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Office



Wilton Park



Report

Disrupting cities through technology

Thursday 17 – Saturday 19 March 2016 | WP1449



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Cities are not isolated islands. Global cities are important actors in international politics, a milieu where political influence is gathered and exercised in unexpected ways: cities are entrepreneurs disrupting global governance. Technology is the means for global success.

A globally successful city needs to exploit its indigenous assets - technology, knowledge, governance and culture - to gain a strong socio-economic position: cities must be smart. The competition is acute. By 2025, twenty six global cities are expected to be smart cities and fifty per cent of those will be in Europe and North America. By 2025, various estimates see 58% of the world's population living in cities and seventy per cent by 2045. Of those urban environments more than 280 are likely to be megacities of over 20 million inhabitants. Rapid urbanisation poses potentially insurmountable problems of poverty, inequality, insecurity, and design. All of the government policies and interventions intended to create or develop future cities have a strategic reliance on the high tech potentials of the city for long term urban development. It would seem that everyone with a voice, particularly those in government and the private sector, wants smart cities. In 2010, IBM said that a smart city is an 'instrumented, interconnected and intelligent city': instrumented by capturing and integrating live data through sensors; interconnected by integrating data into a computer platform that communicates information across a city's services; and intelligent by using complex analytics, modelling, and simulation to make better operational decisions. Technology, the foundation of cities as 'machines for living' will have to disrupt conventional ways of imagining, designing, building, and inhabiting the urban environment. We are living in the convergence of urbanisation and computational ubiquity.

Over two days, young innovators, city governments, academics, and policy professionals brought some clarity to the visions, reasons, and methods for creating smart cities. The forum brought together people who rarely meet to share experiences, expectations and create new collaborations that could improve how we plan smart cities and engage digital citizens.

Executive summary

- No two cities are the same, and while many of the challenges facing our cities today and in the future are similar, there is no single solution to these. Cities have long wished for a greater ability to sense and actuate, in order to provide basic services more efficiently, but this is far more easily said than done. The design of such systems is not easily undertaken, and must be done so with

sustainability and adaptability in mind.

- The main actors involved in successful urban innovation (planners, urbanists, service designers) continue to work at cross purposes. New tools and practices to facilitate their co-operation must be found. As of yet, no national government has attempted to undertake an urban innovation programme on a scale which would 'convene the market'.
- Cities are not always the best customers for the private sector because they do not think in terms of return on investment. Neither cities, nor their inhabitants are the customer. Thus, there is an impedance mismatch between the ways in which companies do business, and the choices a city government might make. Cities need to be business partners and beneficiaries, with the advantages of this position accruing to those who live there
- Cities are not currently acting as 'market makers'. However, the private sector isn't going to step in and create these markets. Cities must take the initiative, and make the case for themselves as fertile ground for business.
- There are two visions of the smart city: intelligent infrastructures and empowered citizens. Despite recent efforts to unite them, these visions remain somewhat at odds with each other. Are we at the beginning of the second machine age? There is a question here of evolution vs revolution. In addition, there is considerable debate concerning innovation. Do we want a top-down or a bottom-up innovation process? Are there alternatives available beyond this dichotomy? Choice must be at the heart of technology.
- Smart cities often work outside formal planning systems: urban planning must be made relevant again. We must embrace early intervention and understand urban complexity. In so doing, we enable planning to iterate and adapt in real time, leading to a kind of 'radical incrementalism'.
- Smartness must be incorporated into the planning regime; smartness and sustainability are synonymous, consequently this requires a different approach to planning and sustainability targets, in contrast with the inadequate 'set-once-and-forget' model. There is an inherent tension between building infrastructure and individual lives, and any new practices we develop must carefully navigate this tension.
- Cities exist from the bottom up – millions of small decisions. We attempt to govern and intervene in these at our peril. Yet these decisions generate data, increasingly we are able to access this data in more instantaneous and granular ways. Data is a source of dialogue.
- Sovereignty is facing its greatest threat since the formation of the Dutch East India Company in 1602, with the growing influence of distributed-ledger technologies such as the Blockchain, and the increasing realisation that many young people no longer think of themselves primarily as citizens of countries, but as members of geographically diverse online communities.
- Technology should be deployed for the good of the people, not for the fascination of technologists. This limitation has bedevilled many smart city projects, dooming them to permanent, limited test-bed status, without a clear strategy for the transfer of successful initiatives to wider adoption.
- People do not care about platforms; people care about outcomes, and the palpable improvement of their lives. This improvement also needs to be democratic: instrumentation must not beget gentrification. Improvement must also maintain personal privacies.
- A pluralist approach is called for. This precludes the possibility of any single vendor, no matter how experienced, being able to provide a satisfactory solution

to a city's technological innovation needs. Collective intelligence of cities can be harnessed to promote ambitious innovation.

