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036 Open Cities: Re-thinking the 'smart city' - simple, collaborative, user-led and open

ABSTRACT: The concept of 'smart cities' is highly problematic, originating as a marketing term used by multinational technology companies. Smart city solutions are typically brittle, prone to failure, lacking replicability and durability: Plug and Play solutions that don't play, closed IP technologies that are impossible to fix.

We contend that cities are already 'smart' and self-organising systems, and that totalising solutions that do not acknowledge this are likely to come unstuck. The 'Open City' offers an alternative vision with citizens actively contributing to the resilience of built environments and the creation of low carbon systems.

Outlined with three real world case studies, we demonstrate the benefit of:

- Simple - appropriate, human-centred technologies
- Collaborative, cooperative and resilient systems.
- User-led solutions
- Open source authorship, for collaboration and against obsolescence

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i) The rise of the smart city?

The world is increasingly urbanised and with urbanisation comes a set of critical challenges in the areas of housing, energy, transport, air quality, health and democratic involvement. Past responses to these issues range from the Garden City movement and municipal socialism to Le Corbusier-era modernism and the Occupy movement.

Over the past 10-15 years, developments in wireless internet systems, connectivity and the miniaturisation of technology¹ have led to the creation of a new overarching vision for urban

¹ Moore's Law, https://en.wikipedia.org/wiki/Moore's_law

development: the 'smart city'.

ii) Defining a 'smart city'

There is no agreed definition or identified originator for the term 'smart city'. An online review reveals a diverse range of interpretations:

- *A smart city is an urban development vision to integrate multiple information and communication technology (ICT) and Internet of Things (IoT) solutions in a secure fashion to manage a city's assets.*²
- *A smart city is one that has digital technology embedded across all city functions.*³
- *A developed urban area that creates sustainable economic development and high quality of life by excelling in multiple key areas; economy, mobility, environment, people, living, and government.*⁴
- *"Smart city" is one of those all-encompassing terms that everyone defines however they want.*⁵

Without a clear definition, we struggle to answer:

1. What is and is not a 'smart city' technology?
2. What 'smart city' technologies are trying to change or achieve?
3. How successful 'smart city' technologies are in achieving these?

iii) Multi-national origins

Further investigation reveals the term 'smart city' has its origins in multinational technology corporations such as IBM, Cisco and Software AG, primarily as a means to subsidise, package and market new technological products and services to municipal public and local government bodies.⁶

Whilst global corporate consultancy Frost and Sullivan estimates a worldwide 'smart city' market worth \$1.565 Trillion by 2020 it highlights 'smart city' funding mechanisms as 99% public in origin.⁷

In this context, one workable definition for 'smart city' is: products and services developed primarily by multi-national corporations as a means to extract public development funding and win municipal contracts. The relative success of such technologies is therefore based on their ability to attract public funding and contracts rather than their ability to deliver appreciable benefits for cities, citizens and the environment.

² Wikipedia https://en.wikipedia.org/wiki/Smart_city

³ <http://www.smartcitiesprojects.com/whats-the-real-mean-of-smart-city/>

⁴ <http://www.businessdictionary.com/definition/smart-city.html>

⁵ Jack Gold, an analyst at J. Gold Associates

⁶ Adam Greenfield, *Against the Smart City* (2013)

⁷ Strategic Opportunity Analysis of the Global Smart City, Frost and Sullivan Mega Trends

Marke<http://www.egr.msu.edu/~aesc310-web/resources/SmartCities/Smart%20City%20Market%20Report%202.pdf>

iv) Not so smart after all?

'Smart Cities' visions of urban development fall short in several ways.

The security implications of dispersed, internet-enabled technologies have been highlighted as CCTV cameras and other devices have been hijacked in distributed denial of service attacks.⁸

As is common with early stage technological development, bugs, glitches and budget over-runs are frequent, though in over-promising but under-delivering, 'smart city' technologies are often fall victim to their own hype.

Too often such technologies are poorly conceptualised or lack end-user involvement. The smart home thermostat product Nest, owned by Google, tried to implement a self-learning algorithm which ultimately locked users out of their own heating systems.

In the UK, much-anticipated new smart meters are failing to deliver their expected benefits, due to a lack of engagement with householders in their development and a lack of integration into a multiplicity of new home technologies.

'Smart city' technologies are biased towards overly technological and complex solutions. Billions are being invested in self driving cars as a solution to urban congestion and road safety when simple, relatively cheap alternative solutions already exist such as improving urban neighbourhoods to reduce transport demand or investing in existing public transport systems or cycling and walking infrastructure.

'Smart cities' are being used to justify and facilitate the privatisation of public assets, leading to an over-emphasis on market-based solutions to urban problems. Uber and Alphabet's (Google) plans to manage and maintain both public and private transport systems within American cities have been criticised as privatisation by stealth.⁹ Why catch a bus when you can call a (publicly subsidised) Uber?

In 'smart cities' success is measured in purely financial terms rather than in the ways underlying urban societal and environmental issues are addressed.¹⁰

v) Towards an Open City?

Smart technologies may not be that smart but our cities are still in need of solutions to pressing urban issues. In contrast to 'smart cities' a wealth of community, not-for-profit, public and co-operative alternatives are being actively developed to address such problems.

