more apparent the connection between development and community benefits. The Council reports savings on administrative costs, as the online crowdfunding platform cuts down on processing funding application forms and managing a decision-making panel. Projects include the one by FlyPlymouth, which is seeking funding to secure legal and professional expertise to support the Plymouth Plan, which states that Plymouth Airport should not be allocated for housing but safeguarded for aviation use, at its Examination in Public in 2017.

## 4.3 NEWCASTLE

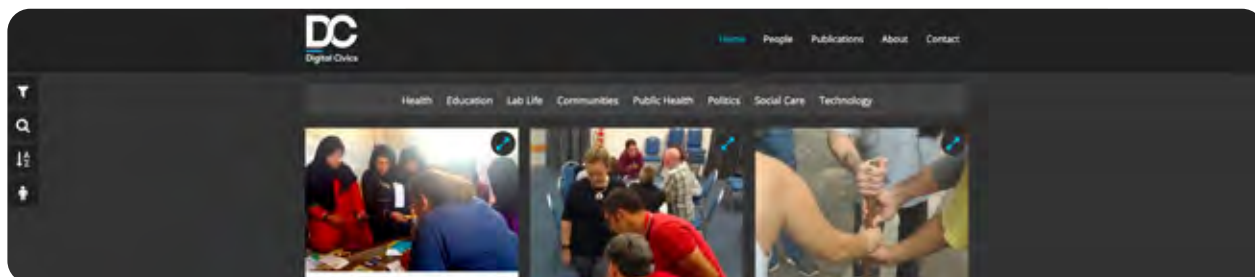


**NEWCASTLE UNIVERSITY, AS A NEUTRAL ACADEMIC BODY WITH A CIVIC MISSION TO GIVE BACK TO THE CITY, HAS BEEN CRITICAL IN BROKERING BETWEEN THE DIFFERENT SECTORS AND BRINGING THEM TOGETHER FOR COLLABORATIVE PROJECTS IN DIGITAL PLANNING, ESPECIALLY UNDER THE LEADERSHIP OF PROFESSOR MARK TEWDWR-JONES, DIRECTOR OF NEWCASTLE CITY FUTURES**

Newcastle boasts its well-deserved Digital City status - it won a £30m national innovation centre, the new National Institute for Smart Data Innovation (NISDI) in March 2016 - but it certainly is not the achievement of a single organisation. A great majority of innovations in digital planning in Newcastle are spearheaded by and housed within Newcastle University, but they are firmly grounded in partnerships with the local government, the local tech and digital SME community, as well as large corporations such as IBM and Siemens.

Professor Mar Tewdwr-Jones, director of Newcastle City Futures, explains that the tech community in Newcastle is not in silos; instead, they actively interact with people with knowledge in planning and economic development to come up with innovative solutions and offer their expertise in digitisation, visualisation, and engagement. Open Lab, a cross-disciplinary research centre at Newcastle University, is at the heart of Newcastle's innovative ecosystem with its two main initiatives: the EPSRC Centre for Doctoral Training in Digital Civics ('Digital Civics'), training a minimum of 55 PhD researchers between 2014 and 2022 in the field of digital civics including in planning, and the Digital Economy Research Centre ('DERC'), training 25 postdoctoral researchers from Newcastle University and Northumbria University in digital economy - both initiatives with a focus on app development. Below are a few example innovations in digital planning, proof of concept projects to push technology, that came out of the university and its partnerships.