Defining the 'smart city'

It has by now become clear that there is a need to move away from a fixed definition of a 'smart city'. No two cities are the same, and while many of the challenges facing our cities today and in the future are similar, there is no single solution to these. Instead, a set of desirable features and practices was proposed, in order to facilitate discussion:

- Connectivity; a city's network infrastructure, whether wired, wireless, or both, must be extensive, reliable, and available to all its inhabitants
- Sensors guiding decision-making; sensors must be deployed intelligently and thoughtfully, in order to give us insight into our urban environment
- Accessibility; there is an urgent need to make cities and their public transport infrastructures more accessible as our population ages, and to better accommodate the needs of the disabled
- Transparent data; the data that our municipal government generate must be extensive, well-structured, and open. Initiatives such as Comprehensive Kerbal Archive Network (CKAN) are beginning to address this need
- Open standards to support the free exchange of ideas; the protocols and formats which underpin the data our cities generate today and in the future must be open, auditable, and compatible beyond geographic borders
- Efficient mobility; we must use network technology to improve car journeys. As an example, NYC's Connected Vehicle Pilot Deployment Program, which will eventually encompass 10k vehicles, is an attempt to improve driver situational awareness for commuting drivers, as well as commercial vehicles
- We must use technology to make travel on our streets safer for all who use them, in line with Sweden's Vision Zero model, which aims to eliminate road traffic fatalities

National and local smart cities strategies

1. Smart Cities 'v1.0', such as New Songdo and Masdar City were solutions looking for problems. They were from-scratch showcases for technology companies to showcase their products in settings they designed and controlled almost completely. However, although these companies had a clear vision of an urban future, which would be made possible using their products, there was no real demand for them. By 2010, capital expenditure was falling, due to the global recession and its aftermath, and the 'demand' side (that is, cities) began to ask for technology. Technology companies need a different business model.
2. Perhaps the chief difficulty lies in the fact that cities want sustainable solutions to an acute problem. However, by their very nature, start-ups and service companies tend towards short-term solutions. This has resulted in many proofs of concept, but few workable long-term solutions. Cities want reference architecture, an abstract model which can be adapted, refined, and tailored to local needs, based on local capabilities.
3. The success of such an approach can only be measured by setting and adhering to standards, and defining these standards using open, participatory processes where appropriate. Cities have long wished for a greater ability to sense and actuate, in order to provide basic services more efficiently, but this is far more easily said than done. The design of such systems is not easily undertaken, and must be done so with long term sustainability and adaptability in mind.
4. There is a misalignment between how cities are, and what people expect them to be. There is a need for common definitions, and an urban innovation system beyond

technology, encompassing a cross-section of the people who live in, and will be subject to, these systems.

5. Cities functioned before the advent of network technology. We need to look to these successes for ideas. One possible route leads from the smart home to the smart building to the smart city.

6. It was pointed out that in some senses, the Smart City narrative can be seen as a three-act Shakespearean tragedy:

Act I: Songdo, Masdar, PlanIT Valley. These developments posited a utopian vision of the future, in which tech is the benign, all-powerful master. They were lifeless pilots, unrealistic models that existing cities were not interested in, but whose often unsuitable innovations they were nevertheless obliged to adopt, due to financial constraints.

Act II: There is no route from these pilots to scaled-up, long-term solutions. Their unviability, and the mode of financing – perpetual pilots – results in very little concrete interest. Tech companies respond to the lack of demand with layoffs.

Act III: Two models are now emerging; the 'City as Platform' model, as seen in Singapore and Dubai, or more open and agile approaches to urban innovation; these are both bottom-up *and* entrepreneurial.

7. The former is a model usually associated with a more technocratic and authoritarian political establishment, in which changes and nudges are readily undertaken, whereas the latter is an approach perhaps more suited to European and American cities.

8. The open and agile planning approach can be seen in cities like Bristol, Oxford, and to an extent, Chicago and Boston. Characteristics of this are; analytics, service design, networking and transport innovation, agile/liquid development, rapid iteration, and integrated research programmes whose outcomes can be quickly incorporated into the urban fabric.