⁸ <https://krebsonsecurity.com/2016/10/hacked-cameras-dvrs-powered-todays-massive-internet-outage/>

⁹ <https://www.theguardian.com/commentisfree/2016/sep/10/only-public-sector-finds-smart-technology-sexy>

¹⁰ <http://www.citylab.com/commute/2016/08/the-downside-of-data-based-transportation-planning/496250/>

We don't have all the answers to the world's urban problems, but we do believe some approaches are more effective than others in bringing about change, together they form the basis of an 'Open City':

1) Simple solutions

Simple solutions incorporating concepts such as 'appropriate technology', technology at a scale that can be mastered and managed by the people using it, easy to use, repair and decommission; and human centred design, the idea that products should be designed with the needs of end users primary in mind rather than aesthetics, built in obsolescence or the financial considerations of the manufacturers.¹¹

2) Collaborative approaches

Co-operative forms of technological development acknowledge the shared nature of the issues we face. Single issue, silo-based approaches fail to take advantage of multi-disciplinary knowledge. Drawing lessons from disciplines such as ecology, solutions overly-concerned with achieving a competitive advantage are likely to be less resilient than networked organisations, part of broader efforts to meet urban challenges.¹²

3) User-led

Developing user-led technology acknowledges that professionals don't have all the answers and that expertise must be applied collaboratively with end users to find effective solutions. User-led solutions achieve the buy-in of end users by involving them in early in project development. User testing and iterative development cycles incorporate the knowledge of customers to ensure products and service meet their needs.

4) Open Source

Technologies designed under open sources licenses such as GPL¹³ are increasingly common rejecting, closed intellectual property development. Open source allows many more people to become involved in the design process, authoring technology in a manner that speeds development cycles. It favours the development of long term, sustainable projects, developed and improved over many years. Importantly within the urban environment, open source technologies are far more likely to enable inter-operability within systems and open platforms are a key driver of innovation and development.

Open source, simple solutions, developed collaboratively, with end user involvement overlap to create a far more effective driver for urban change - the Open City standing in contrast to the closed, overly-competitive, dead end of the 'Smart City'.

¹¹ The term Human Centred Design was popularised by Donald Norman <http://www.jnd.org/>

¹² Surmountable Chasms: Networks and Social Innovation for Resilient Systems, Michele-Lee Moore and Frances Westley <http://www.ecologyandsociety.org/vol16/iss1/art5/>

¹³ <https://opensource.org/licenses/gpl-license>

vi) Case studies

These case studies illustrate the aspects of the Open City outlined above.

1. Open Energy Monitor

OpenEnergyMonitor is an open source project, initiated in 2011 to develop a simple, modular and inexpensive solution to home energy monitoring services. The project incorporates open source hardware including electricity monitoring and environmental sensor equipment, and software to enable data collected to be stored, aggregated, interpreted and analysed.

The project began slowly, initially based on hardware components that had to be soldered onto circuit boards by hand, but development and growth has seen increasing factory based fabrication.

The project has benefitted from ongoing householder participation and testing. A broad-based, open source approach to development means the equipment has undergone many, many development cycles and as a result is lean and focused on delivering the needs of end-users. Through coordinated by a small team in North Wales, the system is now used by over 80,000 people worldwide.

Over the past few years, the OpenEnergyMonitor online dashboard and data repository - EmonCMS¹⁴ - has become used as an open platform for a variety of new energy ICT-based projects including a home energy assessment service, the WikiHouse new build system and new smart meter extension applications.

The equipment is more expensive than commercially available systems but benefits from being more modular and flexible and the ability to extend and develop its functionality. If the equipment breaks or malfunctions users can read extensive online manual documentation and an active online community of other users helps identify repairs and remedies.

More information: <http://openenergymonitor.org>

2) OpenStreetMap

OpenStreetMap is an open source, collaborative project to create a free editable map of the world. Inspired by Wikipedia and facilitated by the advent of inexpensive portable satellite navigation devices, it was founded in 2004 as a reaction to proprietary alternatives such as Google Maps, requiring permission and payment to utilise and reproduce.

The project has over 2 million users from which it has crowd-sourced location information to build an extensive online map of comparable high quality to other available applications.

¹⁴ <https://emoncms.org/>

The project focuses on generating quality location data that can be used by a wide variety of end users and applications. It is now commonly used in urban planning contexts such as for GIS applications, urban transportation systems and apps and even forms the basis for Apple Maps.

OpenStreetMap data is available and free to use under open source licence and the project aims are safeguarded by the OpenStreetMap Foundation which encourages the growth, development and distribution of free geospatial data.

<https://www.openstreetmap.org>

3. Community Finance

A need to finance new local, urban and collaborative projects has led to the development of new crowdsourced, community finance mechanisms.

Community share issues are a method of raising capital via equity shares in registered community benefit societies. They offer equity on a 'one member, one vote' basis ensuring equity and transparency of decision making whilst a constitutional asset lock ensures community benefit in perpetuity.

Since 2009, almost a 120,000 people have invested over £100m to support 350 community businesses throughout the UK.

Such financing mechanisms have been used finance new urban renewable energy projects, co-operative and co-housing schemes and low carbon urban transportation projects, matching citizen engagement with innovative solutions.

<http://communityshares.org.uk>