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ABSTRACT

Both as a business response to internal business problems, and as a transportation demand management (TDM) strategy, telecommuting is gaining acceptance in the United States and elsewhere. Yet there is no consensus on what actually does and does not constitute telecommuting. This paper first indicates why approaching such a consensus is important. It then discusses the definition of telecommuting in two different contexts. In the first case, telecommuting is considered in the abstract, in the context of a variety of other remote work options. Each of the remote work options is classified according to its transportation impacts and its managerial implications. In the second case, the efforts of one group to define non-home-based telecommuting in the specific context of an air quality regulation designed to reduce travel are documented.

INTRODUCTION

Telecommuting is often defined as the use of telecommunications technology to partially or completely replace the commute to and from work (1). Both as a business response to internal business problems, and as a transportation demand management (TDM) strategy, telecommuting is gaining acceptance in the United States and elsewhere. In the U.S., the Federal government (2) and the States of California (3, 4), Hawaii (5, 6), Washington (7, 8), Arizona, Virginia (9,10), Florida (11), Minnesota, and Connecticut (Public Act 90-219) are in various stages of institutionalizing, implementing, planning, or exploring telecommuting programs. Numerous other programs are developing that involve local governments and/or the private sector. Abroad, significant efforts are underway in the United Kingdom (12), the Netherlands (13), Finland (14), Germany and elsewhere in Europe (15), Japan (16), and Australia (17).

Particularly in California, telecommuting has become an important element of transportation/air quality planning. Telecommuting as a transportation strategy has found its way into several major public policy documents:

- o The 1989 Air Quality Management Plan for the South Coast (California) Air Basin sets the ambitious goal of reducing work trips by 30% in the year 2010 due to the combined impacts of telecommuting and alternative work schedules (18).
- o Regulation XV of the South Coast Air Quality Management District (AQMD) includes telecommuting on a menu of strategies large employers must use to decrease peak-period vehicle trips. Reg. XV is being widely studied, and to a certain extent, copied, by other areas of the country that are out of compliance with Federal Clean Air Act standards (19).
- o President Bush has endorsed telecommuting; in introducing the Statement of National Transportation Policy on March 8, 1990, he said, "Sometimes the best transportation policy means not moving people, but moving their work ... a trend known as telecommuting. Millions have already found their productivity actually increases when they work nearer the people they're really working for -- their families at home ... Think of it as commuting to work at the speed of light." The National Policy Statement itself also has a short section on telecommuting (20).
- o The October 17, 1989 Loma Prieta earthquake gave an unsolicited boost to all vehicle-trip reduction strategies, including telecommuting. California Governor George Deukmejian issued an Executive Order on October 30, 1989, which directed state agencies to include telecommuting in their emergency response to the quake (21, 22).

Despite its increasing popularity, however, there are about as many definitions of telecommuting as there are settings in which it is being practiced or considered. And, not surprisingly, not all definitions are consistent. Consider the following examples (see Figure 1):

- o The term "telecommuting" is often used interchangeably with "working from home". Yet there are several varieties of working from home, including home-based businesses and overtime work, that are not commonly considered telecommuting. And telecommuting need

not be home-based; in fact, some experts feel that the satellite/local work center variation of telecommuting will eventually become the most popular form (23).

- o Telecommuting is sometimes equated with teleworking (24) -- the use of telecommunications-related technology to conduct work. But not all teleworking (e.g., teleconferencing) replaces a commute trip. In fact, teleworking may or may not replace travel at all (25, 15).
- o Initially, telecommuting was thought of as being full-time. Many commonly-cited drawbacks of telecommuting (e.g., isolation) apply most forcefully to the full-time work-at-home version, and little or not at all to other forms of telecommuting. These drawbacks are still being raised as serious obstacles, even though it is widely conceded that full-time work-at-home will ultimately be the least-adopted form of telecommuting.

In some settings, telecommuting is still being defined in terms of how often it takes place. Some programs actually prohibit working from home full-time. One program specifies telecommuting to be "working a day or two a week from a home or satellite office and being hooked up electronically to a central office" (7). On the other hand, proposed California legislation would provide tax credit to employers implementing telecommuting programs, provided participants telecommute three or more days a week (26). (The legislation in question has been tabled until the next session, but meanwhile, amendments are being discussed which would provide reduced credit when employees telecommute two days a week).