9. Technology is no longer the driver of innovation, but the outcome of a considered and inclusive approach which understands a plurality of needs, reflecting the demographic diversity of our cities. Singapore and Bristol are two very different and distinct models, and not all cities are suited to one or the other. There are many adaptations and shades of grey.

Restructuring municipal governments to more effectively exist within the digital economy.

10. Can city governments effectively function in the digital economy? How can they acquire this expertise? Municipal governments tend by their very nature to be conservative and budget-constrained, and thus struggle to attract technical talent. This in turn leads to a kind of perpetual game of catch-up. Institutions such as Code for America (US) and the Government Digital Service (UK) have shown that progress can be made in this area, albeit at the national level, and cities such as Boston have been seen some success with projects like New Urban Mechanics.

11. There is no tangible value proposition in the smart city v1.0. There is a need for a 'value framework'; a means of measuring and articulating value creation. Cities and technology providers must come together to create ways in which progress can be made in this area.

12. There is still a great gulf between urbanists, urban planners, technologists, and service designers. This divide needs to be bridged.

Most discussion of smart cities has focused on their uses.

13. We must also discuss their abuses, particularly in more unequal societies, where urban innovation can exacerbate inequalities. The dignity of people, and their quality of life, must be the ultimate concern of urban innovation. Innovation for its own sake is a

hollow pursuit

The main actors involved in successful urban innovation (planners, urbanists, service designers) continue to work at cross purposes.

14. New tools and practices to facilitate their co-operation must be found. As of yet, no national government has attempted to undertake an urban innovation programme on a scale which would 'convene the market'. Though both Singapore and India are engaged in large-scale programmes, their examples are not directly applicable, for structural reasons. Singapore's 'Smart Nation' programme depends deeply on its unique government structure, and India's '100 Smart Cities' programme seems, for now, to be repeating many of the mistakes seen in the canonical 'v1.0' examples.
15. There was a suggestion that the bond between supply and demand in informing production should be weakened; funders must be brought in early in order to shape requirements. For example, planners and smart city vendors must cooperate. It is planners who bring the relevant long-term expertise, and a mandate for change, as well as deep relationships with both developers and municipal governments.
16. There is a need to invert the 'persuasive cities' model: City Hall, not citizens, must be influenced. In order for this to become reality, new tools, and new models for fostering co-operation both within communities, and, perhaps, between communities and technology providers must be created.
17. Those wishing to be successful in the Smart City space must develop an awareness of the social implications of new technologies. We need non-western perspectives on the effects that the rapid spread of wireless communications technologies have.

Fostering international collaborations to co-develop technologies

18. What would a 21st century government look like and how can we collaborate across cities? The problem is data; more has been produced in the past two years than in the previous 500, and Open Data is not yet as successful as has been hoped. Currently data remains too diffuse, too unstructured, and there is a lack of quality control in the space.
19. There is little regional cooperation between cities, and indeed the smart cities programmes they run. Especially in the UK, where devolution is now a key issue, the sharing of technology, data, and expertise in their successful deployment is vital.
20. Government is lagging behind on innovation on policing, water management, governance, education technology. This leads naturally to a key question: how can we use technology to improve government worldwide? IBM have moved away from attempting to sell Smart City v1.0 solutions, as propounded in their original Smarter Planet vision. Jams and hackathons are one approach for engaging people with technology, and its role as a tool for civic innovation is growing. However, these methods are by no means a comprehensive solution.
21. How can technology play a role in making government more service-oriented? Civic technology, and the changes it can bring, is more important than a smart city programme. Government programs are vertical; we need to find ways to make them more horizontal, more cross-cutting.
22. Cities are not always the best customers for the private sector because they do not think in terms of return on investment. There is thus an impedance mismatch between the ways in which companies do business, and the choices a city government might make.
23. Neither cities, nor their inhabitants are the customer. Other businesses are: cities provide the *grounds* for commerce. Cities need to be business partners and beneficiaries, with the advantages of this position accruing to those who live there.
24. Cities are not currently acting as 'market makers'. However, the private sector is not

going to step in and create these markets. Cities must take the initiative, and make the case for themselves as fertile ground for business.

25. A key question, forcefully raised, was the suitability of smart cities for semi-educated citizens. Especially in India and Africa, there is a danger that the deployment of out-of-the-box solutions under the guise of 'modernisation' is simply an attempt to legitimate a government by making it appear technologically savvy, and forward-looking. Technology has a streamlining effect. Should this tendency be encouraged? It must be adapted to local conditions.

