



connected sustainable cities

William J. Mitchell & Federico Casalegno

Copyright © 2008 by William J. Mitchell and Federico Casalegno
All rights reserved.
Printed in the United States of America.
First printing 2008.

ISBN-13: 978-0-9821144-0-7
ISBN-10: 0-9821144-0-0

Library of Congress Cataloging-in-Publication Data



MIT Mobile Experience Lab Publishing

www.connectedurbandevelopment.org
www.mobile.mit.edu

Illustration Coordination, Daniel Cardoso
Book design by Pamela Botacchi, Pearl Graphics

four/managing workplaces

In communities, people tend to experience warmer, more satisfying personal relationships than they do in broader society as a whole. Imagine how much happier and productive we could all be if we could shift more of our work to the “warmer” location and away from the colder, less personal, more dehumanized location of the modern office building or factory.

Such is the idea of the “urban village” – a place where we broaden the local loop concept introduced earlier as a means to organize more sustainable behavior and use sustainable technologies while, simultaneously, capturing the opportunity to work, live, and play in that enhanced location, linking the best of a local community with the infrastructure of the modern work world.

It is possible only in our digital era.

Scenario: connected live-work villages

How can we take advantage of connectivity to create new, more sustainable land-use patterns in cities, and enhance the sense of community?

After the first decades of the industrial revolution, and for most of the 20th century, a typical urban pattern was to separate where people worked and where they lived. Huge office buildings sprung up in central cities, and when possible industrial facilities and huge office buildings were kept away from the leafy green suburbs where factory workers comprising the “middle class” aspired to reside. The result was excessive time spent commuting and lots of wasted energy. Now, with less industry

and far more information- and knowledge-related employment – especially in the developed world – the pattern can change to one that is more sustainable and has some welcome social advantages. We can take advantage of the fact that information work can now be supported effectively in residential areas, and is not incompatible with those areas. The challenge is to transform land use patterns into ones that make sense in the new economy, and in doing so eliminate the energy sink-hole of suburb-to-city commuting.

Combine ubiquitous connectivity with live-work dwellings and new urban design principles to create connected live-work urban villages.

Sigrid works for a software development company in Hamburg, and lives in one of the suburbs out near the football stadium. When she first started in the workforce, she commuted every day in her car, first on neighborhood streets and then onto the congested autobahn, eventually finding herself on city streets maneuvering her way through traffic to the office building. She had to be in the office every day, because her boss expected to see her face – even though her job required little interaction with colleagues in person. The whole trip was unpleasant and wasted a lot of time and fuel.

Today, Sigrid's suburb has been transformed from what was once a bedroom community for people who commuted into the city to an "urban village" – and Sigrid can stay home and work much more efficiently. That transformation, thanks in large part to information technology, has made her home and the surrounding community an electronically supported live-work space, with ubiquitous wireless and mobile connections. In many respects, it represents a return to the pre-industrial pattern of land use in a postindustrial world.

A typical day for Sigrid is a combination of work and non-work activities on a schedule that corresponds to the particular needs of her job and her family. She awakes each morning and checks her email to see whether anything has happened overnight on her main development project that requires her immediate attention. Her team members are dispersed throughout the world, including in the United States, India, Australia, and the United Kingdom.

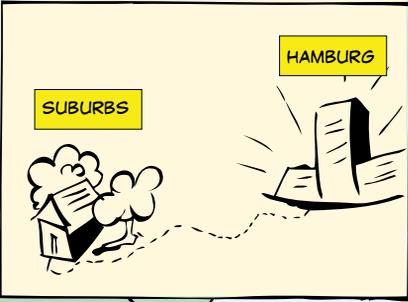
Sigrid likes to walk her two children to school, and always takes her laptop along. After Veronika and Franz enter the school building, Sigrid goes to the park next to the school and logs in to her company's server, where she can access applications that she and her team use throughout the workday. She goes into her calendar to set up a teleconference later that week, and the system automatically sends invitations to the designated invitees. That conference will take place at a "smart work center" in her neighborhood, where she can use the highest-end conferencing capabilities that are prohibitive for home use and, when necessary, rent a small, flexible workspace to augment what she has to use in her living space. When her children were younger, they could come with her to the smart work center and enjoy the childcare offered in the kindergarten. These days, she often picks up some groceries at the small store connected to the center – which eliminates the need for a separate trip to the market when she uses the facility.