# 4.

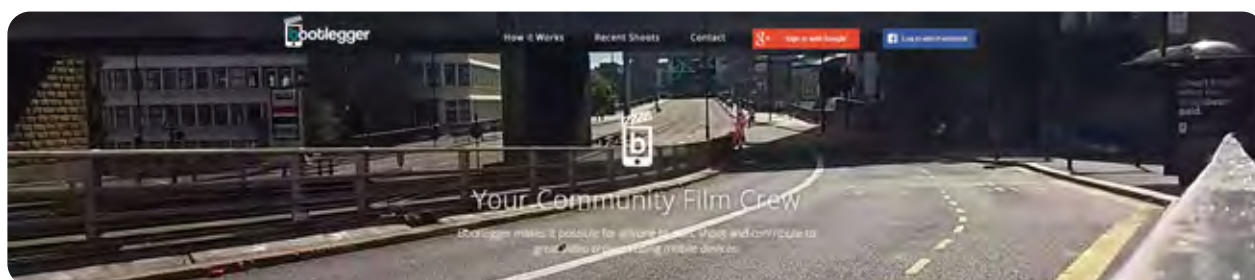


Source: digitalcivics.io - (2016) - screenshot by author

## CHANGE EXPLORER Plan Engagement

[digitalcivics.io/](http://digitalcivics.io/)

Change Explorer, initially designed for wearables, is a smartphone app that uses location data and notifies members of the public when they enter an area that is subject to redevelopment plans. Users are then presented with a number of options on how they would like to interact with the information, e.g. be sent to a platform where one can give extended comments. Digital Civics trialled the application with North Tyneside Council, working with planners and members of the public, and was very successful; it demonstrated that there was an appetite for alternative means of engagement, and younger people engaged much more fully than they would have with a traditional consultation. The trial involved providing testers Apple Watches during the trial period, and the university's ability to fund access to technology partly explains the app's success. Change Explorer presents great potential with the concept of 'push-notifying' users with planning matters as they go about the city; citizens do not need to download local plans or read planning notices on lamp posts to be informed and engage.



Source: bootlegger.tv - (2016) - screenshot by author

## BOOTLEGGERS FOR NEIGHBOURHOOD PLANNING

Evidence Base + Plan  
Making, Plan Engagement

[bootlegger.tv/](http://bootlegger.tv/)

Bootlegger is an app for real-time collaborative video shooting and editing that allows different people who have attended an event, e.g. a concert, to upload their footages, collect others', and edit them into a single video. Digital Civics is applying the app to neighbourhood planning, so that members of the public who have attended neighbourhood planning events such as consultations and pop-up exhibitions can then use the app to make their own films about the neighbourhood area and share them. The app has been a great success with Berwick-upon-Tweed, as it has been used as a powerful device to communicate changes in a way that the public can easily access and recognise rather than by statutory documents.

## 4.



Source: app-movement.com - (2016) - screenshot by author

## BRUTALIST MAPPER APP

Evidence Base + Plan  
Making

[app-movement.com/3qx3k7](http://app-movement.com/3qx3k7)

Brutalist Mapper, similar to Bristol's Heritage Eye, allows users to identify buildings of brutalist architecture, which are under development pressure and subject to change, and rate them on their state of repair, surface finish, historical or cultural significance, and scale. The data collected could be collated by relevant agencies such as heritage bodies and local authorities to provide an indication on degrees of support for change or conservation.

## 5.

# CONCLUSION

The report presented a broad overview of innovations in digital planning in the UK and globally. To conclude, a few insights are underlined.

First, there are a great number of innovations targeting Evidence Base + Plan Making, Site Search + Appraisal, Scheme Design + Communication stages of the planning and development process, while Development Decisions—from the submission and assessment of planning applications to communication of planning decisions—and Plan Monitoring could use more. Though not the most glamorous of the process, Development Decisions stage requires that members of the public, professionals, and planning officers interact extensively with the planning system and therefore has the potential to deliver significant efficiencies and value through innovations. Plan Monitoring, also, is a crucial area that could benefit from data aggregation, analysis, and visualisation to inform future plans.

Second, digital planning innovations are a diverse body of work. Some innovations are true technological innovations involving breakthroughs, for instance, in data analytics, building information modelling (BIM), and augmented reality; others are social innovations in which existing technologies are applied in much-needed ingenious ways to the planning and development process. In any case, both types of innovations are chipping away at a system that seems archaic and overly complex to many. Furthermore, SMEs, larger corporations, universities, civic groups, and public authorities, united by a vision for change, have been collaborating with one another on the digital planning agenda. Indeed, the most outstanding cities all rely on strong multi-partner partnerships, spearheaded by an inspiring individual or team who is committed to the cause.

