The information highway: just because we're on it doesn't mean we know where we're going

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Looks beyond the hype surrounding telecommunications and suggests that the physical aspects of the information highway are currently short of the ideal and further, that when eventually in place, it may not be ideal. Examines some commonly held beliefs about the transportation, geographic and economic impacts of telecommunications. Suggests numerous further research and policy issues. Concludes by reminding us that telecom technology is inherently neutral. It can facilitate travel reductions and geographic decentralization and economic development, but not alone – we, as policy makers and consumers must have some control over the outcome; the compact city made obsolete and settlements dispersed throughout the countryside should only happen if people decide that is what they want to happen.

Introduction

Telecommunications, like many other technological advances, is often accompanied by a lot of hype, an optimistic, rather naïve, and frequently aggressively self-serving over-selling of its potential. Steve Finlay of BC Telephone in Vancouver, British Columbia coined the phrase Information *SuperHYPE-way* – an apt description of the current state of the much-vaunted info highway. We owe a great debt to two other Canadians, Lis and Ian Angus, for explaining to us why the information highway is like teenage sex:

- Everyone thinks about it a lot.
- Everyone thinks everyone else is doing it.
- Everyone talks about doing it, but almost no one is really doing it.
- The few who are doing it are not doing it very well.
- Everyone hopes it will be great when they finally do do it (Gordon, 1994).

I suggest that not only do the physical aspects of the Info Highway currently fall short of the ideal, but that the impacts of the info highway when it eventually is in place may also not be ideal. As a society, we have this touching but usually misguided faith in the ability of technology to solve problems that are essentially human – whether individual or institutional – in nature. The purpose of this paper is to remind us to look behind the hyperbole about what the info highway is and what it will do for us, to peel away the exaggeration and find the reality underneath. First, I will describe three attributes of "conventional wisdom" (CW). Then, I will discuss three examples of the received wisdom regarding the urban impacts of telecommunications technology.

I will briefly present some suggestions for future research into these impacts, and close with three cautionary observations.

Three attributes of conventional wisdom

At least three attributes that characterize conventional wisdom can be identified. The first is that:

It is hard to pin down its origin, and (even if it starts out accurate) it often loses something in the translation

At a 1991 UC Irvine conference on telecommuting, Professor Ilan Salomon, the keynote speaker, traced the "genealogy" of a published forecast that telecommuting may substitute for 12 per cent of all trips. That forecast cited three sources for corroboration. He looked up those three sources. One of them contained no explicit forecast of trip substitution. A second source in turn cited three other studies for corroboration (at least one of which also contained no quantitative forecast), and that second source also contained important qualifications of its findings that were completely ignored by the later study which cited it (Salomon, 1995).

At the same conference, consultant John Nilles gave a droll speech speculating on the origin of the oft repeated factoid that telecommuting results in a 20 per cent increase in productivity. More recently, Professor Salomon has attempted, without success, to trace a brochure claiming a 200 per cent increase in productivity back to its origins. Perhaps it was originally reported as 20.0 and the decimal point got lost.

The message is: Be sceptical. Dare I say the obvious? Do not believe everything you read or hear. Even peer-reviewed papers in academic journals are guilty of careless citations, and they in turn are inaccurately cited by others.

The second feature of the conventional wisdom's argument is that:

It contains both truth and fiction in varying quantities

This of course is what makes it so insidious. Consider a recent magazine advertisement by a major software company. The ad states, "It's not WHO you know, it's WHAT you know. The days of getting somewhere in the business world because you know the right people – whoever and whatever they are this week – are ending. Hallelujah".

Well yes, telecom does, in some but not all cases,
- permit greater access to more people,
- flatten the organizational pyramid,
- decentralize control,

- make it easier for merit to be recognized, and so on.

But do you really think,
- that it is now no longer important to "network" in the human sense of the word?
- that you will hear the same gossip – excuse me, I mean valuable inside information – from random strangers that you get from your carefully cultivated and well-placed sources? – that your e-mail message bypassing the chain of command will receive equal attention whether the recipient actually knows you or not?

I once sent an e-mail message "cold" to an editor of a journal, asking him if he considered the paper summarized in the attached abstract to be appropriate for his journal. When a month had passed and I had received no reply to my message, I fell back to the low-tech approach and telephoned him. "Oh," he said, "I get 200 e-mail messages a day and I delete most of them without reading them. That must have been what happened."

