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Virtual Technology as Cost Effective Substitute

for

Facility & Infrastructure Investments

Virtual Technology as Cost Effective Substitute for Infrastructure Investments

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Abstract

Governments and cities alike, must adopt more creative ways to balance the concerns of local resident about quality of life and environment, against the health of the local economy and the demands of its employers.

Global market developments and large-scale adoption of diverse ICT (Information and Communication Technology) applications laid the framework for an infrastructure that has enabled many organizations to launch distributed teams, often referred to as Virtual Teams. For these collaborators, work is no longer place- or time-centric, but *netro*-centric – organized around the network.

Around the world, many countries¹ and cities are capitalizing on existing remote technology capabilities and harnessing outcomes from the growth of virtual teams and telework.

Typically, as with most planning ideas that arise out of necessity and lack of resources, some of these experiments have indeed been successful at finding innovative solutions while at the same time reducing costs.

On-the-ground experiments in the US and Canada show that the last dollar of investment in virtual technology, to be used as a substitute for facility space, travel/commute or emergency preparedness, can be a more effective investment than the first dollar spent on expanding traditional urban facilities, public and private road infrastructure, or planning for business continuity.

The paper investigates these developments by comparing ranges of outcomes produced by virtual workplace implementations, in the US and Canada.

Then, the paper reviews practitioner cases studies of recent program implementations, to demonstrate how partnering with local area governments and employers can converge virtual capabilities to leverage efforts against intelligent growth, flexible and cost effective business and urban planning.

⇒ *US and Canada – Support, Adoption of Virtual Workplaces*

¹ * In the USA, virtual workplaces and telecommuting are part of public policy. Section 359 of U.S. Public Law 106-346 U.S. law requires that each Executive agency establish a telework policy. In 2005, the departments that failed to meet targets have been fined. Meanwhile, State and Federal Governments are offering tax credits and other policy-incentives to companies that buy equipment, consulting expertise and services that enable virtual work.

Japan, as a sustainability and public health measure, has recently launched a pilot Internet program that aims to have 20 per cent of the nation's work force 'telecommuting' from home by 2010. Many other countries and cities around the world (in the USA, EEC, Australia and New Zealand) are taking a proactive approach to the idea of substituting technology for congestion and movement. Many include virtual workplaces as an imperative in their Kyoto target plans, as well as in Infrastructure and TDM - Transportation Demand Management planning.

North Americans in record numbers are using remote technology to work and communicate virtually. However, until recently, in the US and Canada, the incidence of paid, commute avoiding, remote work, outside of the private business sector, was uncommon.

Rare indeed were examples of formal telework at any level of governments. Rarer still were cases where technology-enabled-work was used by cities as a Transportation Demand Strategy (TDM), targeting reduction of the use of infrastructure at peak times, congestion and GHG emissions.

⇒ **USA**

Post 9-11, the US passed a law making the offer of telework mandatory to all federal employees.

Since then, there has been a growth spurt in the adoption of virtual workplaces. Technology-supported work that enables commute avoidance on a regular basis has been embraced as a transportation, infrastructure and business continuity strategy at all levels of US government, including Federal, State and municipal.

Use among federal staff and at other levels of government has accelerated to the point where teleworkers now represent 21% of the US working population, (which includes mobile workers)

and 17% of its federal staff. In addition to appropriations for failure to comply there are new tax proposals that will create incentives for investments in equipment, technology and expertise that enable remote work.

CHART 1 Policy – Incentives		
Telework(ers) Policy –Incentive	USA	Canada
% Population	21%	7%
% Federal Staff	17%	0.05%
Federal Laws Policy	Section 359-Public Law	1998 HR Policy
* State - Provincial	Regional, State, County, MPO, NGO	None
Municipal Towns	Atlanta, LA, Fort Collins	Richmond Hill, Lanmark
TMA	New Jersey	None
Telework Centres	16 federally subsidized Metro Washington	2 – private, 4 - Industry Canada,1 PWGSC Quebec
Kyoto Ratification	None	December 02 – Target 20%
Appropriations– Compliance	Deduct US\$5 million	None
Proposed New Tax Incentives	State of Georgia White House	None

There is also federal funding available, which can be used at a regional level to provide free-of-charge, telework related services to employers through a non-profit or a government agency. *Atlanta, Phoenix, Los Angeles, Washington DC, Denver, Tampa Bay, and Houston have developed regional outreach programs specific to teleworking.