Once a schedule is set for next week's teleconference, Sigrid will receive a reminder on her mobile phone at the appropriate time.

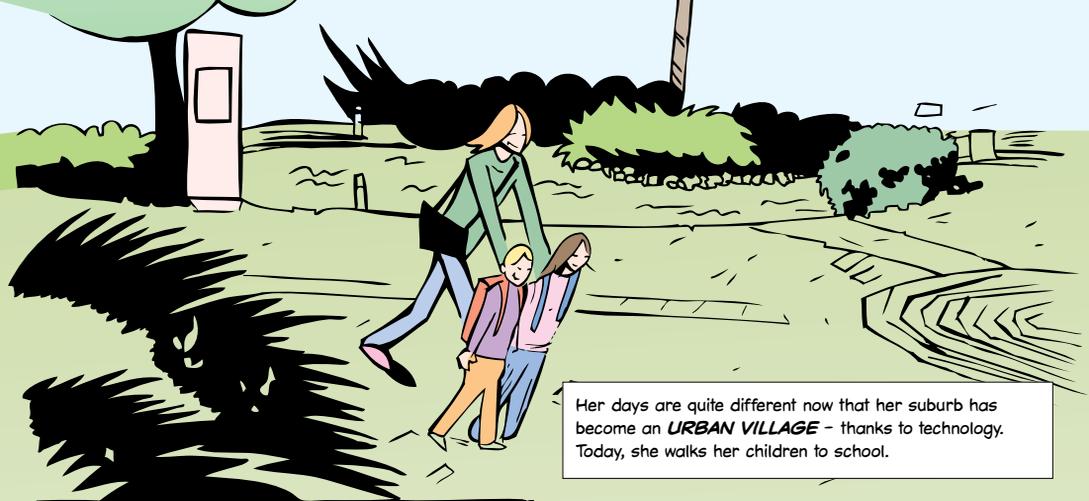
Next, Sigrid heads down the street to her favorite café for an espresso. Again, she uses her laptop, this time checking her email and uploading some files she worked on the night before. Her mobile phone reminds her that she is to talk to Andrew in Minneapolis in 15 minutes, so she heads back to the park. Finding a bench away from others, she pulls out her headset and dials him up over the Internet, and they have a brief conversation about some design issues that are proving to be a challenge.

As lunchtime nears, Sigrid heads back home. She's planning to spend a couple of hours in the workspace she and her husband have created in their house, which is completely wireless and functions as well as any office she's ever worked in. She settles in with her project until it's time to pick up the children at school.

Veronika and Franz run out of the school, excited that this afternoon is their day to play in the parents-kids football game at the park. Although this will take up a couple of hours during what for most people is typical work time, Sigrid isn't worried. She's got all the flexibility she needs to arrange her work time around her life, as long as she gets



Only a few years ago, Sigrid commuted every day from her suburban home to her workplace at a software developing company in Hamburg. The long trip was a waste of time - and fuel - because Sigrid's work required little face-to-face interaction.



Her days are quite different now that her suburb has become an **URBAN VILLAGE** - thanks to technology. Today, she walks her children to school.

Afterwards, Sigrid finds a spot in the **WIRELESS-ENABLED PARK** and uploads some files to her company's server.



Her work team, scattered around the world, will get the new versions of the files right away.



When she schedules a meeting to discuss some design issues with her team, Sigrid knows her phone will remind her beforehand.

In a quiet spot in the park, she begins writing code and notes for the project.



Back home for lunch, Sigrid spends some time with her husband before setting up to work on the project.



A few hours later, Veronika and Franz are excited to see their mom in the field, ready for parents-kids game day.

Back home after the game, the family watches a favorite TV show.