- o Early discussions typically assumed that computers were essential to telecommuting, and that telecommuters were of necessity at least "information workers", if not actually computer programmers and the like. It is now more generally accepted that non-computer-based work (reading, writing, thinking, talking on the phone) can also qualify as telecommuting. And while the "information worker" stereotype may persist, in reality many employees who would not be classified as information workers, deal with information (reading, paperwork) to such an extent that they can telecommute at least part time.

In some cases, the variations in definition are due to a deliberate choice to emphasize particular aspects of telecommuting or to relate telecommuting to other forms of working. More fundamentally, however, there is not a complete consensus on what does and does not constitute telecommuting. This multiplicity of definitions has several undesirable consequences:

- o The term "telecommuting" means different things to different people, resulting in confusion and misunderstanding. Some people reject the erroneous or limited view they have of telecommuting (e.g., full-time work at home), without evaluating each different form of telecommuting on its own merits.
- o Estimates of the amount of existing and projected telecommuting vary widely, often because they are based on different definitions of the term (27, 28).
- o The transportation impacts of other, related, work alternatives may be underestimated at best or ignored at worst, because of the attention focused on "telecommuting" *per se*.

- o The transferability to telecommuting of characteristics of other work alternatives may be overlooked. That is, we may be able to apply to telecommuting some knowledge and skills that are already commonplace for related work options.
- o Those responsible for developing public policy (e.g., air quality regulation) designed to promote telecommuting are struggling to identify practical, monitorable criteria for deciding what constitutes telecommuting.

This paper is divided into two separate but related sections dealing with clarifying the definition of telecommuting. In the first section below, a classification system for remote work forms is developed. Telecommuting is placed within this classification system and related to other forms of remote work. The second section reports on an attempt by a Southern California group to define non-home-based telecommuting within the context of air quality regulation. A final section makes some concluding observations.

A CLASSIFICATION OF REMOTE WORK TYPES

A Description of Various Types of Remote Work

Telecommuting can be considered one type of remote work, but there are a number of others. Before listing some of those other types, it may be necessary to define the term "remote work" in this context. An airtight definition, i.e. one that is both broad enough and restrictive enough to be useful, is difficult to craft. However, one reasonable definition of "remote work" might be: *"work done by an individual while at a different location than the person(s) directly supervising and/or paying for it"*. Note that the focus is on the individual worker, not on the firm.

One potentially awkward aspect to this definition is that "telework", when it is conducted from the conventional office location, would not qualify as "remote work" as it is defined here. Telework is simply the use of telecommunications-related technology to conduct work; some examples include teleconferencing, on-line data-base searches, facsimile transmission, cellular phone calls, voice mail, and electronic mail -- as well, in the broadest sense, as ordinary telephone conversations. While information is being exchanged remotely in these examples, the focus in the present context is on remoteness from supervision. Telecommuting, of course, is both telework and remote work.

It is convenient to group remote work types into home-based and non-home-based. **Home-based** types include the following:

- o *Running a home-based business as one's only job*: sometimes referred to here as a "primary home-based business".
- o *Moonlighting from home*: that is, running a secondary home-based business, in addition to holding another job.

- o *A salaried employee working at home after hours:* i.e., bringing work home after a full day at the office, to work overtime.
- o *A salaried employee working at home in lieu of in-office work:* one of the "classical" forms of telecommuting.

Non-home-based remote work types include the following:

- o *Working from a center closer to home than the primary office:* this is the other "classical" form of telecommuting. At least two different types of telecommuting centers have been identified (29, 30). The *satellite work center* houses only employees of a single firm, while the *local or neighborhood work center* is a facility shared by two or more employers. Pacific Bell, for example, has satellite work centers in San Francisco and the San Fernando Valley of California, while the Hawaii Telework Center (5, 6) is a local work center.

Some people (1) draw a distinction between neighborhood and local work centers: a neighborhood work center is defined as a small, often storefront, facility within walking distance of the homes of those who work there, while a local work center is considered to be a larger facility and located somewhat further from residential areas (although still closer than the central business district). At this point, there are few actual examples of either form, at least in the U.S., and cases are likely to arise which do not strictly fall under either type as defined here.

