

From Intelligent to Smart Cities

Edited by
Mark Deakin and Husam Al Waer

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From Intelligent to Smart Cities

The concept of smart cities offers a revolutionary vision of urban design for sustainability. Utilising the intelligent application of new technologies, smart cities also incorporate considerations of social and environmental capital in order to transform the life and work of cities.

This book brings together papers from leading international experts on the transition to smart cities. Drawing upon the experiences of cities in the USA, Canada and Europe, the authors describe the definitional components, critical insights and institutional means by which we can achieve truly smart cities. The resulting volume will be of interest to all involved in urban planning, architecture and engineering, as well as all interested in urban sustainability.

This book was originally published as a special issue of *Intelligent Buildings International*.

Mark Deakin is Professor of Built Environment at Edinburgh Napier University, UK.

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These essays set the foundation for new thinking about intelligent cities and how smart they can be for individual citizens and communities. The style is international, well argued and leads the way by taking a holistic approach to the planning and design of cities.

Derek Clements-Croome, Editor of Intelligent Buildings International

I find it very refreshing that these articles are focussing on one of the most important and foremost subjects in the built environment design field. They ask the question of what smart cities are, and how may they be formulated and arranged to ensure cities remain functional both for today and future generations.

Matt Kitson, Director of Sustainability, Hilson Moran

At a time when transnational corporations such as IBM are re-configuring themselves into expeditors of a “Smart Planet”, and are spending millions of dollars in advertising to brand themselves purveyors of “Smart Cities”, it is important to have disinterested observers analyze the terms and realities of these campaigns. The Deakin and Al Waer (book) accomplishes this nicely. (The book) will continue to be relevant because (it contains) seminal contributions to discussions that will be occurring for a long time.

Richard E. Hanley, Editor of the Journal of Urban Technology

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Introduction

From intelligent to smart cities

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Drawing upon the smart experiences of 'world class' cities in N. America, Canada and Europe, this special issue draws together five papers from leading international experts on the transition from intelligent to smart cities. Together they do what Hollands ('Will the real smart city stand up?' *City* 12(3), 302–320) has recently asked of smart cities and provide the definitional components, critical insights and institutional means by which to get beyond the all-too-often self-congratulatory tone cities across the world strike when claiming to be smart.

The first paper, from Deakin and Al Waer, reflects upon some of the anxieties surrounding the transition from intelligent to smart cities. In particular, it considers the anxiety that the transition has more to do with cities meeting the needs of the market, than the intelligence which is required for them to be smart. Working on the assumption that any attempt to overcome such an anxiety means shifting attention away from the needs of the market and towards the intelligence which is required for cities to be smart, this paper begins to set out a less presumptuous, more critically aware and insightful understanding of the transition. This less presumptuous, more critically aware and insightful understanding of the transition leads to the realization that it is the legacy of Castells (1996) and Graham and Marvin's (1996, 2001) work undertaken on the informational basis of the communications embedded in such intelligence, rather than Mitchell's (1995, 1999, 2001, 2003), which

leads us away from the purely technical issues surrounding the business logic of such developments. That is to say, away from the purely technical aspects of such developments and towards an examination of the social capital which is not only critical in underpinning their informational and communicative qualities, but pivotal in supporting the wider environmental and cultural role intelligence plays in supporting the transition to smart cities.

What follows captures the information-rich and highly communicative qualities of these technical, social, wider environmental and cultural developments, the particular methodological issues they pose and the critically insightful role which the networks of innovation and creative partnerships set up to embed such intelligence play in the learning, knowledge transfer and capacity-building exercises that service the transition to smart cities. This is what the paper suggests

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Hollands' (2008) account of smart cities misses and it goes some way to explain why he asks 'the real smart city to stand up!' For, in cutting across the legacy of the transition from the informational to the intelligent and now smart city, Hollands' (2008) account of the transition is not as well grounded in the informational and communicative qualities of the embedded intelligence they are built on.

This, the paper suggests, is a critical insight of some note, for only in giving such a well-grounded account of the embedded intelligence drawn attention to does it become possible to do what Hollands (2008) asks of smart cities: that is 'undergird' the social capital which is not only critical in underpinning the informational and communicative qualities of the embedded intelligence smart cities stand on, but pivotal in gaining a fuller insight into their significance.