The kids are asleep, and Sigrid returns to the office in her home, where she has everything she needs to do her work.



In Sigrid's *URBAN VILLAGE* information technology helps her and her family use time optimally for both work and fun.



the results she and her managers have agreed to in advance. She'll put in some time tonight, after the children are in bed.

After dinner, and when all the homework is done from school, Sigrid, her husband, and the two kids enjoy an hour watching a television show they like, which was broadcast the day before but they saved digitally for later viewing. Then, with the kids fast asleep, Sigrid heads back to her home office. She checks her email, responds to a few issues that have come up during the day, and uploads some notes on the development project for access by the other team members. Then she heads for bed.

In Sigrid's "urban village," enabled by information technology, Sigrid and her neighbors have opportunities for broader social interactions because they are around to have them, and can use their time optimally for both work and family. The entire community benefits.

Enabling technologies

Flexible work time

Key to creating urban villages is for employers to provide flexible work time so that village residents can work on their own schedules, not on arbitrary 9-to-5-type schedules imposed by companies. The "Results Only Work Environment" was first launched in the Minneapolis-St. Paul area in an effort to reduce traffic congestion by encouraging telecommuting and flexible work schedules. By defining a flexible, multimedia work-"place" as the norm rather than the exception, ROWE seeks to change the paradigm so that employees and managers alike are in the office only if and when it is helpful for their work, leaving them free to work and even attend meetings remotely. At Best Buy, where the company headquarters participates in ROWE, employees conduct work using company-provided mobile phones, laptop computers, and Blackberry devices, secure remote Internet links to company networks, and mandatory conference bridges at every meeting for employees to dial in. Most important, employees are evaluated only on their actual contributions to the company, not "face time" – which is a key cultural change that makes the ROWE business model possible.

Ubiquitous wi-fi access

One of the surest ways to keep people working in their urban villages rather than heading into a city office is to provide ubiquitous wi-fi access. It certainly makes a difference for Sigrid. In New York City, workers who want to get out of their homes or offices can take advantage of free, public wireless Internet access around the city, especially in open spaces. One of the best examples is the Bryant Park Wireless Network in midtown Manhattan. Located behind the main New York Public Library, Bryant Park is an oasis of calm and beauty in the middle of one of the world's busiest cities – and it's also a free wi-fi hot spot.

Cloud computing

Sigrid counts on her ability to collaborate with her coworkers who are dispersed throughout the world in their own urban villages. Given that her job is to design complex software systems, this collaboration can be a challenge, but Sigrid relies on a number of Web-based applications that can also be accessed by others. This so-called “cloud computing” concept involves providing information technology-enabled services in a “cloud” to users who require neither expertise with or even control over the infrastructure within which the applications function. Google Apps is an example of this concept: it provides word processing tools, spreadsheet applications, presentation tools, a shared calendaring system, and email addresses all in one place for multiple users. These are stored on remote servers hosted by Google and accessed via a web browser.

Coordination through mobile devices

Sigrid relies heavily on a mobile phone with which she not only makes calls, but also coordinates her schedule. Apple's iPhone provides the ability to coordinate calendars and contacts, receive push emails, quickly browse the web, and use GPS technology to find locations and track progress.

Internet telephony

Sigrid often talks with coworkers via computer-to-computer voice calls. Skype software makes it possible for users to make such calls free of

charge. Using Voice-over-Internet Protocol (VOIP), the transmission of the voice is optimized through the Internet or other packet-switched networks.

Virtual meetings over the Web

Whenever necessary, Sigrid and her coworkers rely on web-based teleconferencing and other tools that make it possible for them to hold virtual meetings. Depending on the particular circumstances, these meetings may be over the web via personal computers or via special meeting centers in the communities where the team members live and work. GoToMeeting is an inexpensive tool that makes it possible for up to 15 people to attend virtual meetings online.

Smart work centers

When Sigrid needs the highest-end connectivity possible for a teleconference, she heads to the local smart work center. This is an office center in close proximity to her home that provides workspace that is fully enabled with all the latest information and communication technologies to make remote work the most productive. Cisco has opened just such a center in a residential area just outside Amsterdam.