Making smart cities business as usual

26. There are two visions of the smart city: intelligent infrastructures and empowered citizens. Despite recent efforts to unite them, these visions remain somewhat at odds with each other. In addition, there is considerable debate concerning innovation and whether this is more effective as a top-down or a bottom-up process. Choice must be at the heart of technology.
27. So far, sustainable business models have been largely absent, with the majority of projects, particularly in the EU, being 'pilots' or 'testbeds'. Some cities are particularly proactive in their pursuit of smart initiatives. This can often lead to a collection of dissonant projects. Barcelona, in particular, is seen by some as a disparate collection of smart city like initiatives.
28. Technology can dramatically increase the pace of sustainability; it engages society, facilitates collaborative leadership, and cuts across city systems and disciplines. It also encourages and facilitates data use of which there are 3 kinds:
- Corporate
 - Open Data
 - Machine-to-machine (M2M) data
- Social media data does not fit in easily under any of these three however.
29. We struggle to model change and impact in cities, but a key issue is how to measure the impact of tech on human well-being. Agent-based modelling (**ABM**) is a promising solution here: An open-source modelling platform, a collaborative platform which fosters radical hope.
30. Things are getting worse in the urban world. Suburban poverty is growing. Smartness is not about technological fixes, but many city governments remain unaware of this. Cities are still driven by command and control models of governance, which date from post WWII.
31. What is somewhat inimical to a thriving urban society is to re-democratise urbanism. Informal settlements exist in West London, which has the most highly-regulated planning system in the world. Smart cities often work outside formal planning systems: urban planning must be made relevant again. We must embrace early intervention. We must understand urban complexity, and in so doing, enable planning to iterate and adapt in real time, leading to a kind of 'radical incrementalism'.
32. Smartness must be incorporated into the planning regime; smartness and sustainability are synonymous, and this requires a different approach to planning and sustainability targets, by contrast to the new outdated and inadequate set-once-and-forget model. There is an inherent tension between building infrastructure and individual lives, and any new practices we develop must carefully navigate this tension. Technology can help here. This kind of approach will be data-driven in the Old Oak Common development northwest of London.
33. We must tackle the quick wins, in order to bring people along, in order to address the larger issues. We have no choice but to engage in incrementalism, due to ongoing

austerity measures and budget constraints. Ought we to focus on economic growth at the expense of upward mobility? We need to reverse, or invert this.

34. Our institutions reflect the dominant economic paradigm (that of 19th century industrial society). We must find ways in which to make them become agile and responsive. How can we develop and foreground network-based institutions, and indeed, networks of alternative power? How does the smart city account for these informal networks?
35. Cities exist from the bottom up – millions of small decisions. We attempt to govern and intervene in these at our peril. Yet these decisions generate data, and we increasingly have access to it in more instantaneous and granular ways. Data is a source of *dialogue*. The idea of 'Massive Small' is applicable in this case; the unification of top-down and bottom-up approaches.

Securing the digital city and protecting the digital citizen

36. Sovereignty is facing its greatest threat since the formation of the Dutch East India Company in 1602, with the growing influence of distributed-ledger technologies such as the Blockchain, and the increasing realisation that many young people no longer think of themselves primarily as citizens of countries, but as members of geographically diverse online communities.
37. In the cyber domain the nature of time and space is different: velocity of information is increased, as is the breadth of systems (IoT). We find it difficult to design security into products and services because they move too quickly. It is nonetheless the government's role to protect a city's intrinsic values.
38. What is the military's role in securing smart cities? NATO assumes that militaries will operate in smart cities. It is interested in what happens when their systems are agitated. The military challenge is a paradox: Cities are undeniably physical, but they increasingly exist in the digital theatre. The military would prefer to take a stand-off approach. It may wish simply to 're-boot' a city and its systems.
39. It was agreed that there are three scenarios in which the military might become involved:
 - In times of conflict, cities are a theatre
 - In support of civil authorities (disaster)
 - In support of civil law and order (civil unrest)
40. This involvement poses strategic challenges, not least the existence of multiple forms of technology, which would be available to adversaries. The continuously changing and evolving nature of the smart city in tandem with perpetual adaptation and upgrades in technology ensures an unpredictable force operation environment. Smart technology produces smart adversaries
41. We must acknowledge the existence of competing networks of authority and that failed systems will impede the re-establishment of authority. We need therefore to think about de-centralised operations, such as mesh networks.
42. How do we collaborate with other agencies and actors, and how do we provide both a physical and virtual presence? What is the human response to an attack that disables a city? We need to unify our thinking about the physical and virtual domains. It is the gap between these which will be attacked.
43. The gap between the strategic and the tactical is vanishing, and the failure of a smart city has strategic implications. There is a strong desire to identify risks early.

