

iHOMES and BUILDINGS

THE MAGAZINE OF THE CONTINENTAL AUTOMATED BUILDINGS ASSOCIATION



CABA's Intelligent Buildings & Digital Home Forum

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The Constantly Evolving Smart Building

Jim Sinopoli, PE, RCDD believes that buildings will continue to evolve based upon innovation and technology.

Small Data and the Smart Home

Net-Zero Energy Buildings and Automated Technologies

Intelligent Home Offices

Testing Copper Cabling: Verify, Qualify, Certify

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KEN WACKS' PERSPECTIVES

Intelligent Home Offices

By Ken Wacks

In my article for the fall 2014 issue of *iHomes and Buildings* I summarized the variety of information on home and building systems that CABA offers members in the form of:

- Reports on research studies funded by CABA members.
- A library of papers reviewed by the CABA Information Council.
- Original white papers developed by the CABA Connected Home Council (CHC) and the Intelligent & Integrated Buildings Council (IIBC). I chair the IIBC White Papers Sub-committee.

I am pleased to report the approval of another important IIBC white paper on energy conservation in commercial buildings entitled “On Intelligent Home Offices – A Model and Potential Impacts”. This paper, which I have summarized here, was proposed by Dr. Albert So from the Asian Institute of Intelligent Buildings and Dr. Kwok C. Wong, Department of Real Estate and Construction at the University of Hong Kong. Additional contributions were provided by David Katz of Sustainable Resources Management Inc. and me.

Telecommuting candidates

Telecommuting or working from home is not new, but had been limited in practice. Expansion of telecommuting would benefit the company, the quality of life for the employees, and society.

The best candidates for telecommuting are those whose work is information-based. Even though such employees may often communicate remotely by cell and smart phones, there are challenges to the cultural acceptance of telecommunications in many businesses because clearly defined guidelines for telecommuting have not been established. The thesis of this CABA white paper is that the concept of home offices would become popular quickly if:

- The employer encouraged the employee to establish a designated workspace at home, possibly with an employer subsidy for office furniture, computer, and communications equipment.
- Real-time high speed Internet access and high-quality video conferencing were available for the employee to access corporate servers or other information infrastructures for interactions with supervisors, peers, subordinates, and clients.

Telecommuting may impact various aspects of society including the rental price of offices in the central business districts, traffic congestion, and air pollution on highways, rental price of low-rise office buildings in the suburban area, and the emergence of a new industry of multi-purposed conference centers. Eventually, employees working at home would be contributing to their employers through cost savings, increased productivity, and enhanced creativity. This complements the concept proposed in the previous white paper by these authors that I summarized in an *iHomes and Buildings* article last fall, “Toward Zero Net Energy (ZNE) Super High-Rise Commercial Buildings.”

Measurable benefits of telecommuting

The measurable savings from telecommuting depend on the ratio of at-home versus at-office work. If two adults in a household work at home and commute to their corporate offices only one day per week, about 80 miles of travel on each of the four remaining weekdays could be saved. This is based on an assumption that each driver travels 20 miles each way. With an estimated fuel consumption of about 20 miles per gallon (considering city mileage), the fuel savings from telecommuting would amount to four gallons of gasoline per day. This fuel could be used at an electricity power plant to generate 48 kWh per day based on the energy

capacity of regular gasoline and an average efficiency of 33 percent for a typical oil-fired power plant. 48 kWh provides more power than the 31 kWh of electricity used per day by the average residential utility customer in the U.S. in 2012. A reduction in commuter travel would also mitigate traffic congestion and air pollution from automobile exhaust.

The previous CABA white paper on ZNE buildings concluded that it is almost an impossible mission to turn a 50-story super high-rise office building into a ZNE building (ZNEB) by utilizing contemporary technology. One solution proposed in the article addresses a collaborative plan that all managers working inside the office building have an obligation to contribute to making it ZNE by feeding electrical power generated at their homes from wind and solar sources to form a ZNEB cluster. If all homes of these managers were associated with the super high-rise office building where they work to achieve ZNE, why not extend this association and contribution to ZNEB by using a home office regularly?

Pros and cons of working at home

According to research conducted in 2009 by Herman Miller, working from home can improve the morale of employees since their company trusts, respects and appreciates them, and wants to help them pursue the work/life balance they seek. It was suggested in the article that telecommuting could also be a crucial component of corporate cost savings by reducing real estate and utility costs, generally estimated to be about \$10,000 per employee annually. Also, telecommuting can be a key element to improving the environment by reducing fuel use, pollution, and carbon emissions. Working from home can facilitate focused, efficient work on projects and reduce traffic congestion. According to Sun Microsystems, employees who worked at home gave back to the company about 50 percent of the time they saved by not commuting and used the other half for themselves and their families.

A study was done in 2010 by the Executive Office of the President of the United States about flexible workplace arrangements considering when one works, where one works, and how much one works. Such flexible arrangements may include job sharing, phased retirement of older workers, and telecommuting. Some of the key findings:

- Lower skilled workers had less workplace flexibility in terms of scheduling when they work than do more

highly skilled workers.

- About 15 percent of workers reported working from home at least once per week.
- Lots of employers considered costs and limited funds as obstacles to implementing workplace flexibility arrangements.

The following table highlights the pros and cons of telecommuting that affect employees and employers.

Challenges of Telecommuting	
Pros	Cons
Reduced absenteeism	Loss of status in office
Lower turnover	Isolated from manager
Improved health	Loss of community
Increased productivity	Less home technology
More personal time	Loss of supervision
More housing choices	24/7 telecom support

Impact of technology

Some of the challenges with telecommuting can be overcome with technology.