⇒ **Canada**

Although the Canadian Government has a 1998 Human Resource policy addressing telework, is unused. Recent data indicates that only one half of one percent of its federal civil services work remotely.

In December of 2002, Canada became one of the 122 countries to ratify or access the Kyoto Accord. In addition to adjusting targets for the Large Industrial Emitters (LIES), in 2004, the Federal Government launched The One Tonne Challenge- designed to encourage individual Canadians to reduce their personal GHG footprint. Despite the fact that almost 50% of each Canadian’s 5.4 metric tones of GHG is tailpipe related, there are currently no education plans, tax or other incentives to encourage telecommuting at any level of government or municipality, as part of other TDM strategies, to reduce car commute or travel.

⇒ *Comparison of Outcomes*

Information about the outcomes of telework in a business environment is widely available, and published by individual firms, or by telework association research efforts.

As part of a strategic alliance partnership between the US and Canadian telework practitioners, E-Planning and Telecommuting Consultants International, Inc, the firms decided to compare available national data, as well as their proprietary data bases. In Canada, *national* data is based on the outcomes from one company willing to publish information about its telework program. TCI Normative Data Base is based on twelve years of tracking of public and private sector telework programs. E-Planning data is based on thirty-five case studies of implementations handles by the firm.

There are not significant amounts of public Canadian information, but that which is available from TCI practitioner data indicates the wide, but positive ranges of outcomes that are consistent with US results.

Space savings range from 10% to 43%. This wide range reflects the fact that some programs target only a specific type of staff, e.g. sales, while other programs are company wide and have a more profound effect on overall facility needs. US companies have shown a wide range of space savings depending on the availability of hoteling infrastructure. Some examples of companies that have cut overhead space needs by between 40% and 60% include IBM, Deloitte & Touche, Cigna and AT&T.

CHART 2 Comparison of Tracked Outcomes – National vs. Practitioner				
Comparison	USA	E-Planning Data	Canada	TCI Data
# Telecommuters	28,000,000	2,000	900,000 ²	638 ³
Telecommuters % Pop	21%		7%	
Space Savings	40% - 60% ⁴	25%-90%	-	10% to 43% *
Productivity	20% - 50% ⁵	10-30%	24% ⁶	15% - 22% *
Substitute Absenteeism	20%-63% ⁷	2-4 days/year	-	50% *
Reduction TurnOver	-	25%	24% **	-
Retention		75%		91%

Productivity improvements – also tend to be wide-ranging, from 15% to 50%. The County of Los Angeles based on 5,000 teleworkers estimates a 15 percent increase in productivity. Few companies have actually captured true time motion improvements in productivity, but if only a portion of a day commute time is reapplied against work, once or twice a month, a minimum of 5% - 10% increase is common. Recoup of commute time is typically augmented by the lack of

² 2001, Stats Canada, based on 1999 figures.

³ * TCI Partial DataBase - Canada private sector TW excludes Satellite data and US TW data

⁴ Company Reports - Telework Coalition Site

⁵ Company Reports - Telework Coalition Site

⁶**Nortel – Telework Coalition Site

⁷ Company Reports –IVC Canadian Telework Site

interruptions and meetings during offsite work days, which contributes to overall reductions in error rates and higher quality of work.

Substitute for absenteeism ranges from 20% to 63%. This may be one of the most reliable measures of productivity improvements. For example, Canadians are absent from the workplace an average of 10 days per year. This number is higher for public sector workers - 11.7, per year. On missed days, technology may allow the completion of some tasks from a home office, which has a cumulative effect on down time as well as overall productivity levels. In the City of Los Angeles and County, between 2 and 4 days of absenteeism were saved per teleworker, annually.

Although of low interest to enterprise, capturing and documenting end-user benefits from telework is becoming more important to the medical and insurance communities. TCI data indicates that stress levels among teleworkers undergo dramatic downward shifts, and produce benefits that clearly segregate their work experiences from that of their onsite colleagues.

In October 2004, the New England Journal of Medicine identified the last, most common activity that a victim was engaged in before the onset of a heart attack. After adjusting for anxiety, strenuous activity and other stresses, the study found that the likelihood of a heart attack was almost three times as great if the subjects had been in cars in the previous hour, four times as high if they had just been on bikes and three times as high if they had used public transportation. New England Journal of Medicine, Heart Attack Risk, 2004, & article Heart Attack Linked to Time Spent in Traffic, Anahad O'Connor, NYT, October 26, 2004.

