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## HOW SUSTAINABLE IS DISTRIBUTED WORKING IN THE NETWORKED CITY?

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Sustainability has become the current banner of political correctness. Sustainability however is a slippery word. It is easy to focus on one aspect and lose the value of its holistic meaning. For many architects “green buildings” equals a sustainable future and clever design solutions are single mindedly pursued with little regard to the wider exploration of environmental savings through reconsidering the means of operating. Some years ago I was conducting a group of European corporate real estate managers to a well known office building in Northern Germany. The building was a purpose designed low rise office, on the outskirts of Hamburg, within a parkland setting. The interior layout was planned on the “combi office” principle, where each member of staff had small, 8 msq private offices, the additional space being given over to shared open plan settings. Our host was euphoric about the green credentials of the company, pointing out the sheep grazing in the parkland and an impressive collection of design features to reduce heat gain and maximise natural light. It took a pragmatic Dutch member of our group to point out that the office spaces were half empty and the only convenient means of access was by personal transport. It was at this point I realised that our work at DEGW though not using the language of sustainability was central to the debate. DEGW’s approach has been concerned with both building and organisational design and focused on the effective use of space and time. It is clear that through “lean thinking” [1] and reducing the amount of space required per person, combined with energy saving design, considerable inroads could be made into reducing the ecological footprint.

The paper draws on DEGW’s experience of advising major corporates globally on new ways of working [2], a number of cities on strategies for managing the process of intensification and change and explores the opportunities through reconsidering the way we work and allocate space how major improvements might be gained in meeting our goals for the sustainable city. My proposition is that technology has offered us new opportunities which have changed our paradigm of living and working. This in turn has provided us with a new perception of the city, as a distributed series of high density centres connected by good public and private transport, within a low density landscape. The paper argues that considerable improvements in workplace sustainability can be achieved by a holistic approach with a combination of strategies from rethinking the organisation of work processes and the locations and time work is undertaken to reducing the use of resources by a more intensive use of land and floor space. Disjointed, dispersed “urban sprawl” can be wasteful, but the paper argues a planned dispersed “networked” with well integrated public and private transport, can yield greater choice so supporting social, economic and environmental sustainability.

Information and communications technology over the last twenty five years has transformed the way we undertake and accommodate business. Whilst the change has been incremental the effect over the period is that we are faced with a new paradigm of work. Work can now be undertaken, both face to face in physical locations and virtually, where ever may be most convenient. Organisations are networked across sites and political boundaries to harness ideas and intellectual talent. Technology has offered us choice and diversity in living and work style. The boundaries between what is work and what is pleasure have blurred. Innovation is fostered by “serious play” [3] and leisure as we sweat it out on the tread mill at the local fitness centre has become hard work. The new technology has the ability to both shrink physical space, with a simulator reproducing in 10 sqm what could have taken an acre of site in the past, and expand the experience in real time across continents. The football world cup was a passionate experience for vast audiences around the world as they donned their tribal paint

to watch their team on the big screen in their local pub. Kevin Kelly, founding editor of Wired magazine, in his book '*Ten rules for the New Economy*' describes a world in a networked economy where value is created by abundance not scarcity, you give to get, collaborate to compete, change is the norm and process dominates the product [4]. The challenge of the twenty first century is to embrace paradox. Complex problems in the past were invariably resolved through a binary approach of simplifying the solution to one approach or the other. Today most solutions are seen to embrace and reconcile often conflicting desires. Our workplaces need to accommodate *both* privacy *and* communality and our cities are *both* concentrated *and* dispersed. It might be argued that in the past environmental sustainability has taken the stance of being binary in its approach, with a single minded concern for the mechanics of energy conservation at the expense of a more holistic approach.

Andy van den Dobbelsteen a lecturer at the Technical University Delft, in his Doctoral dissertation [5] argues that the reasons for the poor current performance of the building industry in meeting the challenge of major improvements in energy usage is that the industry has focussed on small scale, ineffective technical solutions. He argues that major improvements in sustainability will be achieved by more than just technology. To achieve a factor 20 improvement will require a paradigm shift that in addition to the green building technologies already being pursued is prepared to explore; new typologies for communities and buildings; prolonging the life span of buildings; optimising the use of space and new ways of living and working. Van den Dobbelsteen began his dissertation on '*The Sustainable Office*' by being firmly focussed on "green architecture" but by the end had realised that a more holistic approach starting from a reassessment of the way work is organised was more likely to lead to factor 20 improvements in office sustainability.