Lessons

There is a huge difference between the commuter city, with workplaces in the center and bedroom suburbs in the surrounding metropolitan area, and the ICT-enabled urban village. In the latter, ubiquitous connectivity and new digital tools make it possible to live and work in the same place. They also enable a 24-hour community with local services that are both social- and work-related.

The concept of the urban village is simple but very powerful. The basic idea is of a community of people who, because they are able to live and work in the same place, can have richer services and richer social interactions than those that existed when they had to leave their suburbs to travel to their jobs. Within this concept we return to the local loop. The days of the extended loop can be put behind us and we can all benefit from local access to information, knowledge, services, and other people – our neighbors. This promotes sustainability not only

with respect to resources but a kind of social sustainability that comes from our ability to remain closer to our families, to childcare and other social care, our schools, and so forth.

And it is all part of a structure that can work only with information and communication technologies.

Scenario: intelligent workspaces

Traditionally, office buildings have consisted mostly of private offices and cubicles. But this no longer makes sense in an era of ubiquitous connectivity and the capacity to make a phone call, or sit down and work on a wirelessly connected laptop, just about anywhere. How can we now take advantage of connectivity to create more functional and efficient office workspaces?

There is nothing less productive than a private office or cubicle that sits dark and empty while its occupant is out on the road, in a conference room or cafeteria, or working with a customer or client at a remote location. At the same time, ubiquitous connectivity now allows effective work away from that office – in meeting rooms, social spaces, cafés, airport lounges, hotel rooms, and so on. Instead of devoting lots of space to private offices, it is now more efficient to create flexible interior landscapes in which office workers can appropriate space, in ad-hoc ways as they need it, for both individual and group work. This allows available space to be used far more intensively, and it makes the organization much more flexible in its responses to changing needs and conditions.

Create more flexible office space that can be reconfigured and reassigned as needed. Emphasize meeting space rather than private work areas. Take full advantage of the information technology tools that enable work anywhere, anytime, and that promote global collaboration.

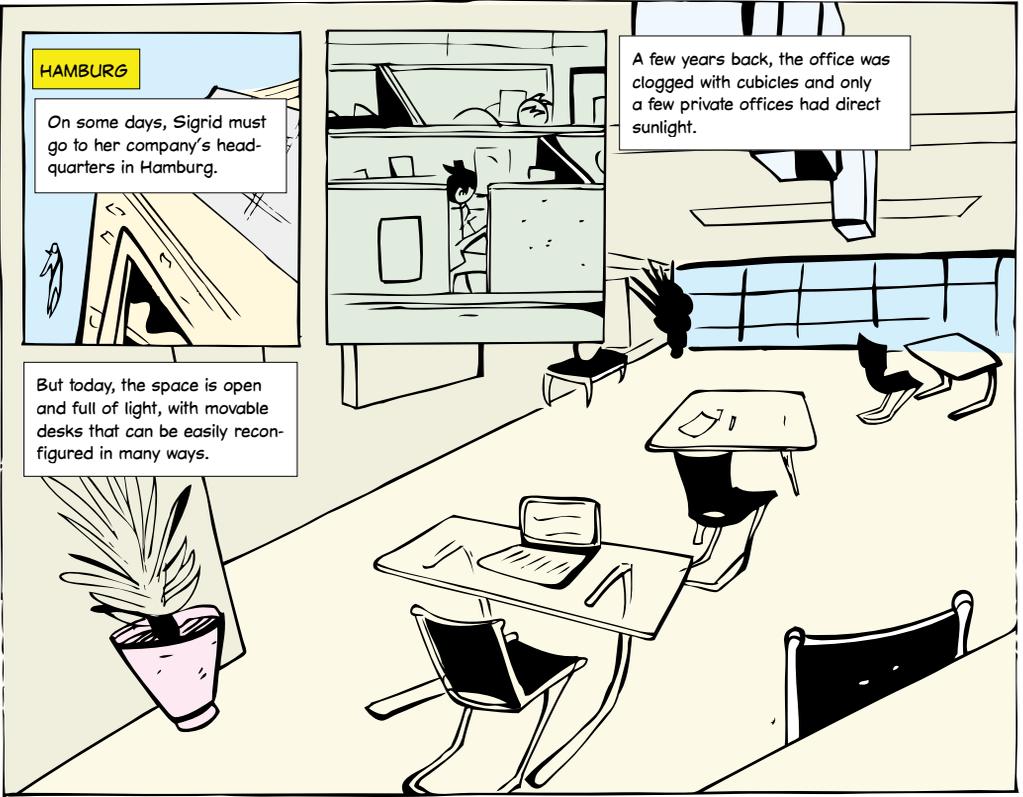
When Sigrid does visit her company's offices rather than working in her urban village, it looks radically different than when she used to commute on a regular basis. The building itself is the same from the outside – except for the solar panels on the roof – but the inside is a new world.