The second paper, from Paskaleva, suggests that, over the course of the past decade, the smart cities agenda is an issue that has gained real momentum in Europe. The significance of this is reinforced further by other international organizations, such as the Organisation for Economic Cooperation and Development, who suggest that smart cities offer society the prospect of being not only environmentally sustainable, but also sufficiently competitive and cohesive to meet their emerging quality-of-life agenda (OECD – EUROSTAT, 2005). As the paper points out, as a result of such high-ranking institutional support, many cities have now adopted this socially cohesive, environmentally sound and economically competitive reading of what it means to be smart, as a way of profiling themselves as forward-looking, prosperous and well endowed. For instance:

- the Amsterdam Smart City initiative emphasizes the importance of collaboration between the citizens, government and businesses to develop smart projects that will 'change the world' by saving energy;
- Southampton City Council uses smart cards to stress the importance of integrated e-services;
- the City of Edinburgh Council has formed a smart city vision around an action plan for government transformation;
- the Malta Smart City strategy promotes a business park as a way to leverage economic growth;
- IBM, Siemens and ORACLE have formed their visions of the Smart Planet;
- a number of EU research and policy projects have emerged as well to deal with various issues of the 'smart city' (Komninos, 2002, 2008). The recently concluded pan-European research project IntelCities, for example, concluded that governance, as a process and outcome of joint decision making, has a leading role to play in building the 'smart city' and that cities should develop collaborative digital environments to boost local competitiveness and prosperity by using knowledge networks as a means to integrate the governance of e-service delivery (Curwell et al., 2005; Deakin and Allwinkle, 2007; Paskaleva, 2009);¹
- the Smart Cities INTERREG project is also using an innovation network between academic, industrial and governmental partners to develop the 'triple helix' of e-services in the North Sea Region by way of and through a novel customization process (Deakin, 2010).

Paskaleva's paper advocates this view of smarter cities as people-based, human and progressive in their deployment of digital technologies, not to hardwire themselves, but instead to be socially inclusive in using them to foster good governance and create services capable of improving the quality of life.

Taking this 'digitally inclusive' vision of cities (Deakin, 2007, 2011) forward, the paper reflects upon the current trends and understanding of what it means for urban administrations, policy makers and businesses in Europe to be smart, and what it takes for them to become smarter. In

developing this vision, the paper pays particular attention to the role of the 'smart city' as a nexus for open innovation and how the strategic significance of this development has become the mainstay of current discussions about the future of the Internet, living labs, innovation and competitiveness-driven (urban) development.

By conducting a critical review of some high-profile programmes and initiatives on smart cities, the emerging trends are explored and insights are drawn about the challenges these developments pose. The analysis is based on four Smart City projects and their relevant EU programmes. They are chosen because, collectively, they reveal what Europe expects smart cities to stand for.

Set within the terms of reference set out by Paskaleva, the paper from Komninos discusses the spatial intelligence of (smart) cities, the use of digital technologies and the institutional settings of those innovation systems seen as smart enough to radically transform cities. The paper has as its starting point two related observations about the increased use of terms like intelligent and smart in contemporary urban planning and development. The first concerns the somewhat over-simplistic way cities tend to use the term 'intelligent', or 'smart'. The second relates to the diverse range of strategies cities are currently assembling in laying claim to such a status. The observation here is that such a diverse range of strategies tends to say more about the ambiguity of the relationship digital technologies have to the planning and development of cities, rather than what it means for them to be either intelligent, or smart. This is because, for Komninos, the strategies in question are seen as being left with plans insufficiently developed for their digital technologies to either embed the intelligence needed for cities to be smart, or build the means required for them to claim such status.

As a counterpoise to these observations, this paper lays down some of the 'fundamentals of spatial intelligence', the strategies and applications of which can be seen as being smart. It argues that, despite the great diversity

of strategies and applications, the logistics of spatial intelligence teaches us that smart cities rest on a few knowledge-based trajectories. In particular, they rest on those knowledge-based trajectories that are embedded in the transitions of Bletchley Park, Hong Kong and Amsterdam and which the paper suggests are still only partially understood.