Finally, despite efforts to cast a broad net and uncover as many interesting and game-changing innovations as possible, it must be noted that the innovations featured are by no means exhaustive. Rather, they are an introduction to the innovations that are currently out there and to the future that is to come. The list of innovations and the ecosystem of innovators continue to grow on a daily basis, bridging the current gap between planning and technology.

All in all, better tools will enable better decision-making, which will lead to better cities; digital planning undoubtedly holds immense promise.

# APPENDIX

## 6.1 EVIDENCE BASE + PLAN MAKING

### **DATASHINE**

University College London (London, UK)

[datashine.org.uk/](http://datashine.org.uk/)

Datashine is a project by James Cheshire and Oliver O'Brien of UCL to visualise Census 2011 data. It was funded by the Economic and Social Research Council. The project overlays census data by theme on a map of the UK, that enables users to geographically spot patterns related to demographics.

### **GO DATA**

City of Detroit (Detroit, MI, USA)

[data.detroitmi.gov](http://data.detroitmi.gov)

Government Open Data Access To All (GO DATA) was created through an executive order by Detroit Mayor, Mike Duggan, and executed by the office of the city's first Chief Information Officer, Beth Niblock, with financial support from the Socrata. GO DATA aims to promote transparent and collaborative relationship between the city and its citizens by offering significant raw material, roughly 90 datasets and counting, for mapping and civic technology projects.

### **VANTAA MAP SERVICE**

The City of Vantaa (Vantaa, Finland)

[kartta.vantaa.fi/](http://kartta.vantaa.fi/)

The City of Vantaa is undergoing a complete overhaul of its land use, construction and environment planning processes to realise a comprehensive solution that serves all participants and reduces the number of separate systems. The new approach will be a process-based information and enterprise resource planning system that guides its users while providing up-to-date and accurate information within a mapping interface.

## **COPENHAGEN SOLUTIONS LAB**

City of Copenhagen (Copenhagen, Denmark)

[cphsolutionslab.dk/#who-we-are](https://cphsolutionslab.dk/#who-we-are)

The Copenhagen Solutions Lab is an incubator for smart city initiatives created by the City of Copenhagen. The purpose of the lab is to combine technologies, ideas and data to solve real urban challenges. The Lab features a range of projects around the Internet of Things (IoT) and open data exchange.

## **URBAN DATA ANALYTICS**

UDA (Madrid, Spain)

[www.urbandataanalytics.com/](http://www.urbandataanalytics.com/)

UDA provides a number of data analytical tools for the real estate market, businesses and government. They aggregate a number of primary and secondary datasets, including market and demographic data to provide tools that aim to improve economic and social decision making.

## **GROUNDING IN PHILLY**

Public Interest Law Centre (Philadelphia, USA)

[www.groundedinphilly.org](http://www.groundedinphilly.org)

Grounded in Philly is a tool that supports gardeners, farmers and community members to bring vacant lots back into use. The service provides a range of urban data and information on lots, in addition to legal advice on gaining access to unused land. GiP uses an API from the City to maintain the currency of data.

## **DLRMINECRAFTED**

Dún Laoghaire-Rathdown County Council (Dublin, Ireland)

[dlrminecrafted.wordpress.com](http://dlrminecrafted.wordpress.com)

dlrMinecrafted was an online event, part of the Inter/Generation Project, in which would-be architects, planners and builders of all ages were invited to recreate their town (Dún Laoghaire / Rathdown, Co. Dublin). The event asked participants to think about architecture's role in forming and changing our built environment.