Over the past decade, changes in technology have had a dramatic impact on the way we work. Mobile devices such as smartphones, laptops, tablets, and powerful social, video, and teleconferencing applications for collaboration have made it possible for us to work wherever we are, provided that the devices are online. With sufficient communications bandwidth, the performance of this technology should be the same whether at work or at home. Issues of data storage and data protection on corporate servers and synchronization with employees' devices are being addressed.

Evidence so far indicates that “working at home” is totally feasible with all available technologies and a growing culture of acceptance. Most information-based workers can work at home for a substantial portion of time. But in order to tackle the obstacles, appropriate design and planning are necessary.

As employees assume more flexible working hours, corporate IT (Information Technology) must ensure that

Features of a home office

An ideal home office should offer the following features:

Features of a Home Office	
Data access	Seamless access to the data pool of the organization since telecommuting is mainly applicable to workers who process information, which accounts for a majority of workers in offices.
Virtual campus	The employees must feel that they are actually participating in the corporate activities though they are physically at home. The home office offers flexibility that may encourage an increased focus on work rather than wasting time with breaks and "water cooler gossip." Workers are more willing to work overtime at home rather than at the corporate office, for example, by attending midnight international teleconferences, etc., because the home and office are only steps apart.
Connectivity	Uninterruptible connections between the home workers and the corporation must be maintained continuously so that an at-home worker does not get any feeling of being isolated. With high-speed Internet connections and video conferencing software, at-home workers can participate in effective video conferences with anybody working in another home office or at the corporate campus.
Efficiency	Working at home is not a penalty; it is just for efficiency. Some companies have reduced corporate office space by encouraging telecommuters to use offices from a pool that accommodates the percentage on campus. The manager can designate certain days, or parts of days, when telecommuters return to the campus to participate in traditional office activities in person.

servers and business data are available 24/7. An emergency maintenance team should be established within the organization, which is always available to tackle any technical problems encountered in these remote offices, such as machines failure, network failure, soft-ware failures, virus attack, etc.

Some employers may provide a subsidy for home office furniture and environmental control to promote comfort and productivity. Power for some of the equipment would be provided by roof-top photovoltaic panels if the employee's house were participating in the corporate ZNEB program. A well-equipped, comfortable, and personalized home office will enhance employee productivity at home and may encourage work beyond the usual working hours such as evenings and weekends if needed.

Impact on real estate market

A rapid growth in popularity of home offices may mean the demand for large office space in the central business district (CBD) decreases. Usually, these large enterprises tend to occupy at least several to tens of stories of office space in a super high-rise office building in the CBD, though not necessarily the whole building, as their headquarters or regional head offices. Telecommuting at 80% of the time allows a connected shared workspace policy to be adopted.

The same seat in a regular office can accommodate five officers instead of one.

When the demand for large office space decreases, the rental price of these offices decreases accordingly. Once the rent of large office space in the CBD decreases due to less demand, middle-sized companies tend to enter the CBD. Super high-rise office buildings in the CBD are then subdivided and occupied by more small or middle-sized companies. Multi-tenancy in commercial centers of the CBD, versus the traditional limited tenancy by anchor tenants, will become the norm.

The commercial real estate market outside the CBD will also be affected. Office buildings in the suburban area, initially occupied by middle-sized or small companies, may gradually become vacant because those companies moved into the CBD to achieve a higher reputation and better image due to the existence of rapid transportation systems. Some land in the suburban area may even be converted to residential use, and the rent for commercial real estate would decrease.

There would be a general decline in CBD office rentals. This will enable enterprises in the CBD to be more competitive, i.e., firms can produce at generally lower costs. Rents in the CBD would fall, but those in suburban areas may rise

due to the addition of home offices. Gross rental income in the region may rise because both urban and suburban lands are much better utilized. Hence, there would be positive effects on employment rates and on the GDP.

A new industry may emerge: the construction of multi-purposed conference centers. These centers are located at the malls of residential communities, close to where people live. Since employees no longer work in the CBD for most of the time, they may choose to meet their clients and colleagues in conference rooms inside these multi-purposed conference centers nearby. The low-rise office buildings originally located away from the CBD may be converted into such conference centers so that employees of different companies can reserve rooms for meetings and seminars etc. on an ad hoc basis. These centers must be fully equipped with IT services and office automation systems. The IT security level must be high as employees from different companies may use the same system at different times. These facilities are like hotels for business activities, not for accommodation.

Besides commercial real estate, the residential market will also be affected by the popularity of home offices. Newly built houses designed with one or two designated rooms for a home office with cabling and related facilities will sell for a higher price because of increased demand and higher construction costs. Eventually, more existing residential houses will be renovated to attain the same quality in order to command a higher price.

Impact on traffic

As telecommuting increases, traffic during rush hours will be significantly decreased. The overall transportation network will extend further away from the CBD and the network coverage will expand to cover the suburbs. As the total traffic demand decreases, the overall emissions from vehicles decrease proportionally, and the overall air quality is improved.

Office-at-home trends

According to Global Workplace Analytics and the Telework Research Network, telecommuting increased 80 percent from 2005 to 2012 and will continue to increase. The provision of a high-quality home office for the employee can save costs, increase productivity, and show respect and trust by the employer. A corporate strategy for supporting offices in the home can make a significant contribution to the success of the organization. ●

Dr. Kenneth Wacks has been a pioneer in establishing the home systems industry. He advises manufacturers and utilities worldwide on business opportunities, network alternatives, and product development in home and building systems. In 2008, the United States Department of Energy appointed him to the GridWise Architecture Council. For further information, please contact Dr. Wacks at 781.662.6211; kenn@alum.mit.edu; www.kenwacks.com.