Technology has changed the way we work and use space [6]. New "flexible" ways of working have emerged which are:

- Open, flexible and collaborative.
- Non-hierarchical with a largely autonomous, professional workforce.
- Cross-disciplinary in response to traditional silo thinking.

Successful firms today are focussed on managing both space and time to allow for: parallel working often across time zones, shared use of space in a variety of settings and an overlap of functions. The outcome is not only to reduce overheads through the use of less resources but to improve organisational productivity through increased collaboration, improved access to ideas and a rise in staff satisfaction. Organisations are becoming networks of direct and indirect relationships. Cisco describes itself as a value network that includes "competitors, strategic partners and standards groups, all with whom the company never exchanges money or tangible goods. Cisco estimates that its intangible exchanges outnumber tangible exchanges by two to one". Cities like the organisations they host are also changing from single centres to a series of centres in a networked conurbation.

Our perception of cities takes a variety of parallel forms:

- The *city of our imagination* which is a virtual collection of experiences; Venice for pleasure, Boston for learning and Tokyo for intensity.
- The *city of convenience* where we are prepared to travel anywhere within the dispersed conurbation that will provide the best value, service and convenience.
- The *city of place* a high density, easily accessible, distinctive place of character, within which we can walk between a diversity of functions. This fragment of a city is for many of us how we perceive the city. New York is far larger than Midtown Manhattan and Greater London more than Regent Street.

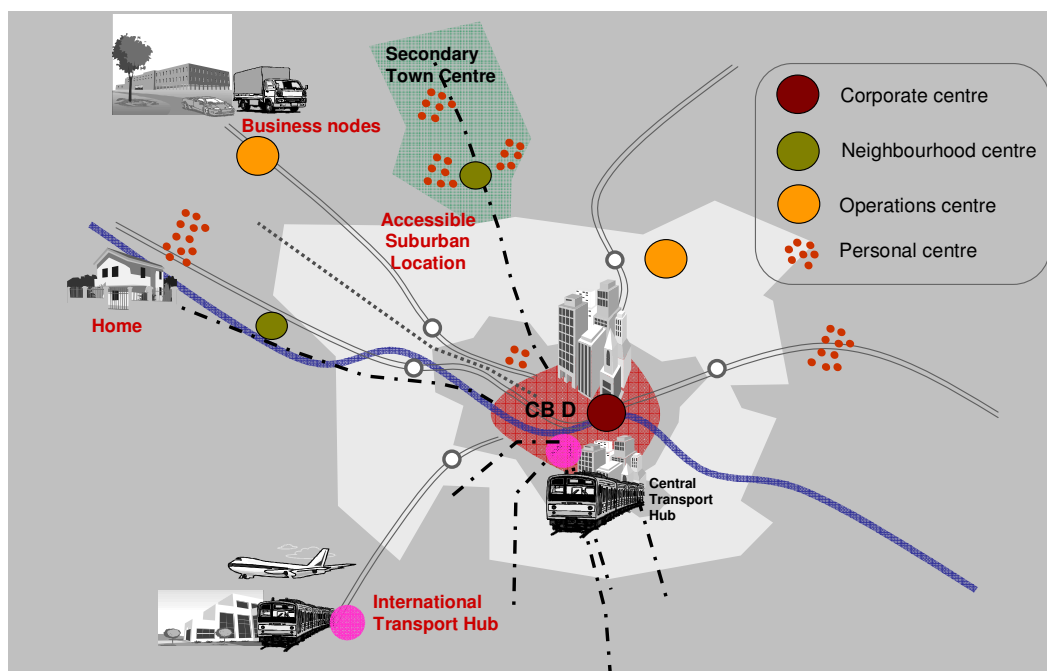
Cities are becoming "splintered" [7] across a network of centres. Copenhagen a city of half a million is now part of the Oresund a far more powerful economic conurbation of 3.5 million inhabitants

straddling two nations, whilst the Helsinki conurbation is a network of 1.2 million population with a number of distinctive centres. The discourse on urban form is frequently framed as centre *versus* periphery rather than recognising that it can be both *central* and *dispersed*, each defining their appropriate strengths linked within a networked conurbation.