HAMBURG

On some days, Sigrid must go to her company's headquarters in Hamburg.

But today, the space is open and full of light, with movable desks that can be easily reconfigured in many ways.

A few years back, the office was clogged with cubicles and only a few private offices had direct sunlight.

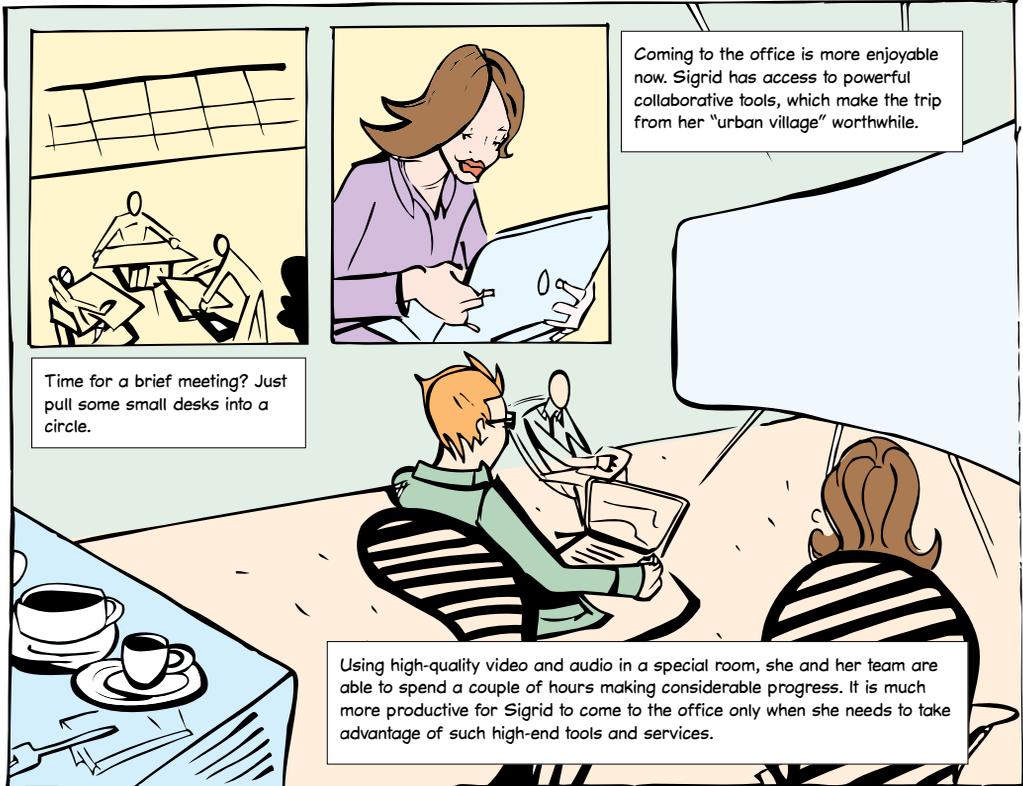


Coming to the office is more enjoyable now. Sigrid has access to powerful collaborative tools, which make the trip from her "urban village" worthwhile.