Taking Komninos' idea that cities are still stuck in the digital, rather than embedded in the intelligence of what is smart, as the 'third' observation on the transition, the paper from Deakin examines the thesis on the 'embedded intelligence of smart cities' first advanced by Mitchell (1995, 1999, 2003). For, as the paper points out, while Mitchell (1995) sets out a vision of urban life literally done to bits, left fragmented and in danger of coming unstuck, Mitchell's (1999) *e-topia* offers a counter-point to this and an image of the city no longer left in bits, but a place 'where it all comes together'.

Dwelling on the reconciliatory nature of these statements, this paper suggests that, while this thesis on the 'coming together' of the virtual and physical and dissolution of the boundaries between 'cyber and meat space' is compelling, there are a number of concerns surrounding the technical, social and environmental status of the embedded intelligence which is currently available for urban planners and developers to make cities smart. While problematic in itself, the paper also suggests that if the difficulties experienced over the transition from intelligent to smart cities were only methodological they might perhaps be manageable, but the problem is that they run deeper than this and relate to more substantive issues which surround the trajectory of Mitchell's (1995, 1999, 2003) thesis.

This, the paper suggests, is a critical insight of some significance because, if the trajectory of the thesis is not in the direction of either the embedded intelligence of smart cities, or the ICTs of what is referred to as 'digitally inclusive regeneration platforms', then the question arises as to whether the whole notion of

e-topia can be seen as a progressive force for change, or merely as a way for the embedded intelligence of smart cities to reproduce the status quo.

This unfortunate scenario is drawn from what Graham and Marvin (1996, 2001) have referred to, not as e-topia, but splintering urbanism, because, under their thesis, the citizenship underlying the informatics of these communities is no longer able to carry the sheer weight of the material which such a cybernetic-based networking of intelligence is supposed to support. This, the paper suggests, is important because such a representation of the transition offers what can only be referred to as the antithesis to Mitchell's (1999) e-topia. An antithesis that, it might well be added, goes to some length to search out, uncover and expose the other side of this cybernetic-based intelligence and reveal what currently lies hidden in the debate which is currently taking place about the transition to smart cities.

From this perspective, the paper suggests the problems with e-topia are as much substantive as methodological, the former holding the key to the latter. In substantive terms this paper offers another twist on the question as to what the transition from intelligent to smart cities means and, in doing so, goes very much against the grain, arguing that our current understanding of embedded intelligence, smart cities and the ICTs of digitally inclusive regeneration puts us on the verge of a new environmental determinism.

To avoid repeating this mistake (yet) again, attention is drawn to the work of Graham and Marvin (1996, 2001) and the spaces which their radical democratic, i.e. egalitarian and ecologically integral, account of the transition opens up for a much more emancipatory view of the intelligence embedded in those knowledge-based agents smart enough to meet these requirements. Those knowledge-based agents, it should perhaps be added, who are smart enough to meet these requirements and do so by way of and through their exploitation of the social capital that

underlies the very communities which give rise to the norms, rules and values of such developments.

The paper suggests that, in ignoring these warnings and being unable to learn the lessons which such a critical reworking of the thesis offers, the strategy Mitchell (1999, 2003) adopts must be seen as suspect. Not only because the vision and scenarios it advances have a tendency to side-step the social significance of digital technologies, but for the reason that, in doing so, the strategy ends up replacing the 'agonies of equality and ecological-integrity' with little more than the 'gnostics' of 'new age' wordings, which are centred around storylines about the quality of life. The strategy advocated for adoption by this paper is not grounded in such rhetoric.

The vision of e-topia it builds instead rests on the messages the likes of Graham and Marvin advance, by turning the tables and agreeing that, while words offer the possibility of 'bringing what it all means back together', actually turning things around lies not so much in the words, as it rests with the semantics of the syntax and vocabulary governing the digitally inclusive nature of the regenerative storylines emerging from this discourse and, perhaps even more importantly, the degree to which they overcome the divided antagonisms of the excluded. In this way, the paper suggests that it becomes possible for the multiplied memory and infinite mind of the 'cyborg civics and environments' of their 'tribe-like culture', not to so much bemoan the 'nomadicity of wireless bi-peds', but actively celebrate the creativity of the virtual communities emerging from the digital-inclusive nature of such regenerative storylines.