Virtual and physical spaces are becoming complimentary. Bill Mitchell of MIT puts the paradox succinctly in 'City of Bits' when he says of future work styles, "We will gravitate to settings that offer particular cultural, scenic and climatic attractions.... Sometimes we will network to avoid going places. But sometimes still, we will go places to network." Location takes on a new significance in the dispersed city. Significant places in the wider conurbation are growing up at locations that simultaneously:

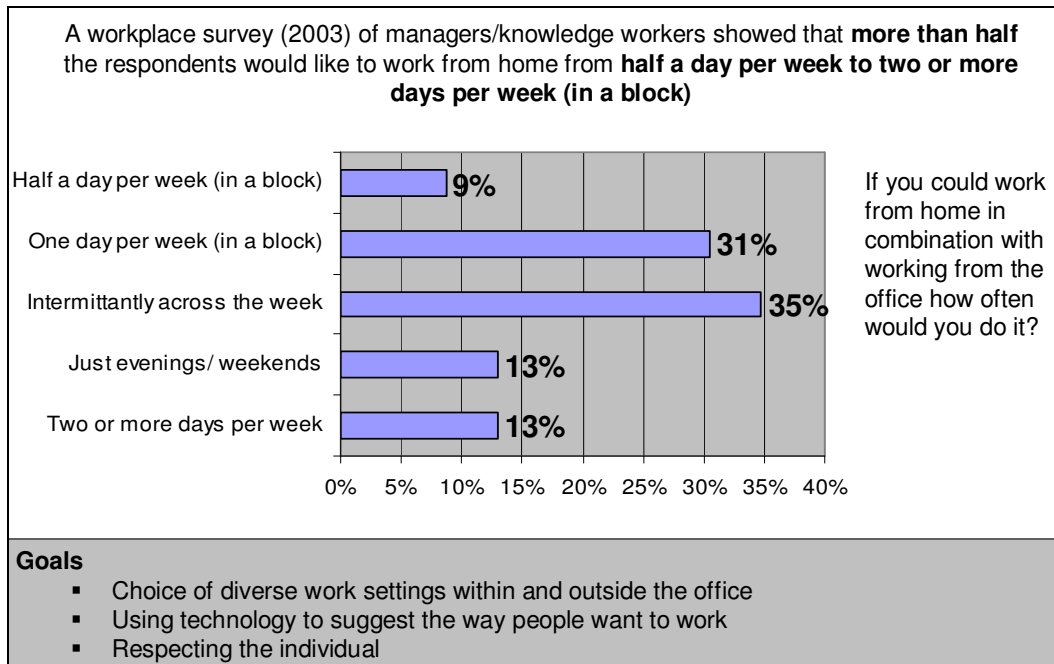
- Hubs Interchanges with different modes and levels (local, regional, international) of transport.
- Nodes Mix of functions – with overlapping functions over at least sixteen hours.
- Places A memorable gateway – accommodating a distinctive range of symbiotic functions.

For many organisations the place of work of many of their staff may be spread across a variety of locations, in different settings. Work might be undertaken at home, in the train, at a hotel, in the client's office, at a company satellite office, in addition to at the office that might be "home base" (Exhibit 1).



**Exhibit 1.** With the New Technologies, work can be undertaken at the time and place chosen to suit the individual at a variety of Work Centres distributed across the city.

In 2003 DEGW Asia Pacific undertook a study for ANZ bank on the opportunities for distributed working. In the study a workplace survey of management and knowledge workers showed that more than half the respondents would like to work from half a day to two or more days per week at home (Exhibit 2).



**Exhibit 2.** A survey by DEGW for a major bank in Australia showed that more than half of the respondents would like to work from half a day to two or more days a week at home.

From these findings DEGW assessed alternative options for distributed work (Exhibit 3) that allowed:

- A choice of diverse work settings both within and outside the office.
- The use of technology to support the way people wished to work.
- A respect for the individual.

		+ve	-ve
<b>Outside</b> ANZ Premises	<b>'in transit'</b>	convenient time efficient 24 hour access ✓	bandwidth difficult to service information security
	<b>home</b>	convenient time efficient 24 hour access ✓	bandwidth difficult to service. information security who pays?
<b>Within</b> ANZ Premises	<b>suburban offices</b>	secure data access broadband well serviced ✓	hours of access
	<b>retail branches</b>	secure data access broadband well serviced space utilisation ✗	induction/security "us and them" hours of access

**Exhibit 3.** Comparison of potential options for distributed workplaces.

The conclusion was a distributed virtual campus that was located in the CBD with suburban offices and touch down spaces at retail branches. Additional time would be spent working in transit, from home and at hotels. Compared with the portfolio of buildings they currently held or a strategy of one single campus the virtual campus was perceived to be low risk and more flexible.