Here was a person who was clearly plugged into the information highway and used to operating on it – he promptly e-mailed me the journal's style requirements and copyright transfer form – but, so much for "access"!

The software company ad is just one example of the mixture of truth and fiction in CW. Our challenge is to separate one from the other.

It oversimplifies
It does not worry about the fine print, the exceptions.

Einstein once said: "Things should be made as simple as possible, but not simpler". If only we knew where that invisible line was. Some examples of this feature are presented below.

Some popular factoids about the impacts of telecom technology

Let us examine three commonly-held beliefs about the transportation, geographic, and economic impacts of telecommunications. The first belief is that:

Telecommunications will reduce congestion and improve air quality
Judging by the number of policy documents and regulations which have favourably mentioned telecommuting, this is now the expectation or at least hope of a number of planners and policy makers. And I support these policies, and believe that telecommunications, at least telecommuting, will have a direct positive impact on travel. What is the catch? The question is how much of an impact, and what the indirect and system-wide impacts will be.

At UC Davis, we recently did a study in which we synthesized the findings regarding the transportation-related impacts of telecommuting from a number of empirical evaluations of pilot projects (Mokhtarian *et al.,* 1995). Two of the most rigorous evaluations took place among California State workers and in the Puget Sound (Seattle) Telecommuting Demonstration Project, which was spearheaded by the Washington State Energy Office. Both studies found quite similar results: on average, telecommuters travelled 52-54 miles on regular weekdays, compared to about 13 miles on telecommuting days – a saving of 75 per cent. Most of all of that reduction was due to the elimination of the work trip.

We thought we had placed this result quite firmly in context. But when the paper was submitted for publication, one of the reviewers commented that it seemed generally well-done and well-written, but the claim that telecommuting would reduce travel by 75 per cent was too extravagant to be credible.

This is a classic example of the CW oversimplifying – not reading the fine print. We suddenly had visions of this number being pulled out of context and carelessly quoted just as the reviewer did: "telecommuting will reduce travel by 75 per cent". So we inserted even more caveats – in the text, in the tables, everywhere we possibly could. What are those caveats?

First of all, our number represents 75 per cent of travel on a weekday by employed telecommuters. It is not 75 per cent of all travel, which would include weekends, vacations, and travel by non-workers. Furthermore, telecommuters are not typical of all workers. An important finding of our study was that telecommuters, not surprisingly, tend to live farther from work than non-telecommuters – fully twice as far, on average. At least, the early adopters of telecommuting found in these pilot programmes did. The commute trip constitutes about 75 per cent of the weekday travel for these long-distance commuters; hence eliminating that commute trip has the noted result. It is likely that as telecommuting moves into the mainstream, commute lengths for telecommuters will drop closer to the overall average – in which case the average travel savings of telecommuting will decline, both in absolute terms and as a percentage of weekday travel.

Furthermore, a 75 per cent reduction obviously only applies to telecommuters themselves, not to the population as a whole. Any assessment of the aggregate impacts of telecommuting must take into account how

many people are telecommuting, and how often. Our study estimated that in 1991, 6 per cent of the California workforce was telecommuting 1.2 days a week (24 per cent of the time) on average. This translated to a whopping saving of one-half per cent in vehicle-miles-travelled and in transportation-related fuel consumption in California (it would be a much smaller proportion of all energy consumption). This effect is well within measurement error, i.e. certainly not strong enough to detect by any kind of "field measurements". Notice how easily 75 per cent became 0.5 per cent!

It may be said, "But that is now", or 1991, to be exact. Surely telecommuting will increase considerably, and have a much bigger impact in the future? Again, it all depends on what is reasonable to assume. If the number of telecommuters increases four- or sixfold (to, say, 25-35 per cent of the workforce), and all else remains constant, then the fuel savings would increase to a dizzying 2-3 per cent. But we have just suggested that the savings per telecommuting occasion is likely to decline over time as telecommuters become more representative of the population as a whole. And what about latent or induced demand?

Even if the freeways ever could become clear, it would not last for long: people would create new trips, and change modes, and destinations, and do all kinds of things to take advantage of the new capacity made available to them. And what about the trip generation effect of telecommunications? There is a lot of evidence to indicate that trips will be created by new technological applications as well as eliminated. These issues of latent demand and trip generation are explored extensively in two recent studies sponsored by the US Department of Energy (1994a,b).