Team Outcomes: Understanding how virtual teams function and interact has become an area of study that has also begun to receive some attention. Professor Andrew Gaudes, of the University of New Brunswick has studied such teams and the results challenge the traditional notion that the first and best budget items and actions of a newly minted team should be to arrange to travel, and meet, en masse, in person.

The data showed that virtual teams, which did not meet at the start of the project, generated greater overall performance than virtual teams that had a face-to-face launch. Also, team members that did not meet face-to-face reported greater satisfaction with their team as well as greater trust among members. Only team cohesiveness scored lower when compared to virtual teams that did have a face-to-face launch. Conversation and email with Dr. Andrew Gaudes, University of New Brunswick, November 2004.

A comparison of enterprise telework outcomes between the US and Canada shows that results are wide ranging. However, based on the measures most important to enterprise, outcomes are both reasonably consistent as well as consistently positive.

⇒ US – Canadian Comparison – Transportation – Planning – Environment

Between the US and Canada, much less has been recorded about the outcomes of the application of telework as a TDM strategy, urban planning or environmental option. What is available has come from programs that simply measure commute avoidance and relate this to emission reductions.

There is a huge gap in our understanding of how adoption of alternative workplace options, like telework, can affect congestion, air quality, emissions and peak time infrastructure use. While other TDM strategies like car/vanpooling and transit incentives produce modal shifts, the consumer outcomes of telework are so compelling as to make this option the first choice of the majority of end users. Nor does telework appear to have the recidivism of other commute options. Once employees have the flexibility to telework, they want to continue doing so.

There are clear differences in the pattern of how the US and Canada commute and the outcomes produced by these commutes. Canada has 14 million cars and is responsible for about 2% of the world's GHG emissions. In order for the Kyoto treaty to take effect, the countries ratifying it must account for at least 55% of carbon dioxide emissions. At this time, the countries that have ratified it account for 42.2% of carbon dioxide emissions. If the United States were to ratify the Protocol, the percentage rate would skyrocket to 78.3%.

Commute distances in the US are 12.1 miles, versus the 4.8 miles in Canada. One reason for this difference may be that Canadian commuters work in the communities where they live. But this may also reflect car-induced

CHART 3 Transportation Planning – Emission Outcomes		
Comparison	USA	Canada
Cars	140 million	14 million
# Commuters	120 million	11.4 million daily commuters
Commute Distance	12.11 miles	4.8 miles - (7.2 km)
Commute Times	42 to 60 minutes	62 minutes car, 100 minutes - Transit
Emissions		16,000 km, 4 tonnes yr
Per Capita Energy	341.8 million Btu per capita	402.6 million Btu per person
Per Capita Emissions	5.5 (mt)	5.4 metric tons (mt)

urban sprawl, because the **duration** of the average Canadian commute is 62 minutes per day by car – quite close to the 42 to 60 minutes in the US.

Geography, distance and weather collaborate to make Canadians and Americans two of the highest per capita country-consumers of energy and producers of GHG emissions in the world. It is within the best interests of both countries to capture data and information that clarifies the potential for the use of technology supported remote work as a substitute for travel and infrastructure investment. What is clear is that the US may be doing a better job reducing commute by convincing its employers and citizens to take responsibility for homeland security, than the Canadian government has done in its efforts to get employers and citizens to take steps to meet Kyoto targets.

E-Planning and TCI recognize the need for more information – research to fill the gaps in knowledge. In the meantime, the firms are investing in more careful and detailed tracking of the telework programs they implement, to develop a more complete understanding of ways to make decisions about safer alternatives to potentially harmful activities.

Case Studies

⇒ TCI Case 1 PWGSC Ontario Region

Description:

In 1999, PWGSC Ontario Region began planning a major co-location venture, designed to reduce Ontario facility requirements and centralize departments at a large Toronto facility. There was a compelling case to include telework as a key component of the Project, as it would solve three problems.

- 1- Act as a retention tool for co-locating staff facing long commutes into the central location.
- 2- Ease overall space deficits as virtual staff could **share** work stations- reducing needs for 1:1 ratio space.
- 3- Control costs; the budget for swing space was estimated at \$837,500. By substituting Temporary Telework for market rate swing space, costs to house staff during construction would be reduced to \$72,751, or less than 1/10th the cost.