In particular, it is added, celebrate the opportunity this in turn creates for virtual communities to use the collective memory, wikis and blogs of their electronically-enhanced services, as a means for such platforms to bridge such social divisions. Bridge them – it is important to note – by drawing upon the political subjectivities of cyborg-civics, their

tribe-like culture and nomadicity, as wireless bipeds with the embedded intelligence smart enough for the citizens of this community to span them. Span them with bridges that are not merely symbolic, but real in the sense which the semantic web of this knowledge-base serves to be the agent of something more than a prop. Something more than a prop and bigger in the sense which the embedding of such intelligence allows the web-based services that support all of this to begin doing the job asked of them. That is the job of building a stage which is large enough for the analytic, synthetic and symbolic components of the transition to be smart in playing out the possibilities there are for urban planning to be both equitable and ecologically integral.

The paper from Walters picks up on what might be referred to as a 'fourth' observation on the trajectory to which Komninos draws attention. His observation also harks back to Mitchell's thesis and suggests that, irrespective of how digital technologies are developed to exploit the electronic opportunities they offer, the physical places of urban spaces will retain their relevance in society because people still care about meeting face-to-face and gravitate to places which offer particular cultural, urban, scenic or climatic spaces, unable to be experienced at the end of a wire and through a computer screen.

The paper from Walters offers what might best be referred to as a 're-urbanist', or 'new urbanist' account of the transition from intelligent to smart cities. Rooted in the 'equity planning of public participation', it argues that the transition is progressive because it is not only intelligent, i.e. founded on the cognitive logic (cybernetics) of systems thinking, but smart enough to present cities with the master plans and design codes capable of regulating the form, massing and placement of the buildings they in turn 'build out'. This, the paper argues, is possible because the embedded intelligence of smart cities rests on the master plans and design codes that are

assembled to represent the urban form, spatial infrastructures and buildings seen as capable of sustaining such development.

As the paper goes on to suggest, within the spatial infrastructures and buildings of smart cities, we find that place is something which truly matters. As the paper makes clear: it matters because, while exactly what 'smart' means for cities can be subject to several interpretations, the simplest and most potent definition of smart cities is of a 'place enriched by the assignment of meaning'. For, while technology keeps pushing us apart, in using media to bridge physical distance, we as a culture continue to gather in specific locations meaningful to us. The smartest places, therefore, are those that combine the best of both the physical and virtual worlds, where presence and 'tele-presence' are fused together in a specific location. Here physical locations are pervasively penetrated by digital technologies to provide a collaborative meshing of physical and virtual environments. As an antidote to the 'splintering urbanism' suggested by Graham and Marvin, Walters suggests that in such locations the centrifugal tendencies of digital technologies are balanced by centripetal forces of human interaction which manifest themselves in physical space.

This paper takes it as read that ICTs will continue to evolve in ways that continually challenge our perception of place and as a consequence, space will offer as-yet unforeseen opportunities. As a consequence, it suggests that there will likely be as many negative as positive outcomes from this technological evolution, and that one of the roles of physical, place-based urban planning, development and design is to capitalize on the positives and offset as many of the negatives as possible by means of determined, activist and design-based public policies. As the paper emphasizes, the challenges that surface from such a reading of the transition to smart cities range from counterbalancing the power of global capitalism, to creating generic 'themed' environments which are devoid of place-specific

designs, to assisting poor communities in under-serviced parts of cities to participate in grassroots regeneration.

As the paper also makes clear, while debate continues to swirl around the relevance of traditionally construed physical places as settings for human activity in a world both expanded and collapsed by digital media, it is recognized that Mitchell's view of a potentially fruitful and mutually beneficial collaboration between the physical and virtual worlds currently stands in stark contrast to Graham and Marvin's more dystopian vision of a world splintered and fragmented by technological mobilities and networked infrastructures. In particular, it contrasts with that view of the world which suggests that the electronic spaces of urban places threaten to develop 'silent, invisible and pervasive networks with unprecedented potential for exclusion'. The implication of this is clear: if 'place' matters at all, well-planned and designed locations shall become the realm of the more privileged classes and those not fitting some pre-defined intellectual notion of what is smart shall be denied admittance.

In spite of this critique, Walters argues that Mitchell's position is still relevant, particularly if the process of place-making is rooted in participatory democracy, utilizes electronic media to structure and extend democratic debate and, most importantly of all, creates clear implementation strategies regulated by way of, and through, the master planning of form-based design codes.