Bottom line: Do not count too heavily on the trip reduction benefits of telecommunications technology. Yes, they will be there – at the margin. But they will be counteracted and perhaps completely swamped out by impacts in the opposite direction.

The second commonly-held belief I want to examine is that:

Telecommunications will make location irrelevant

This CW has several variations:
- telecommunications will create even greater urban sprawl by making it possible for people to move even farther from work (thus, incidentally, potentially negating some of those transportation savings that the CW was so confident would occur. That is by the way a fourth characteristic of CW – it often contradicts itself);

- everyone will move to the countryside, or to those scenic resort villages in the mountains or to that island in the Puget Sound;
- jobs will haemorrhage to cheap labour markets offshore.

Again, there is doubtless some truth to these statements: not only manufacturing and data entry but professional jobs such as software development have been placed overseas.

According to the popular press, resort towns like Telluride, Colorado have been invaded by affluent "lone eagle" telecommuters and mobile executives, driving up land prices to the point that native residents can no longer afford to buy a home in the town in which they grew up.

But human settlement patterns are far from becoming completely homogenized, and technology is far from eliminating locational advantage. In reality, there are sound reasons why cities as we know them will endure:
- agglomeration economies: telecom will not erase the need for face-to-face interaction or for goods movement (we are still going to need not only food, but clothing and shelter and other tangible things that cannot be "downloaded"); it will continue to be more efficient for these activities to be conducted in dense settlements;
- the massive already-built environment (Mandeville, 1983);
- the tendency of similar or inter-related industries (or groups of people) to cluster together (Muth, 1985);
- distinctive geography, climate, and other amenities;
- differences in infrastructure capacity and topology;
- the role of cities as cultural, political, and economic centres (Gottman, 1983).

Depending on how the decision variables are weighted in each instance, the optimal location for a particular individual or firm may be the urban centre, the urban periphery, or an exurban or rural area. But most location choices are likely to be incremental accretions to where most activities are currently located. So, we are likely to see simultaneously, continued growth in metropolitan areas, emergence of multiple nuclei in expanding metropolitan areas, growth of smaller cities into regional hubs and specialized centres, and some movement into currently rural areas. In other words, evolution, not revolution.

The third and final commonly-held belief needing scrutiny is that:

Telecommunications will stimulate economic development

Whether in a rural or urban setting, the hope is the same: that providing advanced telecom

services will result in a competitive advantage that will attract jobs and dollars to the area. However, Abler (1987) and others point out that communications networks are two-way streets, so to speak. The same technology that, it is hoped, will bring economic benefits from major metropolitan areas to the periphery provides the opportunity to vacuum resources from the periphery to the more powerful urban core.

The belief in telecom as an instrument of economic prosperity sounds suspiciously like the factoids often used to justify enormous investments in transportation infrastructure: this subway or that beltway will increase economic development. To give this a reality test, pick a depressed area of the USA, say downtown Detroit. Will building a new freeway through downtown Detroit revitalize it? It is ludicrous on the face of it; numerous other factors must come together to achieve healthy economic growth. Infrastructure may be necessary, but it is certainly not sufficient. Yet we often seem to subscribe to the "Field of Dreams" school of economic thought: if we install a fibre optic loop, or ISDN, or a teleport or a smart building, or a telecottage in this urban area or that remote town, "they will come".

I have met with a few rural telecottage developers from around the world, and have read about a number of others. I am currently directing the implementation and evaluation of 12 urban and suburban telecommuting centres throughout California, and have studied several others. It appears to me that rural telecottages and urban telecentres alike have a very mixed record to date. Many (although not all) have closed following the conclusion of a heavily subsidized demonstration period. Our study of urban telecommuting centres in California shows that, of those which have been open more than six months (but have not yet closed!), occupancy levels average about 17 per cent. As for rural telecottages, not all of them have the expressed goal of job creation, and most of them have other goals besides that. But any job creation (or even attraction of existing jobs from elsewhere) that does take place is by no means automatic – "because 'it' is there". Rather it is the product of careful, labour-intensive job and skills training, of extensive and tireless marketing, and of patience and an ability to stay in it for the long haul.

Message: Getting the technology in place is only one step, not even necessarily the first step, and probably the easiest step. Almost inevitably, the crucial barriers to achieving the desired economic benefits are not techno-logical, but institutional, social, economic, and personal.