Pre-construction, TCI used a custom workplace mapping tool, designed to simulate telework in the organization by identifying exactly who could telework, at what outcome and cost. Based on the output, PWGSC and TCI oriented and deployed almost 100 staff and managers to home and satellite offices.

To capture of proof-of-concept, both onsite and teleworker populations were tracked before, during and after deployment. The captured data was compared to the TCI normative data base. On all Key Measures the program was judged to meet or exceed comparative data norms.

Benefits of Telework

A number of important professional and personal benefits were more pronounced in practice than expectation.

Effects on Work

Incidence of known work-related complaints decreased between Pre and Post deployment. Teleworker job satisfaction increased over pre-deployment levels and proved higher than levels among staff who remained onsite.

Effects on Space Sharing

100% of teleworking staff agreed to share or give up Head Office space to qualify for telework.

Effects on (Reduced) Absenteeism

75% used Telework at least once during deployment, to help out on family need/sick days, to avoid absenteeism. 51% used it in the last month they telecommuted to avoid 2.1 absent days per capita.

Effects on Commute Patterns

Average daily commute time per Teleworker = 1 hour 44 minutes.
Average daily distance commuted per Teleworker = 52 kilometers

Effects on Commute Avoidance

In the last month teleworked, drivers avoided:

A total of 427.2 hours in commute = 12.2 hours per capita = almost 2 x 7 hour work day.

Environmental Considerations

Each teleworker avoided or saved 3,210 pounds of carbon dioxide, 26 pounds of hydrocarbons, 195 pounds of carbon monoxide, 178 gallons of gasoline, 13 pounds nitrogen oxides

Case 2 Teleworking in Metro Atlanta

Teleworking is taking a bigger foothold in metro Atlanta, with the convergence of efforts from state government and the regional TDM organizations that are resulting in renewed and heightened interest in teleworking among employers across the region. In September 2003, Governor Sonny Perdue unveiled his Work Away initiative, a management program that encourages divisions of the Georgia government, the state's largest employer, to select employees to telework one or more days each week. Closely following this announcement, Gov. Perdue lent his support to the Telework Leadership Initiative, a regional grant program created by The Clean Air Campaign® that provides up to \$20,000 in cash and consulting time to qualified employers. The coordinated timing of these two initiatives has allowed both of them to get off to successful starts.

The Clean Air Campaign is a not-for-profit organization that manages regional TDM initiatives; works directly with employers to develop and implement commute options programs;

and serves as a clearinghouse for air quality information and services. Together with the eight metro Atlanta based transportation management associations, regional TDM providers serve almost 800 employers and property managers.

Investment Credit Support

After several months of planning, in October 2003, The Clean Air Campaign launched the Telework Leadership Initiative. One of the unique components of the Telework Leadership Initiative is its cash reimbursement provision. The Clean Air Campaign's is the first and only program to offer reimbursement to employers to offset the cost of staff time to develop and implement a formal teleworking program. Not all employers in the program are receiving the reimbursement funds, but those who are can receive up to \$10,000 for documented time of staff devoted to telework program development.

The original plan budgeted the selection of eight employers to take part in a six-month program. However, due to the hard work of both The Clean Air Campaign and the region's eight transportation management associations, the Telework Leadership Initiative was met with exceptional response, and 17 awards have been granted to employers representing the public, private, and not-for-profit sectors.

The 2003 Telework Leadership Initiative grant recipients were selected based on their levels of commitment to teleworking and willingness to undertake teleworking programs. Grant recipients were also selected to represent both public and private sectors, a broad range of industries, geographic locations and employment sizes. All employers committed to designate a minimum of 10 employees who will telework for a minimum of six months. Upon completion of the program, The Clean Air Campaign will develop a case study on the impact of teleworking on the employer, employees and on trip reduction and air quality.

The 2003 grant recipients span a wide range of current levels of telework involvement. The recipients include the Atlanta Regional Commission, Biolab, Children's Healthcare of Atlanta, City of Atlanta, DeKalb County, Drew Eckl & Farnham, GE Power Systems, The Georgia Conservancy, Georgia Department of Corrections, Georgia Department of Education, Georgia Department of Human Resources, Georgia Merit System, Georgia Office of the Commissioner of Insurance, Georgia-Pacific, Georgia Power/The Southern Company, Georgia Technology Authority and Quintiles. On completion of the program, these employers will add a minimum of 2,000 more regular teleworkers to the region. Most importantly, they will each have the organizational framework and the expertise to continue to expand their telework programs.