While the paper suggests that there is no denying the power of Graham and Marvin's alternative view (which states that a 'privatization and liberalization of infrastructural systems' is unravelling the city as a place where people come together for common purposes, implanting instead the conditions of spatial segregation, social polarization and exclusion) the City of Beaufort, SC, stands as a place of resistance to these trends, using electronic media as an agent of social and physical cohesion. While Graham and Marvin quite rightly suggest

that traditional place-making should be treated with scepticism because it can fix exclusionary policies in time and place to the detriment of certain social groups, the inclusionary and electronically enhanced democratic process used by Beaufort in its planning and design activities mitigates such concerns by going out of its way to enhance the public's input into charrette-based blogs and online community discussions.

Referring to the 'triple bottom line' of economic prosperity, environmental stewardship and social justice found in Beaufort's smart growth and sustainability audit, this paper suggests their experience of the transition manages to challenge the belief that such urban planning, development and design exercises merely reproduce the status quo. Whereas some plans do minimize change to suit the interests of upper- and middle-income residents to the detriment of those less well-off, the Beaufort plan specifically encourages, for example, housing diversity and affordability, with an emphasis on workforce housing and 'aging in place'. Indeed, as the paper goes to some length to show, a large segment of work in the case-study charrette deals with many of the substantive issues surrounding the development of housing and the quality of life of people with low and moderate incomes.

Overall, the paper suggests that the Beaufort case study illustrates how the digital town hall can be used to embed place-based master planning and design codes into the town's e-governance. In doing so, this case study is seen as offering a clear example of how Mitchell's thesis on the electronic codification of urban planning and design can give 'character' to a place and, what is more, make this intelligible by embedding the rules and protocols which are smart in encouraging some activities and discouraging others.

This particular charrette, with its detailed preparation, analyses and subsequent code-building methodology, is said to represent state-of-the-art community design practice for neighbourhood renewal in the USA. Its

extensive scope, digital presence and attention to small-scale contextual detail are also seen as important in creating 'market-ready' redevelopment projects and providing the benchmarks of progressive planning practice. In particular, the charette can be seen to realize the prospect there is to 'bring this all together' under the reciprocal capacities of a form-based code recalibrated by the site-specific urban design proposals contained in a plan. This, in turn, is seen as something of a step change in what has previously gone under the name of 'progress'.

NOTE

1 <http://en.wikipedia.org/wiki/Intelcities>.

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From intelligent to smart cities

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Taking Hollands' previous statement on the transition from intelligent to smart cities as its point of departure ('Will the real smart city stand up?' *City* 12(3), 302–320), this article reflects upon the anxieties currently surrounding such developments. In particular, it considers the suggestion that such developments have more to do with cities meeting the corporate needs of marketing campaigns than the social intelligence required for them to be smart. Focusing on the social intelligence of such developments, this article captures the information-rich and highly communicative qualities of the transition. In particular, it examines the methodological issues that smart communities pose cities and the critically insightful role which the networks of innovation and creative partnerships set up to embed such intelligence play in the learning, knowledge transfer and capacity-building exercises servicing this community-led transition to smart cities. This, the article suggests, is what existing representations of smart cities miss. This article offers a critically insightful account of the transition.

INTRODUCTION

Smart city forerunners, such as San Diego, San Francisco, Ottawa, Brisbane, Amsterdam, Kyoto and Bangalore, are all now setting a trend for others to follow. Other cities now keen to follow in their wake and become smart include Southampton, Manchester, Newcastle, Edinburgh, Edmonton, Vancouver and Montreal.

Taking Hollands' (2008) article on the transition from intelligent to smart cities as its point of departure, this article reflects upon the anxieties currently surrounding such developments. In particular, it considers the suggestion that such developments have more to do with cities meeting the corporate needs of marketing campaigns than the social intelligence required for them to be smart. Working on the assumption that any attempt to overcome such

anxieties means cities shifting attention away from the needs of the market and towards the intelligence required for them to be smart, the article begins to set out a less presumptuous and more critically aware understanding of the transition from intelligent to smart cities.

WILL THE REAL SMART CITY STAND UP?