- o *Field work:* e.g., making sales or service calls, or collecting data, at one or a variety of locations other than the primary office.
- o *Working while traveling:* possibly using cellular phones, portable computers, fax machines, voice mail and/or other computing/communications technology.
- o *Managing a branch office:* the branch manager works remotely from the boss at (say) company headquarters. Most others in a branch office, however, report to on-site supervisors and therefore are not remote workers. This is an important (if not perfect) distinction between a branch office and a telecommuting center, as will be discussed later.

Finally, one form of remote work that can be either home-based or non-home-based is:

- o *Long-distance telecommuting:* that is, living and working in one Standard Metropolitan Statistical Area (SMSA), say, for an employer or client in a different ("distant") SMSA or even country. While the proportion of long-distance telecommuters in the workforce is small, there are numerous examples in professional occupations (including lobbyists, scientists/engineers, advertising professionals, writers, and graphics artists) as well as clerical ones (data entry, word processing) (31, 32). Computer-Supported Cooperative Work (CSCW), or "groupware", might be considered a special case of long-distance telecommuting (33).

Telecommuting Criteria

What are some reasonable criteria for determining whether a particular remote work situation is telecommuting or not? The structure of the word itself suggests two main criteria:

- o *tele* (meaning far or distant): is the worker physically distant from the primary worksite -- i.e. the location of the supervisor?
- o *commuting*: is commute travel reduced or eliminated?

By these criteria, a remote work type would be considered telecommuting if it involved remote management and reduced commute travel.

One pertinent observation is that, strictly speaking, telecommuting need not involve telecommunications at all. Rather than one necessarily implying the other, they both simply spring from common semantic roots. Thus, the employee reading and writing at home all day, without using the telephone, can be telecommuting just as surely as the employee who is on-line to a mainframe for six or eight hours. In practice, of course, it is most likely that at least the telephone will be a key tool for telecommuters. Indeed, well-planned telecommuting programs stress the importance of frequent communication with the primary office and others. The point is, requiring telecommunications to take place before calling a particular event "telecommuting" seems to be unnecessarily restrictive.

The concept of remote management, however, is central to telecommuting. "How will I know they're really working?" is undoubtedly the biggest obstacle to the widespread acceptance of telecommuting by employers. To the extent it can be shown that other, common forms of work have similar remote management requirements, the comfort level with telecommuting may be increased. Further, some management techniques for these other kinds of work may be transferable to telecommuting.

It is of interest to test each of the remote work types listed in the previous subsection against these two criteria: remote management and commute reduction. The position of each type is graphically portrayed in Figure 2. The discussion below is based on the figure, starting in the top right area and generally moving clockwise. The classification and discussion of each work type visà vis remote management focuses on its relevance to telecommuting. The discussion visà vis commute reduction has some points in common with an earlier discussion by Salomon (28).

Classification of Remote Work Types by Transportation Impacts and Managerial Proximity

At-home overtime generally does not reduce commute travel. (An exception is a case in which the employee would have to drive back to the office after dinner if it were not possible to work from home, but this would not affect peak period travel.) Technically, the work is being done remote from supervision, but this is a situation with potentially little relevance to telecommuting. Overtime work is often a short-term "crunch", with a well-defined product and deadline by which performance will be judged. And with ample opportunity for on-site observation, managers are usually not

reluctant to allow employees (at least, exempt employees) to work at home after they've put in their allotted time at the office as well.

However, there is at least one way in which at-home overtime might lead into telecommuting. Some employers have established financial incentives for their staff to buy home computers, in the expressed or implied hope that the employees will (a) learn or improve their computer skills on their own time rather than the company's, and/or (b) be likely to put in more overtime when they can do it from home. Regardless of the ethics of that strategy, it does provide a technological base and a foot in the door as far as management policy is concerned, for eventual migration to working from home in lieu of going to the office.

Like at-home overtime, *working while traveling* also does not reduce commute travel. And again, it may, strictly speaking, be conducted away from a manager, but experience with it will probably not itself lead an employer to implement a telecommuting program. For one thing, those with the sophisticated tools to work while traveling (carphones, laptops, and so on) often are the managers rather than the rank-and-file. (Field workers are a common exception; they are discussed separately below). For another thing, travel time may not be expected to be used productively. Any ability to do so may be viewed as a bonus rather than the norm, and therefore not subject to the usual management scrutiny. Such expectations may grow, however, as the tools for using that time productively become more ubiquitous.