Sustainable design has inevitably been viewed by the architectural profession as new and innovative design. It has been less well understood as being about increasing the effectiveness of existing resources. Womack and Jones's book on lean thinking is sobering reading on how much waste is built into most systems and the opportunities that exist to increase capacity by the more intensive use of what we have already. I will argue that significant improvements in utilisation can be made by the more effective use of space, time and technology through the overlap of use and space, integrated thinking to establish synergies and the application of appropriate hybrid solutions that address the combined issues of economic, social and environmental sustainability. From my own experience of consultancy at DEGW over the years four major opportunities for improvement stand out.

### **Intensification of Use**

Our desire to measure success through economic growth fuels a desire for new construction whilst at the same time with careful husbandry we have huge spare capacity in the buildings and infrastructure we already have. For an architect or engineer it is far more challenging to build afresh and answer the most complex of needs than to husband what already exists and search out the low key, simple solution. New building places a significant impact on resources, not just on the building site but in transportation, sourcing the materials, manufacturing components and waste disposal. Van den Dobbelen argues that by designing for long-lasting, multi functional buildings the environmental load of building materials could be reduced by a factor of 30.

In 1998 DEGW Twynstra were asked by Shell international to provide a new learning centre for the training of senior managers from Shell world wide [8]. The Brief was to provide a residential venue for three day courses within forty five minutes of Schiphol Airport to be available Monday to Thursday evening, and not for 8 weeks in the summer when most managers would be on vacation. The solution was a deal with Holiday Inn whose peak times of use were the weekends and the summer holidays. It was a perfect fit and maximized the use of the facilities. When Shell were in residence the space was personalised by the use of projected logos, hinge down room names with Shell branding and a new built small auditorium which was used at the weekend as a cabaret theatre. Both parties gained, space use was intensified, and five years later Shell have been able to move out as planned to a long term facility, with the minimum of wastage. It was not iconic design but a model of sustainable thinking.

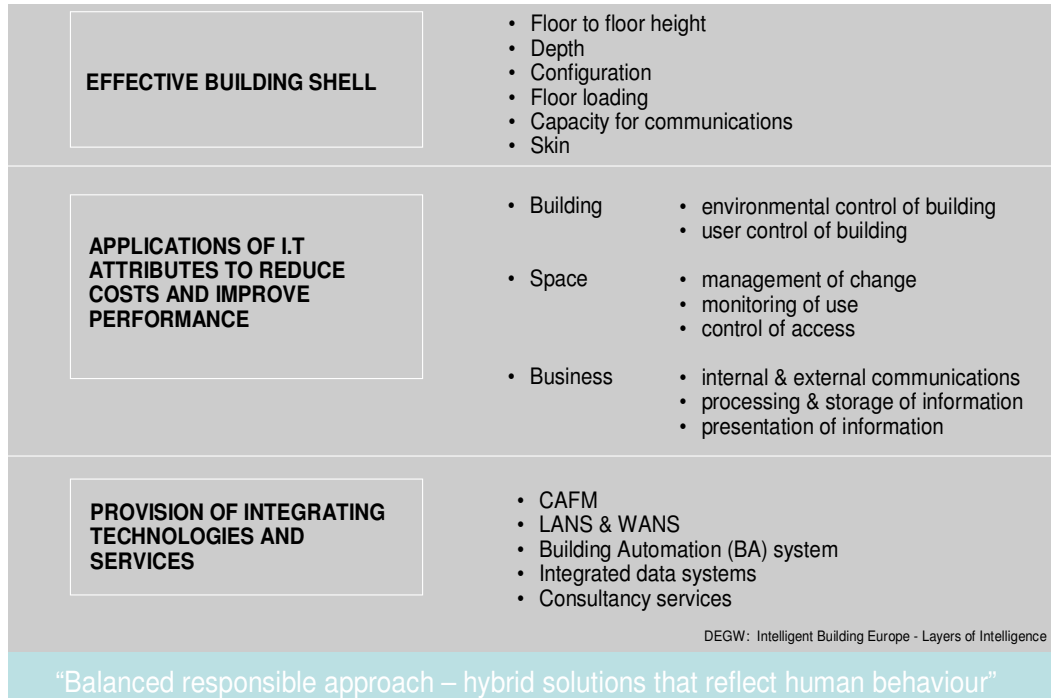
In 1992 I was commissioned to advise BAA at Heathrow airport on the brief for a new flight connection centre to serve the central terminal area. Passenger numbers per annum at Heathrow had grown dramatically since the airport was founded in the early 1950's. By 1992 the number of passengers had risen to 45 million of which only 9% were transfer. The airport had reached capacity for landing and take off slots and the capacity to allow for vehicles to enter and leave through the only tunnel available to the central terminals areas was saturated. As an alternative, building additional runway capacity was ruled out. The alternate was to "increase yield". Many of the flights at off peak periods were below capacity, but by airlines selling cheap interconnecting tickets for off peak usage, plane capacity was increased with no extra demand for runway space, the transfer passengers who stayed airside put no extra burden on the road access tunnel additional expensive and disruptive construction work was minimised and the overall capacity of the airport was increased. Between 1992 and 2004 passengers per annum increased from 45 million to 67 million, with transfer passengers increasing from 4 to 23 million per annum an increase of 86%, whilst transit passengers increased by a mere 14%.