Time for a brief meeting? Just pull some small desks into a circle.



Using high-quality video and audio in a special room, she and her team are able to spend a couple of hours making considerable progress. It is much more productive for Sigrid to come to the office only when she needs to take advantage of such high-end tools and services.



The first thing she sees when she walks in is, well, everything. There used to be rows of offices along the outer walls, with many windows shut off except to those who occupied those private offices, and the minimum amount of window accessibility to all the rest of the employees as stipulated by law. The center of the one-floor headquarters comprised several rows of cubicles, with walls just high enough to make it nearly impossible to distinguish any one part of the space from another. Today, though, there are no private offices. The windows draw the light into a big, open space with a variety of workspaces, all of which are easily movable depending on the needs of employees. Time for a brief conference? Pull the small desks around in a circle, or move a larger table to wherever is best. Need some privacy for a phone call? Head into one of the small “booths” located in various places throughout the space. The executives, too, work in this space, and they can see – and be seen – by all.

When Sigrid goes into the headquarters, it’s often to take advantage of the somewhat more “powerful” versions of the collaborative tools available to her in her urban village. This particular day, she needs to have a virtual meeting with collaborators working on one of her development projects, and they are widely dispersed around the world. Using high-quality video and audible capabilities installed in the office, she and her collaborators are able to spend a couple of hours making quite a bit of progress. In the “old days,” at least a few of these coworkers would have needed to fly to Hamburg from considerably far away, using up a lot of energy resources and time that could be better spent working rather than traveling.

Of course, this is not to say that none of Sigrid’s team members ever get on an airplane to attend a work-related meeting. In fact, Sigrid herself is planning just such a trip for a few weeks hence. It is a necessity to meet face-to-face every once in a while. But she is confident that the time she spends traveling will be just as productive as the time she spends in the meeting at her destination. The Hamburg airport is as functional as her urban village: she has a wi-fi connection while she waits for her plane to depart, and can even book a small room for a videoconference if her travel schedule demands it. At minimum, she can always keep in touch with her team and her office when she travels.

Sigrid's trip is to a metropolitan area where several of her team members reside and work from home. Her company has no dedicated office in that city, but Sigrid's team has a standing arrangement to use flexible office space at one of the area's on-demand facilities available without a lease. This minimizes the company's costs and is an environmentally sound way to do business – after all, resources are consumed only when the space is actually in use.

The availability of sensible office space on the road, and the changes at Sigrid's headquarters building, have spelled a big change in Sigrid's overall attitude about work. She used to hate coming into the office every day, finding the environment less than conducive to getting her work done in a way that made sense to her. She longed for the chance to work offsite, on her own schedule. She knew she would be more productive. Today, she is more productive, working most of the time in her urban village. And when she does come into the office, or must travel, it's on her own terms – because she and her team know it's necessary for the work. The space and tools she finds when she arrives makes it all worthwhile.

Enabling technologies

Collective intelligence

In Los Angeles, a group used collective intelligence and a powerful open-source design approach called BIMStorm (for Building Information Modeling) in a collaborative city planning demonstration project for a 60-block area. The team comprised more than 130 architects, planners, and others from 11 countries. The BIMStorm LAX open architecture project was a demonstration of the potential for real-time virtual collaboration in city planning using a central open-source online model. The demonstration employed a variety of different software, virtual imaging, and online meetings so team members could communicate with each other in a central planning system and complete the work. The “storm” part of the concept is to make all needed information for the project available all at once, as soon as it's created, to everyone involved. In such an environment, design occurs in real time in a central

online model on which everyone is simultaneously working. A similar approach and tools are key to Sigrid's work.

Collaborative tools

Adobe's Acrobat Connect Pro makes it possible for multiple users to attend virtual meetings – even unscheduled meetings, thanks to always-available personal meeting rooms. These meetings replicate face-to-face meetings with shared screens, whiteboards, chat capabilities, and videoconferencing, all in real time. The tool also is widely used for on-line classroom education. WebEx is available on several platforms, is available for on-demand web meetings, and also functions with large, scalable online events.