The *branch office manager* does make a conventional commute trip. It might be argued that the commute is reduced if the branch office is closer to home than the headquarters office, but (a) that is by no means certain to be the case, and (b) it would be valid only if the branch manager actually has the option of working at either place and simply chooses the one with the shorter commute -- an unlikely situation.

Supervision of the branch office manager takes place remotely. This type of remote work has some management parallels to telecommuting. Presumably the office manager and the supervisor set objectives, criteria, deliverables, and deadlines for the work to be accomplished by the branch office, and the office manager's performance is evaluated on how well those objectives and so on are met. Presumably, too, frequent communication takes place between the branch and the headquarters, with performance feedback requested and supplied as needed. These activities are characteristic of well-run telecommuting programs as well.

Field and sales work may or may not involve a reduced commute, depending on whether the trip from/to home is directly to/from a field site or the central office. In many if not most situations, the field worker is still required to report to a central site -- to be dispatched, to complete paperwork, to make phone calls, or simply for one's presence to be recorded -- before and/or after the workday. Some employers are realizing, however, the absurdity of requiring a field worker to drive into the office for a "telephone hour". Los Angeles County's telecommuting program, for example, involves a variety of field workers, including audit staff, welfare fraud investigators, health services inspectors, probation officers, and social service workers (34). Note that these types of occupations are not generally classified as information work.

Field work certainly does involve remote management. It may be argued that performance criteria for many field work jobs are easily quantifiable (number of service calls made, dollar value of sales generated, number of data records gathered), and therefore that managing field work is not comparable to managing an information worker whose performance is more subjectively measured. Without disputing that, some parallels to telecommuting can be observed. The element of trust is involved in both cases. The manager often has no guarantee, for example, that the field worker isn't finishing the "quota" in six hours instead of eight, and idling away the other two hours instead of increasing productivity. Trust may be required in other areas, too, such as the legitimacy of all the contacts reported, or of expense account claims. Ultimately, then, the field work manager must make some subjective assessments of merit just as the manager of a telecommuter does.

Long-distance telecommuting, when it is home-based, eliminates the commute trip. For long-distance telecommuting based in a local office, it is debatable whether the commute is reduced or not. It could depend on whether the office is a nearby telecommuting center or a highrise in the central business district. It could also depend on the likelihood that a different work arrangement would result in a longer commute.

In terms of management, long-distance telecommuting is much like "regular" local telecommuting. Importantly, though, long-distance telecommuting is likely to be full-time, whereas local telecommuting arrangements often involve spending one or more days a week in the primary office. In this respect, the long-distance telecommuter more closely resembles the branch office manager than the local telecommuter.

The salaried employee working at home instead of in the office usually meets the telecommuting criteria of commute reduction and remote management. However, there are two types of gray areas: one relating to commute reduction and the other to remote management. The first potential exception occurs when the alternative to "working at home" is "not working at all", rather than "working in a conventional office". This may sometimes be the case for mobility-limited segments of the population such as the person with a disability, the single parent, the new mother, the institutionalized. In these situations, commute travel is not reduced.

Second, some classes of salaried workers do not have supervisors in the usual sense of the word: university professors, top executives of firms or public agencies, the President of the United States, and so on. Whether or not one refers to work at home by these kinds of people as telecommuting, their ability to work at home is unlikely to influence employers to allow it for their less-privileged types of employees. In each of these special cases, however, as with "regular" telecommuters, the worker is ultimately judged on results, rather than on appearances, time spent in the office, or other superficial measures.

The salaried employee working at a satellite or local center nearer to home than the primary office also fulfills the two telecommuting criteria, assuming the kinds of conditions described in the following section are met. These two categories -- salaried employees working at home or at a center near home -- are, again, considered the "classical" forms of telecommuting.

It is of interest to mention several work types which are not classified as remote, since they do not involve management from afar, but which are related to other remote work forms discussed here.

Branch office staff, as mentioned earlier, are supervised on site. Commute reduction cannot be said to occur, except in the relatively rare cases in which employees are given a choice of working at the branch office closest to their homes.

A related situation is that of *decentralization of an entire business or of a functional unit* (e.g., personnel or data processing) to an outlying area of a region. The effect on commuting is again ambiguous. If the new site were chosen specifically to minimize the average commute of existing employees, then it could be viewed as reducing the commute in most cases. On the other hand, if the site were chosen for primary reasons other than minimizing commute travel, then it is likely to increase travel, at least for existing employees who have already centralized their residential locations around the previous site (35).