Beyond Incentives

The focus on teleworking does not stop with the Telework Leadership Initiative. Using the knowledge of our expert consultants and the resources of the TDM community, The Clean Air Campaign has developed a multi-faceted program that provides a greater depth of telework services for all metro-area employers. Recognizing that many of the region's employers already have informal teleworking programs in place, the TDM community has stepped up to the plate to provide the tools and resources needed to formalize and expand their programs.

The Clean Air Campaign has added significant resources to its Web site (www.cleanaircampaign.com) and is providing regional training programs throughout 2004. The first professional development seminar, "Maximizing Productivity through Teleworking," was held in mid February attracted almost 200 managers and employer transportation coordinators (ETCs) to learn about best practices for telemanagers.

For the Telework Leadership Initiative, the consultants worked hand-in-hand with the participating employers to identify potential teleworkers, formalize policies and procedures, identify technology needs, and provide management and telework training. They worked with each employer throughout the six-month program to track progress and will measure results on program completion. Both the employer and The Clean Air Campaign can use these results to demonstrate return on investment for the telework program.

Looking Ahead

The Clean Air Campaign is currently in the process of evaluating the impacts of the pilot programs. The results of the programs will be available by end of May 2005. The evaluation emphasizes impacts on company operations, management, work productivity as well as air quality and transportation. The program has resulted in 1600 teleworkers amongst the various pilots.

Summary

The application of virtual and dispersed work places are proceeding at very different rates in the US and Canada.

Canada

Canada has signed the Kyoto Accord, and generally recognizes that the activities of employees in the public and private sector are the cause of significant levels of “outside emissions”, that is, GHG generated from workplace commuting and business travel. In fact, the Ministry of Transport says that – “The Government of Canada has approximately 300,000 employees who commute to work. Employee commuting and business travel generates a substantial amount of greenhouse gases (GHG) and other air emissions. A recent analysis by Transport Canada estimated that the GHG emissions from federal employee commuting and business travel total approximately one-and-a-half million tonnes annually (40 percent from commuting and 60 percent from business travel). This is roughly equivalent to the annual GHG emissions from 350,000 Canadian cars – about as many as there are in all of Newfoundland and Labrador.”

However, the use of virtual work and telework is not a consideration as infrastructure strategy at any level of government, in Canada, with the exception of the smaller, lifestyle municipalities. Nor is it under consideration as an emergency preparedness or business recovery strategy. Finally, despite the proof-of-concept provided by PWGSC, for use as a facility – cost avoidance option, ensuring swing space costs are not incurred to the “detriment of the Crown”, it is not in use as a space planning or cost of construction alternative.

USA

The US government, conversely, is actively pursuing the use of dispersed and virtual work as an aspect of emergency preparedness, as well as retention strategy. Legislation commitments include investment credits and reimbursements – and in 2005 departments that failed to meet quotas were fined \$5MM each. At Regional and municipal levels, telework is being actively supported as an alternative to congestion and poor air quality. State and regional incentives to invest in remote work are available to companies that will implement.

A sure sign that telework has become part an integral of the US workplace scene is the current considered review of tax legislation.

In May 2005, Sen. Christopher Dodd and U.S. Rep. Christopher Shays introduced legislation in the House and Senate that would exempt state telecommuters from paying a second income tax to New York. The Telecommuter Tax Fairness Act encourages more people employed by New

York business' but living in other states to work from home, thereby reducing traffic and enhancing their quality of life.

The US is beginning to actively explore the potential for the use of telework and virtual workplaces for use in the spectrum of infrastructure and transportation demand management. As important, incentives are in place and outcomes are being captured and used as templates for best practice distribution. There also appears to be a developing commitment at the Federal level and some Regional levels, that there is valuable interplay between the use of telework (and TDM) to reduce movement and reliance on place and infrastructure use. Its actions in this direction, although not specifically linked to Kyoto strategy, may be of more value in the long run, than the Kyoto signatures of countries like its neighbour Canada, where little action is being considered.