Cisco TelePresence uses high-quality video and audio capabilities to replicate the experience of communicating in person, with visibility of expressions, gestures, and other nuances provided via specialized video monitors designed to make remote participants life-size on screen, in high definition. The tool works with enterprise groupware tools so that it can be available on-demand, with no advance scheduling or IT support required. The interface is via the telephone, which makes it easy for participants to use familiar phone functions such as mute, hold, and conference. HP Halo, which is similar to Cisco TelePresence, runs on a private network specifically designed for video collaboration.

On-demand urban office space

When Sigrid travels to see her team members face to face, they will work at an office they use only when needed – which results in considerable savings. The Cambridge Innovation Center in Massachusetts is an example of this kind of solution, offering flexible “instant on” facilities and office services when needed, replacing the need for companies with a distributed workforce to maintain underused offices in all locations.

Lessons

Old, inflexible designs for workspace result in many inefficiencies. Because space is assigned to individuals, it remains unused when those individuals are away from it. And because it is assigned to specialized

purposes, it remains unused when the current need is for something different. However, the combination of ubiquitous connectivity with mobile and portable devices, online data, and sophisticated software tools enables much more flexible and efficient workspace designs.

When data, tools, and connectivity to collaborators are available anywhere and any time, any place potentially becomes a workplace as needed. This allows ad-hoc, temporary appropriation of shared-use space as needed instead of permanent occupancy of private offices or cubicles. And it allows many spaces other than formal workspaces – cafeterias, public circulation and atrium spaces, homes, hotel rooms, airplane seats, outdoor spaces in good weather, and so on – to serve temporarily as workspace as well. This enables more intensive, less wasteful use of available space resources, and it allows an organization to be more flexible.

Architects can take advantage of this new condition by designing landscapes of varied, shared-use space that can be appropriated and used in unplanned patterns as needed. They also need to rethink traditional ideas of net-to-gross ratios in buildings. There is nothing less productive than a locked, dark, private office – even though it would traditionally be counted as part of the net. And there is nothing more productive than an “amenity” space, such as a cafeteria table, that is being used for impromptu brainstorming by a group of engineers with their wirelessly connected laptops.

To manage workspace use under these conditions, and to make people findable, it is useful to have scheduling and tracking tools that are accessible from mobile devices. These enable, for example, the instant discovery and temporary claiming of a meeting space that is available and suitable for a particular purpose right now.

Under these conditions, workspace buildings and campuses don't have rigid floor plans, space assignments, and scheduled patterns of daily use. They become space-on-demand servers.

Connected sustainable cities, which will evolve over the next decade, employ ubiquitous, networked intelligence to ensure the efficient and responsible use of the scarce resources – particularly energy and water – that are required for a city's operation, together with the effective management of waste products that a city produces, such as carbon emissions to the atmosphere.

Through a series of prospective scenarios, *Connected Sustainable Cities* illustrates some of the ways in which inhabitants may use and manage their living spaces, move around the city, work, shop, pursue their educational, cultural, and recreational interests, and make well informed, responsible personal choices. These scenarios are accompanied by brief sketches of the existing and emerging technologies, products, and systems that will support new, intelligently sustainable urban living patterns. In addition, there are short discussions of some of the theoretical, policy, and design issues that these scenarios raise.

Connected Sustainable Cities is a starting point for the investigations and debates that will be necessary as citizens, technologists, designers, policy experts, and political and business leaders begin to shape the new urban areas we urgently need to create in the near future.



Mixed Sources

Product group from well-managed forests, controlled sources and recycled wood or fiber

www.fsc.org Cert no. SW-COC-002514
© 1996 Forest Stewardship Council

ISBN-13: 978-0-9821144-0-7

ISBN-10: 0-9821144-0-0



MIT Mobile Experience Lab Publishing

CONNECTED
URBANDEVELOPMENT

Printed in the USA with soy based inks
on FSC certified paper