## **AZAVEA**

Philadelphia, USA

[www.azavea.com](http://www.azavea.com)

Azavea is a B Corporation (certified to meet rigorous standards of social and environmental performance, accountability, and transparency) software development company. They specialise in the creation of web and mobile applications and insightful analytics based on client's geographic data and their own research projects. Notable collaborative projects include GeoPhilly and OpenDataPhilly.



## PAVANU

Pavanu Mobility (Tullamore, Ireland)

[www.pavanu.com](http://www.pavanu.com)

Pavanu is a smartphone application and survey platform designed to effectively map ground relief which is intended to assist in designing for, and communicating efficient routes to, persons of reduced mobility. Gathered data can be valuable to city engineers and in the near future to autonomous vehicles delivering goods or cleaning streets.

## PLACEMETER

New York, USA

[www.placemeter.com](http://www.placemeter.com)

Placemeter, founded in New York City in 2012, quantifies the movement within cities, by analysing pedestrian and vehicular movement. Placemeter gathers data from live streams through leveraging a proprietary computer vision technology revealing hidden patterns and strategic opportunities. All this is done whilst maintaining the anonymity of those captured on screen.

## BLOCK'HOOD

Plethora-Project (Los Angeles, CA, USA)

[www.plethora-project.com/blockhood/](http://www.plethora-project.com/blockhood/)

Block'hood is a neighbourhood-building simulator that celebrates the diversity and experimentation of cities and the unique ecosystems within them. Budding city planners will have access to 90+ building blocks to arrange and combine to create unique neighbourhoods with and discover the implications of their designs.

## iSCAPE

European Community's H2020 Programme (Dublin, Ireland)

[www.iscapeproject.eu](http://www.iscapeproject.eu)

Improving the Smart Control of Air Pollution in Europe (iSCAPE) is an EU-backed project involving a multidisciplinary consortium of international organisations, whose overall aim is to develop and evaluate an integrated strategy for air pollution control in European cities grounded on evidence-based analysis. This will be attempted through the development of sustainable and passive air pollution remediation strategies, policy interventions and behavioural change initiatives.

### **KIDS' TRACKS**

Norwegian Centre for Design and Architecture, Norwegian Centre for Science Education, Bergen University & Bengler (Oslo, Norway)

[barnetrakk.no/en/](http://barnetrakk.no/en/)

Kid's Tracks utilises a digital registration tool to allow children to draw routes taken to school and to highlight places as negative or positive which will potentially feed into future municipal planning decisions. The aim of Kids' Tracks is to understand how children perceive their built surroundings and engage them in the planning process showing how they can be aware of and care for their rights at a young age.

## **6.2 PLAN ENGAGEMENT**

### **SMARTICIPATE**

Horizon 2020 Programme of the European Commission (London, UK | Hamburg, Germany | Rome, Italy)

[www.smarticipate.eu](http://www.smarticipate.eu)

Smarticipate aims to develop a platform, that will be trialled in London, Hamburg and Rome, enabling interested citizens to support the decision making process by presenting them with digestible data on proposed urban developments. Users will be able to alter proposals directly and crucially they will also observe the potential impacts of these changes.

### **COMMONPLACE**

Commonplace (London, UK | La Jolla, USA)

[www.commonplace.is](http://www.commonplace.is)

Commonplace is an online consultation platform that facilitates local participation from a wider audience. Commonplace can thus help create more compelling proposals with more feedback and the analysis presented through its live analytics dashboard. The platform helps developers drive a deeper level of engagement building greater trust and buy-in from local communities.

### **COLAB**

Colab.re (São Paulo, Brazil)

[www.colab.re](http://www.colab.re)

Colab is a citizen-to-government engagement platform offering a social network for citizens focused on issue reporting (e.g. potholes or rubbish), urban improvement suggestions for their area, and public service evaluations, as well as participation in the decision making process.

On the government side, Colab.re provides workflow management, customer relationship management and consultation tools.