In a recent article, Hollands (2008) asks the question: 'will the real smart city stand up?' For, according to Hollands (2008), cities all too often claim to be smart, but do so without defining what this means, or offering any evidence to support such proclamations. The all-too-often 'self-congratulatory' tone cities strike when making such claims does not seem to sit well with Hollands (2008). While images of the digital

city, intelligent city, high-tech district and neighbourhoods of smart communities abound, they all fail to convey what it means to be smart and why it is important for cities to be defined in such terms.

In Hollands' (2008) opinion, the validity of any claim to be smart has to be based on something more than their use of information and communication technologies (ICTs). Hollands (2008) asks this question because cities all over the world are beginning to do just this and use such technologies as a means of branding themselves smart. Such smart city forerunners like San Diego, San Francisco, Ottawa, Brisbane, Amsterdam, Kyoto and Bangalore, are all now setting a trend for others to follow. The other cities keen to follow in their wake and become smart are: Southampton, Manchester, Newcastle, Edinburgh, Edmonton, Vancouver and Montreal. It appears that the rush to become a smart city has begun to gather apace and, as a consequence, pressure is now growing for cities to become even smarter.

IBM's recent high-profile campaign on smart cities also goes some way to acknowledge this pressure for cities to become smarter. As they state:

Technological advances [now] allow cities to be "instrumented," facilitating the collection of more data points than ever before, which enables cities to measure and influence more aspects of their operations. Cities are increasingly "interconnected," allowing the free flow of information from one discrete system to another, which increases the efficiency of the overall infrastructure... To [meet] these challenges and provide sustainable prosperity for citizens and businesses, cities must become "smarter" and use new technologies to transform their systems to optimize the use of finite resources.¹

Hollands' (2008) anxiety about the 'self-congratulatory' nature of the claims cities

make to be smart tends to hark back to the image-building and city marketing campaigns of the 1990s and the competition this sparked between cities. Hollands' (2008) fear of using such an ill-defined notion to spearhead yet another marketing campaign lies in the in-built tendency that such strategies have to be almost exclusively entrepreneurial in outlook and to undermine the more collaborative and consensus-building aspirations of the networking paradigm which has developed to replace them.

Hollands (2008) asks us to be aware that, if left to be entrepreneurial, there is a strong chance that smart cities will develop in a way which is too neo-conservative and insufficiently progressive to offer the type of liberating experience everyone expects of them. For Hollands (2008) the way to avoid the disappointment of any neo-conservative route to smart cities lies in following the clarion cry of those advocating a more neo-liberal pathway. This is because, for him, such a pathway is seen to be rooted in a critically aware and more realistic understanding of smart cities.

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In the interests of developing just such a critically aware and realistic understanding, Hollands (2008) draws particular attention to the work of Komninos (2002, 2008) on the intelligent city. For, according to this account of what it means to be an intelligent city, there are four main components to such developments, these being:

- the application of a wide range of electronic and digital technologies to communities and cities,
- the use of information technologies to transform life and work within a region,
- the embedding of such ICTs in the city,
- the territorialization of such practices in a way that bring ICTs and people together, so as to enhance the innovation, learning, knowledge and problem solving which they offer.

This much-needed definition of what it means to be an intelligent city is in turn used by Hollands

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(2008) to clear the way for a vision of cities that are smart because they are:

... territories with a high capacity for learning and innovation, which is built-in to the creativity of their population, their institutions of knowledge production and their digital infrastructure for communication.

For Hollands (2008, p.306) the key elements of this definition relate to the use of networked infrastructures as a means to enable social, environmental, economic and cultural development. While this involves the use of a wide range of infrastructures, including transport, business services, housing and a range of public and independent services (including leisure and lifestyle services), it is the ICTs of these developments that are of critical importance because they are seen to 'undergird' (Hollands, 2008) all of these networks and single them out as the common denominator lying at core of the smart city.

Those ICTs seen as 'undergirding' all of this and lying at the core of the networks include: mobile and land line phones, satellite TVs, computer networks, electronic commerce and internet services. They are seen to be of critical importance because Hollands (2008) considers the intelligence such infrastructures embed as the main driving force behind the development of smart cities and capable of sustaining social, environmental and cultural progress.

TOWARDS SMART CITIES

As Hollands (2008, p.315) goes on to state: smart cities, by definition, appear to be 'wired cities', although this cannot be the sole defining criterion because:

progressively) smart cities must seriously start with people and the human capital side of the equation, rather than blindly believing that IT itself

can automatically transform and improve cities.