How to build new (sustainable) cities?

44. The final session was an opportunity to analyse two very different case study cities, Santander (Spain) and Harare (Zimbabwe), addressing deployment of technology in

the respective cities, and look more generally at hopes for the future of technologically-mediated urban innovation.

45. A central theme was the social and digital fabric of a city. Does technology increase inequality? Are the less educated and wealthy handicapped from the outset? Digital cities should aim to close that gap.

Santander

46. The speed of technological change is overtaking us and we need to rethink how we manage and understand our cities. The conclusions drawn from the Santander example suggest four stages in which to operationalise this:
- Infrastructure (sensing / instrumentation) such as bins
 - Technological platform / information centre (integrated information management, 5-year timeline, 65 services)
 - Reactive intelligence: service fusion, algorithmic management
 - Predictive intelligence, ahead-of-time service management

Santander will not consider itself a smart city until it reaches stage four

48. Government needs to adapt its cities to the new socio-economic paradigm and facilitate the education of its citizens. This requires being mindful that citizens are consumers and producers. Individuals can rapidly produce new products; this is the co-creation eco-system. Automation is a concern is however a concern and the transition from a labour-based to a service-based economy is fraught with dangers.

Harare

49. Harare is a city of 2 million people and 4 satellite cities, numbering 4.2m people in total. The country is emerging from 15 years of turmoil, and has an urban population with high literacy, and high mobile phone penetration. Zimbabwe is a net importer for the moment
50. Water and electricity billing are based on pre-pay platforms, and phone-based banking is widespread.
51. The municipal government is very interested in sensing and automation, in order to reduce its reliance upon unskilled labour. It is not a question of 'if', but of 'how' automation is expanded; the rewards outweigh the risks. There is however no interest in intrusive technologies and it is politically impossible to take automation to its most efficient conclusion
52. There is no Uber, or Uber-like service, and no biometric sensing, which the government, as the second-largest employer, has an interest in. There is also a frank interest in top-down approaches implying less of a direct role for the private sector

Cross-cutting lessons

53. Neither city feels their institutions are fit to cope with rapid technological change. The inability to help mayors and municipal authorities articulate how 'smartness' can help create value has been a major industry failure.
54. It was pointed out that over the course of the sessions, several words commonly associated with urban life were conspicuous by their absence: fun, altruistic, healthy, welcoming
55. While several benchmarks exist, there is (still) no reasonable basis for the comparison of smart cities
56. Technology should be deployed for the good of the people, not for the fascination of technologists. This limitation has bedevilled many smart city projects, dooming them to permanent, limited test-bed status, without a clear strategy for the transfer of

successful initiatives to wider adoption.

57. People do not care about platforms; people care about outcomes, and the palpable improvement of their lives. This improvement also needs to be democratic: instrumentation must not beget gentrification. Improvement must also maintain personal privacies.
58. A pluralist approach is called for. This precludes the possibility of any single vendor, no matter how experienced, being able to provide a satisfactory solution to a city's technological innovation needs. Collective intelligence of cities can be harnessed to promote ambitious innovation.

Conclusion

The budget constraints faced by many municipal governments since the 2008 financial crisis – particularly in Europe – show no signs of being relaxed. They continue to operate in a climate of fiscal conservatism. Top-down approaches must place their value propositions front and centre; it must be clear that their benefits are broadly applicable, and long-term.

On the other hand, the use of technology to foster civic engagement, and to enable cooperation at the community level is just beginning. Cities must embrace both approaches, and this unified approach must be mirrored in their own administrations: instead of silos, departments must share data, information, and expertise with each other, and allow cross-cutting initiatives to flourish.

As devolution increases, particularly in the UK, cities must find ways to effectively share and collaborate with one another, just as they enable their inhabitants to do the same by opening their data and infrastructure.

The security risks faced by cities as they become increasingly connected are multiple, and our understanding of them is far from complete:

The potential vulnerabilities which may result when connecting legacy industrial and infrastructure-management systems to networks are extensive, and any such work must be performed with great diligence and care.

The problems facing cities in emerging economies and those in Northern Europe and North America are often quite different, and require different approaches.

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