## Rethinking the Business Model

The story of Heathrow’s expansion shows clearly how capacity can be dramatically increased if a company is prepared to think creatively outside the confines of the expected construction solution. The Success of the budget airlines has been through their willingness to reconsider the perceived demands of the passenger and by so doing strip out potential wastage, allowing the passenger to add back additional functions by paying for each service on an on demand basis. South West Airlines were the first airline starting in America to rethink the offer with a dramatic effect on profitability which has subsequently reinvented the airline industry. Such shifts in thinking are going to be required in construction if major advances are to be achieved in reducing the negative impact society has on our environment by a factor of 20 in the year 2040 [9].

## Appropriate Solutions

I define design as the appropriate, meaningful and elegant allocation of resources. In this context the term elegant being used in the way one defines an elegant mathematical solution. Much of today’s design adds in features which have no real value but may just possibly be useful in the future whilst supposedly adding to the perception of value. In 1992 DEGW in association with Teknibank (Milan) published a multi client study on the Intelligent Building in Europe [10]. The intelligent building movement started in North America grew out of the integration of building automation and integrated communications systems which were rapidly merging and becoming an independent revenue stream that could be an addition to the traditional sources of income from the commercial office building. The North American “intelligent” or “smart building” was rated according to the number of features it possessed. The more features the smarter the building. The Intelligent building in Europe redefined Building intelligence (Exhibit 4) as any building which “... *provides a responsive, effective and supportive intelligent environment within which the organisation can achieve its business objectives*”.



**Exhibit 4.** Building intelligence is a combination of an intelligently designed building shell, the appropriate IT applications and an effective integrating system of technology and services.

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Successful intelligent buildings it was argued rely on the provision of three layers of inter-related solutions:

1. Common sense – the provision of an effectively designed shell which had the flexibility to absorb information technology and adapt to growth and change.
2. The appropriate I.Q. – sufficient IT applications to meet the needs of the immediate target market so as to reduce costs and improve performance in building, space and business management. An over provision of features for the context it was recognised could be counter productive, resulting in a “dumb” building.
3. Integrating technologies and services which allow disparate organisations, systems, data and personnel to focus on the common goal of increased business effectiveness.

In retrospect the definition of intelligence would have equally fitted that of a sustainable office environment. The definition encompassed, capacity to meet future needs, included appropriate attributes sufficient to meet current requirements, and provided a holistic integrating supporting structure.