Office-based telework (e.g., teleconferencing, on-line data base searches) does not reduce commute travel, but may reduce other kinds of travel. For example, an on-site videoconferencing facility may eliminate the need for some business trips. The ability to interact with remote databases may permit the decentralization of government services, reducing the need for members of the public to travel to a downtown civic center to access those services (see, e.g., 6).

Where do home-based businesses fit in this classification system? *Moonlighting* typically does not reduce commute travel, since it is only a secondary job. For a *primary home-based business*, whether commute travel is reduced depends on whether the alternative is (a) no job, or (b) a conventional job involving a commute. In either type of home-based business, the worker is the owner-manager, so management is, technically, anything but remote. The home-based business owner is, however, working remotely from the customer: the person paying for -- and therefore, broadly speaking, supervising -- the work. In that sense there are some valuable parallels to telecommuting. The customer and the business owner agree on the amount and type of work to be done for the price, and on a schedule for completing the work. Then, the customer judges the final product(s) against the agreement, rather than by ascertaining that the business owner was in the office every day from 8:00 a.m. to 5:00 p.m. Similarly, telecommuters and their managers agree on performance standards, and the work is judged on those standards rather than on physical presence at a desk.

Finally, a similar argument can be made for virtually any *consulting business* that is not on the client's premises. While commute travel is typically not saved, the same aspects of remote management apply as for a home-based business.

Implications of the Classification System

The classification system described above has some implications for the managerial acceptance of telecommuting, and for its usefulness as a transportation reduction measure. First, it is clear that the characteristic of *remote supervision* is not unique to telecommuting. Similar remote management skills are required in familiar types of jobs: managers of branch office managers, supervisors of field workers, and clients of consulting firms. To the extent that this commonality is recognized, telecommuting should not appear to be a radical departure from ordinary ways of doing business. Exploiting that commonality should lead to improved remote management techniques.

Second, the characteristic of *commute reduction* is also not necessarily unique to telecommuting. It was suggested that several other forms of remote work could reduce commute travel, "depending on the alternative". For example, to the extent that a home-based worker would otherwise be making a conventional commute, the transportation impacts of a primary home business are identical to those of full-time telecommuting. Thus, transportation planners should be interested in tracking remote work types other than telecommuting. It will not usually be practical to ascertain whether, for each individual, the alternative to the current work arrangement would in fact reduce commute travel. However, it is possible to monitor and analyze broad trends in work arrangements for their transportation implications.

Specifically, several trends seem especially important from a transportation standpoint:

- o *Home-based businesses (36, 37, 38, 39)*: How many are there now? What is the formation rate? What is the failure rate? How long does a business stay home-based before expanding to a non-home location (thereby causing a commute trip(s))? What are the demographics of home-based business owners, including gender and number/ages of children? What was the nature of the business owner's previous employment, if any, and what is the relationship of the home business to that previous employment (e.g., is the former employer now a client of the home business)?
- o Partial or complete *geographical and/or functional decentralization* of businesses (40, 41): What are the numbers and proportions of jobs involved? Are suburb-to-suburb commute trips shorter or longer on average than suburb-to-CBD trips? What role is telecommunications technology playing in motivating a company to decentralize?
- o *Telework (42)*: To what extent do telework activities replace travel, represent new communication that otherwise would not have taken place, or even induce additional travel?

Reviewing these areas in depth is beyond the scope of this paper; the references given provide some introduction to them.

Finally, even when focusing exclusively on telecommuting, predictions of its transportation impacts will be faulty if too restrictive a definition is used. For example, it has been seen that the universe of potential telecommuters is not limited to information workers, as has been assumed in the past. For another example, more commute trips may be eliminated by the large number of people who are willing to work at home one day a week than by the small number willing to do it full-time. And, the transportation, energy, and air quality implications are different for non-home-based telecommuting than for the home-based form.

TOWARD A DEFINITION OF NON-HOME-BASED TELECOMMUTING

Background

As mentioned earlier, it is expected that the satellite/local work center will ultimately be the most widely accepted form of telecommuting. Work centers are, initially, more difficult and perhaps

more expensive to set up than home-based telecommuting programs, but they have potentially a much broader appeal. For the employer, prospective advantages of a telecommuting center over the home include:

- o a more professional image;
- o an improved ability to deal with security/confidentiality concerns;
- o an increased confidence in the telecommuter's productivity; and
- o a more conventional worker and property liability context.