### **DIGITAL PLANNING LAB**

Urban Redevelopment Authority (Singapore)

[www.gov.sg/sgdi/ministries/mnd/statutory-boards/ura/departments/isgg/departments/dplab](http://www.gov.sg/sgdi/ministries/mnd/statutory-boards/ura/departments/isgg/departments/dplab)

The Urban Redevelopment Authority (URA) set up the Digital Planning Lab in 2013 to transform the way their planners worked. URA uses digital tools like the ePlanner, 3D Geographic Information System (GIS) and the GIS-Enabled Mapping, Modelling and Analysis (GEMMA) applications to put data at the fingertips of their planners and architects. URA now operates a data-driven decision-making process and has an enhanced ability to understand the impact and implications of different planning scenarios.

### **CiviQ**

Dublin, Ireland

[www.civiq.eu](http://www.civiq.eu)

CiviQ offer a suite of services that visualise the flow of all stakeholder's opinions, from submission, through consultation and deliberation. CiviQ's software allows the representation of the convergence/divergence of opinion and how this can be transformed during the course of a meeting or process which supports a more complete understanding of issues and therefore more effective consultations.

## **6.3 DEVELOPMENT DECISIONS**

### **SOUTHWARK LIVE PLANNING NOTICES | TOWER HAMLETS INTERACTIVE ONLINE MAP**

Southwark Council | Tower Hamlets Council (London, UK)

[www.southwark.gov.uk/info/200074/planning\\_and\\_building\\_control/3831/live\\_planning\\_notices](http://www.southwark.gov.uk/info/200074/planning_and_building_control/3831/live_planning_notices)

[towerhamlets.maps.arcgis.com/apps/webappviewer/index.html?id=b0448c3d9f254bf683e200174fc3f729](http://towerhamlets.maps.arcgis.com/apps/webappviewer/index.html?id=b0448c3d9f254bf683e200174fc3f729)

Local authorities have begun innovating the way they publicise and consult on current planning applications. Examples include Southwark and Tower Hamlets, where information on planning applications is disseminated not only through physical site notices and online planning records services, but also through interactive online maps. These maps allow users to go straight to their area of interest, whether by zooming in or entering a postcode or a street address, and access planning application information if there is any currently pending, or decided (in the case of Tower Hamlets).

This kind of geospatial aggregation of planning application data allows citizens to capture a borough's development activity in one glance as well as speedily access information on a specific development of interest, without having to encounter a site notice on the street or run a text-based search on the online planning records service.

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## 6.4 SITE SEARCH + APPRAISAL

### **VANMAP**

Vancouver City Council (Vancouver, Canada)

[vanmapp.vancouver.ca/pubvanmap\\_net/](http://vanmapp.vancouver.ca/pubvanmap_net/)

VanMap, a part of the City of Vancouver's open map strategy, is a web-based application that allows users to view city data in map form. The map has dozens of layers of data, including property lines, zoning information, sewer mains, water mains, public places, and crime.

### **BUILDING RIGHTS**

DK-CM (London, UK)

[www.buildingrights.org](http://www.buildingrights.org)

Building Rights is an online resource of planning expertise that is user-generated, peer-reviewed and independent of the party-politics. It is a place where the rules of what is built and what is not can be shared, tested and generated in public. It is currently in development.

### **TheBuildingAPP**

Inform Architecture (Cardiff, UK)

[thebuildingapp.net](http://thebuildingapp.net)

TheBuildingAPP is aimed at non-construction-professionals and is designed to quickly show you if you can develop your house without planning permission under the Permitted Development Order. The app, due for release in September 2016, also provides a number of other services including feedback on applications and statutory OS maps.

### **PlanningVIC**

State Government of Victoria (Victoria, Australia)

[www.dtpli.vic.gov.au/planning/planning-schemes/get-information-about-your-planning-scheme/planningvic-planning-property-report-mobile-app](http://www.dtpli.vic.gov.au/planning/planning-schemes/get-information-about-your-planning-scheme/planningvic-planning-property-report-mobile-app)

The PlanningVIC: Planning Property Report app provides easy access to planning scheme information for any property in Victoria. The app complements the online Planning Property Report service and includes property details like zoning and overlay controls, and state heritage information where it applies to land.

