

Does Telecommuting Really Increase Productivity?

As many companies have learned in the last decade, the reality of telecommuting does not reflect the hype, the expected potential, or the existing literature.

BY RALPH D. WESTFALL

"[PACIFIC BELL'S] \$1.5 MILLION INVESTMENT...WAS QUICKLY RETURNED BY ENORMOUS [SIC] PRODUCTIVITY GAINS."

"STORAGE TEK IN BOULDER, COLO., REPORTED A 144% INCREASE IN PRODUCTIVITY."

"MANY [BELL ATLANTIC MANAGERS] RECORDED 200% INCREASES IN OUTPUT."

—J.M. WEISS, "TELECOMMUTING BOOSTS EMPLOYEE OUTPUT," *HRMagazine*, (FEB. 1994)

THESE quotations are admittedly quite lurid examples of hype about the productivity of telecommuters. Still the literature on telecommuting is rife with statements about productivity gains of 20% or more. Indeed, it is difficult to find published materials that indicate telecommuting does *not* generate productivity gains, or that gains are less than 10%.

A literature search at the time of my dissertation found claims of productivity gains of 30%, 43%, and 65% for groups of employees. The claims have been made so often, from so many different

sources, that a group of European researchers [2] noted a "surprising degree of unanimity" on this issue.

As a follow-up to that literature search, I scanned articles published in 1999 or later. Most mentioned productivity gains in general, and some mentioned numerical estimates including "15% to 40%" (IBM) and "as much as 40%" (USWest). However, in many articles the references were to telework, which includes mobile workers as well as people substituting telecommunications for travel in the classic telecommuting mode. In contrast to earlier literature, a few of these studies raised questions about the productivity impact of telecommuting. In particular, one recent article analyzed the methodology and findings of over 80 previous studies, indicating that "little clear evidence exists that telework increases job satisfaction and productivity, as it is often asserted to do" [1].

I witnessed another example of hype about productivity at a seminar on telecommuting in 1994, just after a major earthquake destroyed parts of the Southern California freeway system. One vendor mentioned that, in addition to providing relief from the horrendous traffic congestion at the time, telecommuting could also produce “tremendous productivity gains.” When I asked why the details of these gains were not being published so the benefits could become more widely known, the vendor said that organizations were using telecommuting as a “secret weapon.”

Although the Web was only in its infancy at the time of that seminar, telecommuting was definitely not a secret. A search on the word “telecommuting” on ABI-INFORM Global found 829 articles published before 1994. These included a *Business Week* article in 1984 that mentioned 35% and 50% productivity gains at Control Data and Blue Cross, respectively. (Using telecommuting as the search word on April 19, 2004,

could provide a compelling rationale for the necessary organizational support. They claim that telecommuting results in dramatic increases in productivity.

The claims of large increases in productivity are not limited to anecdotal reports. Jack Nilles, lead author of the first academic book on the subject [8] who actually coined the word telecommuting, has made similar claims. His discussion of the findings of his research of a major telecommuting implementation in a governmental organization in the early 1990s included the following phrase (italics in original): “37% of the work being accomplished in 18% to 23% of work week; possibly an average 100% productivity increase per telecommuting day” [7].

In his economic analyses of the project benefits, Nilles used a supposedly conservative 22% productivity gain based on the average of managers’ subjective impressions of employee productivity gains. However, since employees were telecommuting approximately

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I found approximately 466,000 Web pages in Google; 1,761 articles since the start of 2000 on ABI-INFORM Global; and 1,894 books on Amazon.com.)

Productivity as a Rationale for Telecommuting

The productivity issue is important because telecommuting is often suggested as an additional public policy option for mitigating traffic congestion and associated air pollution, as well as reducing dependence on energy imports. However, telecommuting is contrary to the general trend of centralization of employees that started in the industrial revolution. In particular, it conflicts with the dominant employment pattern for information workers that developed and evolved since the advent of high-rise office buildings more than 100 years ago.