Research and policy issues

A number of research studies would be of value in increasing our understanding of the types of impacts of telecommunications technology considered here. Space permits only a brief mention of the possibilities; each suggestion below carries within it numerous specific questions of interest.

In urban areas, we could:
- track telecommuters longitudinally to assess long-term impacts on residential location, job choice and travel;
- continue to study the role of telecommunications in business location and relocation decisions;
- analyse the short- and long-term transportation impacts of those business decisions, at both aggregate and disaggregate levels; and
- explore ways to strengthen the role of telecommunications infrastructure in supporting the urban core.

In urban areas, we could:
- monitor telecommunications-facilitated residential and business relocation to high-amenity areas such as resort towns.

Regarding the use of telecommunications for rural and small town economic development, we could:
- learn more about successful "gardening" (local job creation) projects;
- demonstrate and evaluate rural telecommuting centres as in Kentucky and elsewhere;
- analyse the success of job shifting strategies such as those being followed in Kansas and Japan.

Internationally, we could:
- monitor the location of firms and employees offshore, with distinctions between the situations for data entry workers and skilled professionals likely to be of interest.

Any number of policy issues are implicit in these studies. One such issue is the ability (and desirability) to provide infrastructure to support large shifts in population to the urban fringe or to exurban areas. There is also an equity issue: the greater ability of middle and upper class workers to live anywhere they choose will contribute to the ongoing socio-demographic fragmentation of society. And, how to achieve or maintain economically viable central business districts will continue to be a concern.

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neering at UC Davis. Fol-
lowing completion of her
PhD in Operations
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ern University in 1981,
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tion asked her to explore
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munications applications
to reduce congestion and
improve air quality for the
region. She became
intrigued with the capabili-
ties of telecommunica-
tions technologies, and
with their impacts on
transportation in particu-
lar and society in general,
and has been studying
those issues ever since.
From an initial position of
naïve optimism about the
potential of telecom to
reduce travel, she has
reached a more critical
(but not negative) posi-
tion. Issues she would like
to see studied further
include: long-term impacts
of telecom on location
decisions and urban form;
telecommunications as a
tool for economic develop-
ment; short-term travel
and communication
impacts of online con-
sumer-oriented informa-
tion/transaction services
and community networks;
and travel and communica-
tion patterns of mobile
workers.

Conclusions

I do believe that telecommunications has an enormous potential to change society. I just do not believe that those changes will necessarily be simple, or on net in the expected or desired direction. For that reason, I do believe in monitoring and analysing trends and impacts of telecom technology, and proactively planning to harness that technology for the public good.

In closing, it is important to remember three things:

Telecommunications technology is inherently neutral

It can facilitate travel reductions and geographic decentralization and economic development, but it alone does not cause these things. It can also facilitate the opposite results: increased travel, geographic centralization, loss of jobs off-shore and increasing polarization of the haves and have-nots. External forces will determine how technology is used and what its impacts are. We, as policy makers and as consumers, have some control over the outcome. The well-known geographer Jean Gottman (1983) wrote:

> The organization of space is man-made; it is a product of the collective will of the participants … Living and working together in compact settlements may seem unnecessary once the technology to overcome distance is well-developed. However, it does not necessarily follow that the compact city has been made obsolete and that settlements will disperse throughout the countryside. It all depends on what people decide to do.

There are no easy answers

Technology may solve some problems while creating others. We will still be faced with hard work and hard choices to achieve a desired outcome. Public policy decisions have historically had an important effect on urban form. Governments have wielded their zoning authority to block or downsize development in the face of favourable market forces. Conversely, they have also attracted development through tax breaks, provision of infrastructure, and other incentives (Giuliano, 1989). Today, policy choices can help determine the extent to which telecommunications technology will support propagating urban sprawl even more widely, and the extent to which location activity will be channelled into more efficient higher-density, balanced land use, and infill development patterns.

And finally,

Be sceptical, be realistic

Read the fine print. Ask questions. I am not suggesting planning paralysis – that is, waiting till we have all the answers before acting – we often must go with our instincts and limited knowledge to get anything done. But while proceeding on instincts and limited knowledge, solicit opposing viewpoints, and listen to them. Monitor trends carefully to see if they match your instinct. And support research that will help provide answers to those important unknowns.

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