For the employee, prospective advantages include:

- o adequate space to work, which may not be available at home;
- o minimization of family/domestic distractions, which may not be practical at home;
- o the ability to share equipment, facilities, and services too expensive to maintain in an individual home; and
- o professional and social interaction.

Many personalities and jobs not well-suited to working from home may quite effectively work from a center close to home. Thus, for policies intended to encourage telecommuting, the treatment of non-home-based telecommuting becomes very important.

Regulation XV of the SCAQMD is one such policy. As indicated earlier, Regulation XV includes telecommuting among the ways an employer can reduce peak-period vehicle travel to achieve a specified average vehicle ridership (AVR) target. South Coast Air Basin firms with 100 or more employees at a single site are subject to Reg. XV -- more than 8,000 employers in all. (The South Coast Air Basin includes Los Angeles, Orange, and the urbanized portions of Riverside and San Bernardino Counties).

Giving an employer AVR credit for home-based telecommuting is straightforward: a vehicle-trip has been eliminated. The situation for non-home-based telecommuting, however, is not so simple. In the first place, travel to a telecommuting center would likely involve a vehicle trip, thereby creating significant emissions (a typical five-mile trip generates 61% of the hydrocarbon emissions of a typical 20-mile trip, since a high proportion of the emissions occur during the "cold start", the first few minutes that the engine is running [43]). In the second place, no clear guidelines have been set as to what constitutes non-home-based telecommuting. The AQMD does not want a firm to obtain commute-reduction credit by calling a conventional branch office or a decentralized function a telecommuting center, nor does it want conventional field workers classified as telecommuters.

In the spring of 1990, the AQMD indicated that it was considering granting only partial credit for vehicle trips to a telecommuting center. That is, a company may receive credit for eliminating 0.5 vehicle trips, say, rather than 1 trip. As part of its request for public comment on this proposal, the AQMD invited the Los Angeles-based Telecommuting Advisory Council (TAC) to develop recommendations on both issues: how to grant credit for non-home-based telecommuting involving a vehicle trip, and guidelines for determining what non-home-based telecommuting is.

The TAC is an *ad hoc* group of about 300 individuals from a variety of backgrounds nationwide and abroad, including public agencies and major corporations as well as smaller private firms, consultants, and telecommunications service providers. It was founded in 1985 for the purposes of promoting the adoption of telecommuting where appropriate, and serving as an informational resource on telecommuting. In response to the AQMD's invitation, a Telecommuting Center Subcommittee was formed, and met intensively over a period of several months to develop a set of recommendations. The twelve subcommittee members (including this author) represented public and private sector employers, the central city and outlying areas.

The TAC recommendations to the AQMD fell into three main categories: changes to the AQMD definitions of telecommuting; a policy statement on granting credit for vehicle trips to a telecommuting center; and guidelines or criteria for determining what a telecommuting center is (44). Each of these sets of recommendations is discussed below.

Recommended Definitions

The AQMD had been defining telecommuting as: "Working at home or at satellite work stations using electronic or other means to communicate with the usual place of work" (19). The TAC proposed two changes to that definition. First, it recommended replacing the phrase "satellite work stations" with "an alternate location". Doing so would be more consistent with the nearly-standard terminology that reserves the term "satellite" for the special case of a telecommuting facility occupied by a single employer. Second, it added the phrase, "instead of physically traveling to a more distant work site", to emphasize that reducing travel was essential from an air quality standpoint.

Thus, the proposed definition reads as follows:

"*Telecommuting* is working at home or at an alternate location and communicating with the usual place of work using electronic or other means, instead of physically traveling to a more distant work site."

The AQMD had no definition specifically for non-home-based telecommuting. The TAC proposed referring to these "alternate locations" generically as "telecommuting centers", and provided the following definitions:

"A *telecommuting center* is a site, other than the home, from which the employee works instead of traveling to a more distant central work location. There are several kinds of telecommuting centers:

- "*Satellite work centers* are facilities used for telecommuting by the employees of a single organization. The center can be office space obtained expressly for the purpose of telecommuting, or a portion of space devoted to telecommuting within a conventional branch or local office.
- "*Local or neighborhood work centers* are telecommuting facilities shared by two or more employers. The center may or may not be part of space within an existing office."