Except for the self-employed, whether people are eligible to telecommute is usually determined by their immediate supervisors and/or organizational policies. Even if telecommuting is allowed, individual telecommuting decisions are strongly affected by peer influence and organizational culture [3]. To achieve usage levels sufficient to produce significant environmental benefits, telecommuting needs strong support at the organizational level. To address this issue, researchers and writers on this topic often point to a potential benefit that

one day per week, this implies a productivity gain of around 100% on each telecommuting day to achieve a 20% productivity gain for the week. The accompanying table demonstrates this visually. (An alternate explanation is that telecommuting also increases productivity on nontelecommuting days, but a rationale for such gains is not readily apparent.)

As illustrated in the table, even if telecommuting does substantially improve productivity, the gains would be restricted in many cases by the typically low proportion of days per week that telecommuters work at home. A survey of pilot programs [6] indicates an average telecommuting rate of 1.2 days per week. This is comparable to the 18% to 23% of the week in the Nilles study, and to figures in another survey of the literature [1].

Deconstructing Telecommuting Productivity

One way to evaluate the likelihood of potential productivity gains of a large magnitude is to apply logic and common sense. The following model of productivity is based on four major factors:

- *Amount of work:* Actual hours of work per day, week, month, or year.
- *Intensity of work:* How hard the person is working,

(amount of concentration or focus).

- *Efficiency of work*: Ratio of outputs to labor inputs (affected by amount of supporting technology, experience and training, organization of work, and so on).
- *Adjustments*: Telecommuters generally require additional inputs from the organization compared to other employees, and any such costs need to be netted out of productivity calculations.

$$\text{Output} = \text{Hours} \times \text{Intensity} \times \text{Efficiency} \times \text{Adjustments}$$

This model is multiplicative, similar to one used to estimate programmer productivity based on data from the European Space Agency [5]. It can be expressed as an equation in the following form, and the parameters can be estimated via multiple regression:

$$O = a \times H^b \times I^c \times E^d \times A^e$$

This equation is a rephrasing of the standard definition of productivity as output divided by hours, except that productivity is elaborated as the product of the intensity, efficiency, and adjustment factors.

If the exponents for hours, intensity, and efficiency are close to one in the model—a 10% increase in any factor—while the others remain constant or balance out, results in an output gain of a bit less than 10% (depending on how close A^e is to one). A simultaneous 10% increase in two factors could produce a gain approaching 21%, and so on. The question then becomes: What types of changes in these factors are likely to occur as a result of telecommuting?

Hours or amount of work. The average one-way commute in major urban areas is typically between 20 and 30 minutes per day. Thus, for an employee who works an eight-hour day, commuting represents around 10% of the work time. If we assume the average telecommuter puts all the commuting timesavings into extra work, that the levels of intensity and efficiency do not decline, and that the adjustments are small, this would result in an increase in productivity of close to 10%.

However, there are no guarantees that employees will actually devote all the extra time to more work than they would do in the office. From an employee relations point of view, telecommuting consultants warn it would be bad policy to suggest or even imply that telecommuters should work extra hours.

Another possible source of extra work hours is recapturing time that would otherwise be lost because of

medical appointments or problems in the home. For example, instead of losing a whole day because of a medical appointment near home, the employee could put in couple of hours at home rather than wasting the rest of the workday. (This argument suggests that all appointments are around the middle of the day, rather than in the early morning or late afternoon.) However, simple calculations indicate a productivity gain of only 2.5% for a person who has a relatively high average of one such situation per month (12 occurrences x 4 hours / 1900 work hours per year).

Intensity of work. The telecommuting literature consistently emphasizes this aspect. Authors claim that, away from the distractions of the office, people will be able concentrate better and get more work done. There is anecdotal evidence for this in certain situations. For example, Kidder's book, *The Soul of a New Machine*, mentions a software engineer at Data General Corporation who ducked out to the Boston Public Library and developed the microcode for 195 minicomputer machine instructions in a very short time.

It is certainly true that people can work very intensely for short periods when highly motivated. However the issue

here is the impact of telecommuting. Will this change in working circumstances motivate or energize people to work more intensely, on a sustained basis over months and years?