### **Changed Perceptions**

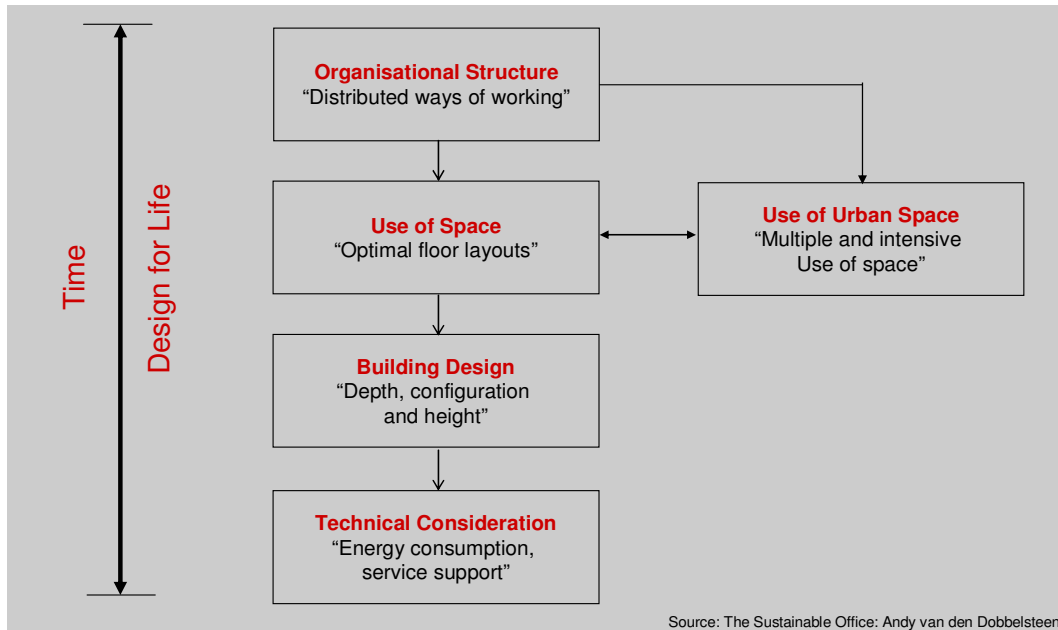
Yet another paradox of our lives is the way that change is both incremental and seismic. Imperceptibly a myriad number of small seemingly unconnected changes are daily occurring, which gradually are changing the expectations, mood and behaviour of a community. It takes a major event, such as Woodstock or the American eastern seaboard power cuts to trigger a paradigm shift. With events such as the Boxing Day Tsunami and Hurricane Katrina, global warming has risen in the public's interest. Achieving our sustainability goals, I believe, will be as much about changing perceptions and so behaviour, as it is about technological prowess. The awakening is happening rapidly through an ever wider group of the population being exposed to alternative practice and seeing it can work. The growing recognition that “seeing and feeling is believing” has shifted the emphasis on publicising rather than hiding good practice. The reality of the relevance of alternative energy sources only fully came home to me when I flew over the wind farm near the Oresund Bridge and read that over 20% of Copenhagen's power demands are now provided by alternative energy sources.

John Thackara in *'In the Bubble; Designing in a complex world'* [11] suggests that in our infinitely complex world, designers have a role to play, by reducing complexity and making environments and products more understandable. He argues that “Things may seem out of control – but they are not out of our hands. Many of the troubling situations in our world are the result of design decisions.” These however he argues are often bad design decisions, and could be overcome. What an opportunity when you realise that 80% of the environmental impact of the products, services and infrastructure around us was determined at the design stage.

Van den Dobbelsteen in his study of sustainable offices shows how the big gains could be achieved by a combination of factors (Exhibit 5) that encompassed:

- Rethinking organisational structures.
- Use of space at both the urban and building scales.
- Building design in the choice of depth, configuration and height.
- Technical considerations, such as energy usage and service support.
- These in turn should each be addressed through time and designed for life.

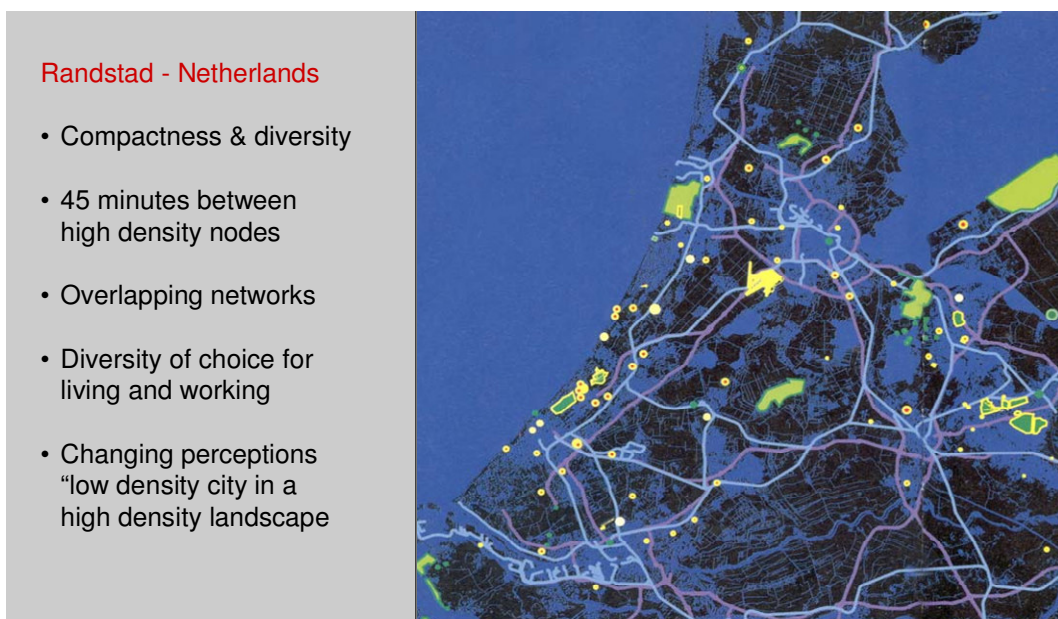
However, he recognised these could only be achieved with a parallel programme to change expectations, perceptions and behaviour.