Clarifying that a telecommuting center did not have to be a dedicated, stand-alone facility was important. A large employer with multiple sites may be able to set aside a portion of space in some of those locations far more easily and cheaply than acquiring totally new space for the purpose of telecommuting. But the AQMD had been inclined automatically to view everyone at a branch office site as conventional employees. The TAC wanted to emphasize that telecommuting could take place regardless of the label affixed to a particular facility, providing the proposed guidelines were met.

Recommended Policy toward Vehicle Trips to a Telecommuting Center

The TAC recommended giving full trip-reduction credit for trips to a telecommuting center, in the calculation of the average vehicle ridership (AVR) for a given primary site. The AVR is defined as the number of people reporting to a worksite during the morning peak (6:00 am - 10:00 am), divided by the number of vehicles used by those people in the same time period. (Telecommuters are considered to "report to" the primary site, while actually working from home or from a telecommuting center). The higher the AVR the better, so the lower the denominator the better. Giving full credit for a specific employee means incrementing the denominator sum of vehicle trips by zero, instead of by a fraction or the number one. The reasons provided by the TAC for this recommendation are self-explanatory; the entire text of the proposed policy is included here verbatim:

"We suggest that a peak-period commute trip to a telecommuting center receive full credit under Regulation XV when the associated acceptance criteria are met. The number of vehicle trips would be 0 (zero) in calculation of average vehicle ridership. The AQMD currently grants full credit to employees who walk, bicycle, take transit to a telecommuting center or telecommute from home. We recommend that full credit also be granted when an employee drives to a telecommuting center.

"Our reasons are as follows:

1. "When a commuter drives a short distance to rendezvous with a vanpool, carpool, or express bus, the entire trip receives full credit under Regulation XV. The trip to a telecommuting center typically is not longer than the access trip to such a rendezvous point, and the 'line-haul' portion of the trip is eliminated entirely. Trips to telecommuting centers result in a greater benefit to air quality than these two-leg transit/rideshare trips.
2. "Telecommuting centers substantially shorten the commute trip, resulting in a direct reduction in emissions.
3. "Trips to telecommuting centers often avoid the congested, urbanized corridors of the region. This improves traffic flows and average travel speed, thereby indirectly reducing emissions.
4. "Telecommuting centers improve the jobs-housing balance of the region, a policy which the AQMD supports.

5. "The establishment of telecommuting centers is called for in the South Coast Air Quality Management Plan [18].
6. "The AQMD is searching for every reasonable incentive for employers to reduce the peak-period commute travel of their employees. Failure to allow credit for telecommuting centers is, in fact, a disincentive to the establishment of such centers."

Recommended Guidelines for Acceptance

The TAC proposed seven guidelines for determining whether a specific situation was a telecommuting center. These guidelines were designed to assist a company wanting to claim credit for a telecommuting center, as well as AQMD staff who would evaluate the adequacy of a company's transportation demand management program. Some of them apply primarily to a site, some to an employee, and some to both.

The proposed guidelines are presented here, and discussed in the following section:

1. "**Transportation Demand Management (TDM) Programs:** The operation of a firm's telecommuting center should be an integral part of a central office work site transportation demand management program, and monitored accordingly.
2. "**Distance:** An employee's commute to a telecommuting center should result in a reduction of the home to central work site distance traveled.
3. "**Linkage to the Office:** The telecommuter's job responsibilities should be a direct extension of the work normally performed at the central work site within the AQMD's jurisdiction. Results of the work at the telecommuting center should be transmitted or communicated to the central work site and integrated into the central site's work.
4. "**Job Mix:** A telecommuting center may include selected employees from one or more business units of a company. A telecommuting center may include employees from one or multiple companies, government agencies, or business entities.
5. "**Employee Characteristics:** Employees that work out of a telecommuting center can be full-time telecommuters (i.e., use the facilities more than half of the work week or timeframe) or part-time telecommuters (i.e., use the facilities 1 to 2 days a week, on an occasional, or drop-in basis).
6. "**Supervisors:** The full- or part-time presence of a supervisor at a telecommuting center is not a required criterion for defining a telecommuting center. A supervisor may or may not visit the employees at the telecommuting center, or may work from a telecommuting center provided that results in a reduction of the supervisor's commute.
7. "**Telecommuting Employee Population:** As long as all other telecommuting criteria are met by a group of employees of a firm at any telecommuting center, such employees should be considered telecommuters reporting to a central worksite. A telecommuting center,

regardless of the number of telecommuters, will not have a separate employee count or AVR requirement. Non-telecommuting employees that work at the same site will be subject to Regulation XV."