### **ENVELOPE**

Envelope City, Inc. (New York, NY, USA)

[envelope.city](https://envelope.city)

Envelope, a software company that spun out of collaboration between SHoP Architects and the Director of MIT's Civic Data Design Lab, provides a 3D urban mapping platform that integrates proprietary geospatial datasets, algorithms, and iterative scenario analysis. It enables real estate professionals to visualise opportunity and aids their investment decisions. Envelope is currently offering a beta version trial.

## **6.5 SCHEME DESIGN + COMMUNICATION**

### **VUCITY**

Wagstaffs Design & Vertex Modelling (London, UK)

[wagstaffsdesign.co.uk/vucity-2/](https://wagstaffsdesign.co.uk/vucity-2/)

VUCITY, a joint venture between Wagstaffs Design and Vertex Modelling, is a 3D interactive model of London, which contains over 100 sq. km of buildings imported into a game engine that allows users to turn on and off planned and proposed developments within the existing built environment and overlay custom live city and environmental data.

### **VIRTUAL NEWCASTLE GATESHEAD**

Newcastle City Council, Gateshead City Council & Northumbria University (Newcastle & Gateshead, UK)

[www.northumbria.ac.uk/about-us/academic-departments/architecture-and-built-environment/research/virtual-reality-visualisation/research-enterprise-projects/virtual-newcastle-gateshead/](https://www.northumbria.ac.uk/about-us/academic-departments/architecture-and-built-environment/research/virtual-reality-visualisation/research-enterprise-projects/virtual-newcastle-gateshead/)

Virtual Newcastle Gateshead (VNG) is a joint venture to create a 3-D digital model of the urban core of Newcastle and Gateshead. The model allows accurate assessments of the impact of design proposals as well as being an effective communication tool in the consultation process.

## URBANE

Centre for Urban Science and Progress, NYU  
(New York, NY, USA)

[cusp.nyu.edu/](http://cusp.nyu.edu/)

Urbane provides professionals and developers with a data and analysis rich way of reading the city with the goal of improving decision making in urban development. Users can explore properties of neighbourhoods and buildings using the data exploration view to identify underdeveloped sites for potential development. Then, using the visual interface together with the map view, they can simulate the impact of such development.

## BRAND NEW SUBWAY

Jason P. Wright (New York, NY, USA)

[jpwright.net/subway/](http://jpwright.net/subway/)

Brand New Subway is an interactive transportation planning game that allows players to rethink the design of the NYC subway system from scratch. Players can experiment with new lines and stations resulting in an estimation of a given route's ridership based on census and transportation data, with the potential MetroCard fare being calculated based on the construction cost of the new subway.

## CLOUDCITIES

SmarterBetterCities (San Francisco, CA, USA)

[cloudcities.io/sbc](http://cloudcities.io/sbc)

CloudCities is an online platform allowing users to create, upload, edit and publish models across multiple platforms freeing users from dependence on particular devices or programmes. CloudCities' powerful 3D visualisation tools easily facilitate effective collaboration and sharing of designs.

## ESRI CITYENGINE

Esri (Redlands, USA)

[www.esri.com/software/cityengine](http://www.esri.com/software/cityengine)

CityEngine is a software application that allows users to convert 2D GIS data into Smart 3D City Models. The tool enables professionals, developers and communities to understand how projects will impact on their surroundings through the generation of realistic virtual scenarios. The tool is being used by many city authorities in the USA and the Singapore Redevelopment Authority.

## CONCRETE ACTION

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London, UK

[www.concreteaction.net/#top](http://www.concreteaction.net/#top)

Concrete Action is a platform enabling communities and architecture and planning professionals in the struggle for housing in London. Users can anonymously provide advance information on proposed developments, allowing the dissemination of planning and development knowledge amongst communities and activists, whilst also linking professionals who are willing to provide educational and design services to those negatively affected by property development.

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