For Hollands (2008, p.316) the critical factor in any successful community, enterprise or venture is its people and how they interact. This is because, for Hollands (2008), the most important thing about information technology is not the capacity which it has to create smart cities, but the ability that such communications have to be part of a social, economic and cultural development. That is to say, serve as communications which are smart in the way the deployment of their information technologies allows cities to empower and educate people, allowing them to become members of society capable of engaging in a debate about the environment to which they relate. This, it is stressed, in turn, is only made possible when the community of people undergoing such a process of socialization are able to:

create a real shift in the balance of power between the use of information technology by business, government, communities and ordinary people who live in cities, as well as seek to balance economic growth with sustainability. ... In a word, the 'real' smart city might use IT to enhance democratic debates about the kind of city it wants to be and what kind of city people want to live in.

To achieve this, Hollands (2008, p.316) suggests that those cities that really want to be smart will have to:

take much greater risks with technology, devolve power, tackle inequalities and redefine what they mean by smart itself, if they want to retain such a lofty title.

SOME IMMEDIATE REFLECTIONS

While Hollands' (2008) image of what it means to be smart tends to start with the nightmare scenario of a city dominated by the

entrepreneurial values of the elite few, it is clear this vision of a somewhat unintelligent, neo-conservative and less than liberal representation is soon swept aside by a more progressive alternative. An alternative, which, in this instance, uses information technology, not to shore up the entrepreneurial values of the city, but to underpin them in a way which is smart. That is to say, smart in the sense that information technologies and not entrepreneurial values are used as the means by which cities 'undergird' their social, communal and environmental qualities.

As a 'best-case' scenario, this works well to allay any fears that may linger about the purpose of smart cities and the ways in which they should be put to work. As with all such visions, however, there are some inconsistencies and omissions in the narrative and storylines this develops as a means to usher in the reworked version of what is being represented, i.e. the smart city. These relate to both the legacy of smart cities and the more contemporary issues underlying their development.

In particular, they relate to Hollands' representation of the 'smart city' legacy, that is perhaps just a little too 'fast and furious', in the sense that the retrospective offered relies less on the notion of 'informational cities' advanced by the likes of Castells (1996), or Graham and Marvin (1996, 2001) and more on Mitchell's (1995, 1999, 2001, 2003) accounts of what it means for the technologies of such infrastructures 'to work smarter not harder'! While Castells (1996) and Graham and Marvin (1996, 2001) all draw attention to the information technologies of the so-called critical infrastructures (water and drainage, energy and the like), it is Mitchell (1995, 1999, 2001, 2003), who first deployed them in the Smart City laboratory at MIT and has sketched out how they make it possible for communities to network the embedded intelligence of smart cities.

THE SMART CARD LEGACY

This can be illustrated by reference to the influence of the Smart City laboratory on what

Hollands (2008) himself defines as the first smart city. Southampton was the first city that attempted to develop a portal capable of supporting smart card applications. This initiative, promoted under the triple-helix model of University, Industry (of the telecommunications sector) and Government, was the first to develop a smart card software customizing access to a variety of services distributed across the public and independent sectors. It was also the first software development reported as capable of supporting the transactional-based logic of multi-application management architectures and as enterprises allowing services to be added to and removed as part of the card's dynamic user environment.

The administration of the card scheme involves the processing of personal data: compliance with UK and EU data protection legislation is critical and both the University and Industrial sector in question are keenly aware of the privacy issues arising from any association with such Government-sponsored card schemes. To comply with this legislation each smart card has a unique identifier, which can be used by all service applications to identify the user, and when transaction information is sent to the data warehouse, this unique identifier is 'one-way' encrypted. This means that the unique identifier is scrambled so that transaction information cannot be traced back to any user whose personal data are held within the warehouse. However, even though the information held in the data warehouse is stored anonymously, it is still considered to be 'personal data', due to the fact it is possible to match it with information in other databases.

If service providers wish to share personal data for which they are the controller, this must be done for a distinct purpose, underpinned by some formal data sharing protocol. However, where multiple applications are provided by the same data controller, the data collected from these applications can be used in the course of any legitimate interest. This may include cross matching and trend analysis, where this directly relates to a notified purpose.