**Exhibit 5.** Major gains in sustainability can be gained by combining a combination of factors.

### Distributed Working: the Argument for Spatial Dispersal

The Randstad, a conglomeration of fiercely independent cities at the heart of the Netherlands is a “low density city in a high density landscape” [12]. The metropolitan conurbation is a community of 6.5 million including the major cities of Amsterdam, Utrecht, Rotterdam and the Hague and one “inner city” international airport, Schiphol. It is spread over a land area similar to greater London and yet it is only 45 minute travel time between the major centres, similar to the travel time between destinations within central London. The Randstad exemplifies the polycentric city, combining both compactness and diversity and integrated by a network of overlapping communications systems (Exhibit 6).

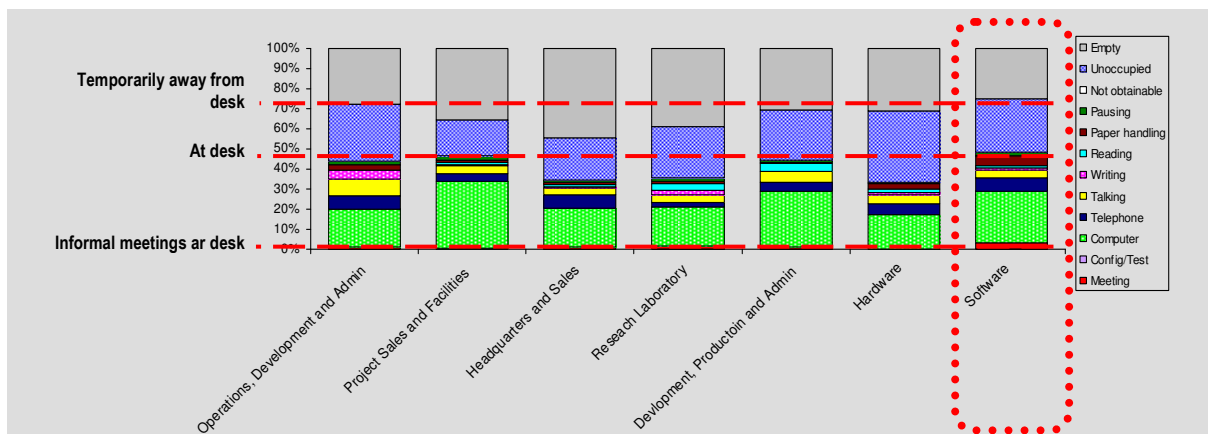


**Exhibit 6.** The Randstad in the Netherlands has been recognised by policy makers, academics and politicians as a networked conurbation.

Space has shrunk in terms of time. Average travel times to work vary little for the suburban or central city household [13]. With improved virtual and physical communications we no longer need to be in physical proximity “to gain access to information, culture, recreation or work.” The dream of living, and working in the same geographical neighbourhood has been discredited as we recognise that we change jobs on average every five years and that family households may have three working members each generating a work trip at a different time to a different destination. Global city comparisons show that the lowest density cities have the highest GDP per capita. A well serviced dispersed polycentric city region allows functions to locate in the most cost effective locations, a wider range of choice for the consumer and greater buying power. There is a direct relationship between mobility and wealth [14].

### The Growing Evidence for the Effectiveness of Distributed Working

Our office stock is an increasingly valuable resource which it could be argued is dramatically underutilised. On average we only use our office buildings for 10% of all the hours available in the year. Within these “office hours” studies show that on average the individual desk is occupied less than 50% of the time available. This underutilisation is compounded by the least used desks being those of the most senior members of staff who have the highest space allocation per person (Exhibit 7).