Telecommuting advocates suggest several possible mechanisms for increases in intensity. Not having to commute, telecommuters may have more energy to put into their tasks. However, if this extra energy is used to work longer hours, as previously discussed, it may not be available to also increase the intensity of work.

Another argument is that some employees work better at certain times of the day, and these times may not coincide with traditional office hours. But even if there is a substantial proportion of the population that works significantly better at times largely outside traditional working hours, potential gains may be limited by the need for some to interact with other employees by telephone during the 8-to-5 time frame.

Efficiency of work. People who use more IT in their work are more productive, and by its very nature telecommuting requires more use of IT. Telecommuters in formalized programs usually receive extra training in using technologies and managing their work. In many formal programs, managers of telecommuters also receive additional training. Employees selected or allowed to telecommute typically have more experience

	Telecommuting Day	In Office Days	Total for Week
Actual hours	8 hours	32 hours	40 hours
Productivity equivalent	16 hours	32 hours	48 hours
Productivity gain	100%	0%	20%

Basis for a 20% productivity gain from one day/week telecommuting.

and a track record of performance. Therefore, telecommuters should be more productive. However, these gains are not necessarily a result of telecommuting, and might be obtainable by providing comparable technology and training for other workers who remain on site.

Another efficiency issue relates to the telecommuter's distance from the work place. The modern office has been evolving for over 100 years. It provides efficient access to support personnel, high-speed office equipment, office supplies, as well as to the paper files still present in most organizations. Telecommuters must put in more time planning to make sure all the necessary resources are available when away from work. They may need to devote extra time or money to obtaining some of these resources if they become necessary while telecommuting. Therefore, for some aspects of their work, telecommuters may be less efficient than their counterparts at the office.

Adjustments. Output gains would be reduced by expenses for equipment, technology support, training, telecommunications and other services that are greater than those received by nontelecommuters. In addition, the productivity calculations must include intangible costs such as extra managerial supervision; extra support from other employees, for example, faxing materials; and work transferred to other employees when telecommuters are unavailable [1].

Hourly rates can be applied to estimates of these items to generate cost figures. In addition to these items, however, telecommuting may result in problems with trust and understanding, and in exchanging knowledge within an organization [9]. The influence of such adverse organizational impacts could exceed the actual labor costs to support telecommuters, especially if they increase turnover or reduce creativity in the organization.

The business press abounds with anecdotal accounts of increased productivity resulting from telecommuting. However, published research studies are relatively rare, and many of these have not been of high quality. Like the study in [7], these studies typically rely on subjective estimates of productivity. I identified 15 possible factors that have not been adequately taken into account in most of the research on telecommuting productivity [10], including the subjective issues of Hawthorne effects and employees' inability to objectively gauge their own performance. Another possible explanation of the high subjective estimates is that some telecommuters may exaggerate productivity estimates to justify being away from the office during regular working hours. (The author of the popular "Dilbert" comic strip appears to view telecommuting from this perspective.)

Questions about the adequacy of the supporting evi-

dence for productivity gains are not a secret among telecommuting researchers. Such concerns have been around for a number of years. For example, Robert Kraut stated in 1989: "It is not yet possible in most studies, however, to untangle the effects of novelty, self-selection and longer work hours from the effects of work location" [4].

Conclusion

To put the productivity issue in context, the continuing emphasis on increasing productivity throughout the U.S. and world economies has been a major driving force for IT investments. Suppose that telecommuting consistently generated significant productivity gains—for example just 10% rather than the much higher gains reported in the literature—and that these gains were translating into measurable increases in bottom-line profitability. If this were really happening, companies that employ large numbers of knowledge workers would have adopted telecommuting on a large scale a long time ago, on a mandatory basis where necessary, and would be continuing to promote it heavily. To the contrary, many organizations offer telecommuting as an option, but are not strongly encouraging it. This is a very telling indicator that telecommuting does not deliver, at least at the level of the whole organization, the productivity gains touted by consultants and vendors. **C**

This article is an adaptation of an article published in [11].

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RALPH D. WESTFALL (rdwestfall@csupomona.edu) is a professor at California State Polytechnic University, Pomona, CA.

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