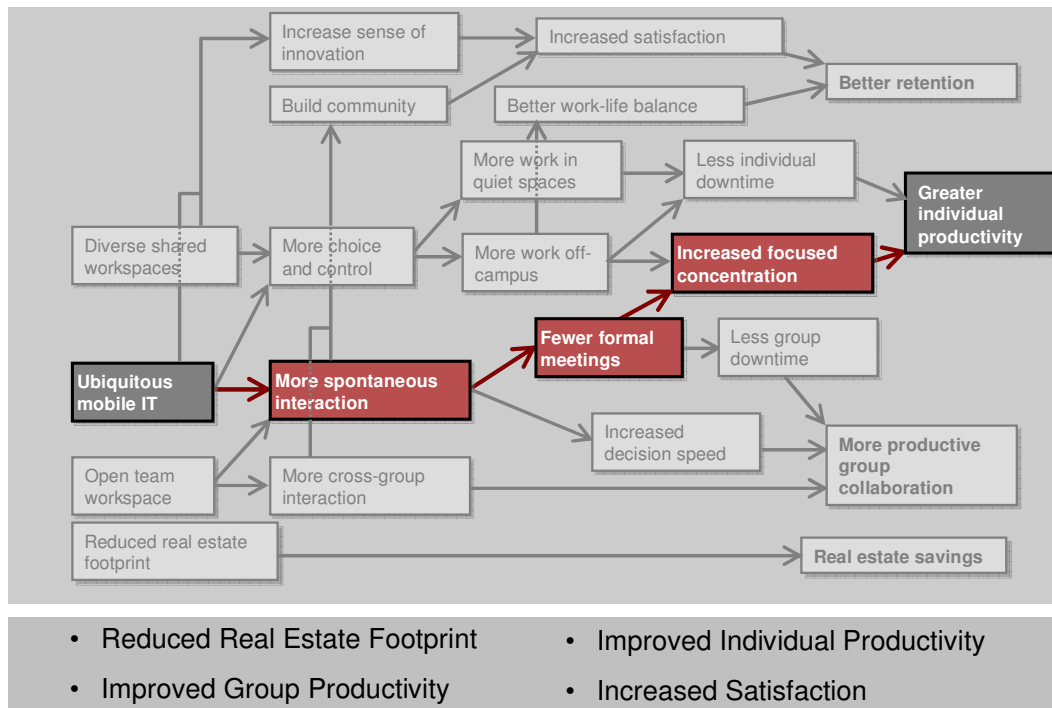


**Exhibit 7.** The largest sized offices allocated to senior staff lie empty for over 50% of the working day.

With the take up of new ways of working, organisations are exploring alternative means of allocating space, with less space to the individual and more to shared settings, dispersed across a variety of locations. In the Netherlands 21% of the working population work at least one day a week from home, the comparable figure for the UK being 11%. In the United States a recent survey by DEGW of the staff within a major multi national financial services company found that of those surveyed 70% chose to be “mobile”. The momentum for remote working is building rapidly. The Office of National Statistics latest figures show that 3.2 million of the working population work all or part of the time from home and that number is increasing by quarter of a million each year. CBI figures show that 14% of its industry members (250,000) now offer employees the option to telework. The impact of the home as a focus for work is even more sharply identified with the fact that today over half new start up companies are founded from home. Cheap computing and ease of connectivity has dramatically reduced the cost of starting in business. Geographical centrality is no longer an essential. Work can now be located where ever it is most convenient, amenable and cost effective.

A recent study by DEGW for a financial services company measuring the impact of new ways of working showed (Exhibit 8):

- Greater individual productivity through a combination of less individual downtime and increased focused concentration.
- More productive group collaboration through fewer formal meetings, more spontaneous interaction, more cross group interaction and less group downtime.
- Better staff retention through increased staff satisfaction and a better work-life balance.
- Real estate savings through the reduced floor space demand.



**Exhibit 8.** Attributes of Distributed Working that impact on productivity and staff satisfaction.

The perception of the compact, dense and diverse pre industrial city as the model we might follow for a sustainable future is perhaps over simplified. I have argued that the sustainable urban form of the future will be both concentrated and dispersed. Compact nodes in a sub-urbanised landscape, connected by a network of interconnected public and private transport, and telecommunications. The essential features of the future sustainable city logically from what has been argued previously might be:

- More mobility, allowing for a flexibility and diversity of accommodation and greater choice of work style and location.
- Simpler buildings, which are flexible, more easily re-configured and adaptable to changing uses. Environmental systems will be less precisely designed more reliant on natural elements and “responsive” to personal demands and local conditions.
- More complex cities, which are difficult to comprehend as single entities, but act as highly serviced managed environments. The integrator will be multi-modal access across a rich diversity of amenities.

The challenge is to be prepared to rethink our approach to sustainable buildings by questioning the need for new construction and seeing it as the choice of last resort; searching out redundancy by

applying lean thinking and intensifying the use of space and time and recognising that changing the way we operate may have as great an impact as the innovative design solution. The answer may not be one action but a combination of actions applied responsibly.

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