Discussion of the Recommended Guidelines

In general terms, only the first three standards are criteria in the sense of being necessary conditions for receiving telecommuting credit. Note that the first one is administrative, while the second and third relate to the familiar areas of commute reduction and remote management, respectively. The next three guidelines are really explanations that the presence or absence of certain characteristics does not determine whether or not a situation is telecommuting. Each of the guidelines is discussed further below.

The "Telecommuting Employee Population" Guideline

The seventh guideline is a policy statement reinforcing the principle that a telecommuting center should be treated differently than a conventional company facility, even if it happens to be co-located with that conventional facility. For a conventional facility, the employees are viewed as reporting to that site, and any site with more than 100 employees reporting to it is subject to Regulation XV. The AQMD had suggested that if a telecommuting center had more than 100 employees, it too should be subject to Reg. XV as a separate worksite, and should meet the AVR target at that site.

The TAC argued that, by definition, telecommuters report to a different location, and are contributing to improving the AVR at that primary site. Requiring them to do even more would be a double standard that other strategies for trip reduction do not have to meet. The issue becomes especially important when the AQMD lowers the applicability threshold to 50 or even 25 employees at a single site (as is called for by the AQMP within the next few years).

The "Supervisors" Guideline

The sixth guideline, "Supervisors", may require a little explanation, in view of the previous emphasis on remote management. It was intended primarily to deal with the exceptional case in which an employee and supervisor were both telecommuters, and happened to live close enough to each other to be using the same telecommuting center. Assuming the supervisor had other staff at the primary office and/or at other telecommuting centers, the principle of remote management would still hold.

However, there was also the desire on the part of some TAC subcommittee members to explicitly include another type of special case. Consider a situation in which a company establishes, say, a small telemarketing unit in an outlying part of the region. Suppose, for the sake of argument, that the unit is an expansion of a larger, existing telemarketing section that remains at the primary office. Existing employees are assigned to the new unit only if they live nearby, and any new employees are drawn from the local (not regional) labor market. The company wants to have a supervisor manage the new unit, and transfers or hires someone who also lives nearby. Under the guidelines given above, this unit could qualify as a telecommuting center.

It is this author's contention that such a situation should be classified as a form of functional decentralization rather than telecommuting. It may still be beneficial from an air quality standpoint, it may still be desirable to encourage this kind of location activity (as current air quality regulations do not) -- but without the element of remote supervision, it seems a corruption of the concept to label it "telecommuting".

The "TDM Programs" Guideline

A comment on the first criterion ("TDM Programs") is that it deliberately excludes informal or *ad hoc* non-home-based telecommuting from qualifying for Regulation XV credit. The intent, consistent with AQMD's intent for other TDM strategies (including home-based telecommuting), is to force an employer (a) to proactively plan to achieve transportation improvements, and (b) to be public and accountable about transportation-related company policies. Thus, a side benefit of Reg. XV for telecommuting advocates is that firms are beginning to document and formalize the *ad hoc* telecommuting that has been there all along.

However, it should be understood that the TDM criterion is a somewhat artificial constraint on what constitutes telecommuting. *Ad hoc* arrangements have been, and will probably continue to be, a non-negligible proportion of the telecommuting universe. In Southern California, for example, an annual commuter survey based on a random sample of 1,254 completed telephone calls (45, p.iii) found that "[t]en percent of the respondents claim they have the opportunity to work at home instead of their regular place of work... Sixteen percent of the respondents say they have the opportunity to work at an alternative work site instead of going to their regular place of work" (the two groups are not mutually exclusive). These proportions are far higher than the number and size of formal telecommuting programs alone would suggest.

The "Employee Characteristics" Guideline

The fifth guideline, "Employee Characteristics," states that employees can telecommute from a center full-time or part-time. There was some deliberation among the TAC subcommittee members as to whether a telecommuter should be expected to physically report to the primary office with some regularity (e.g., at least once every two weeks). Such a requirement would help distinguish telecommuters from branch office workers (see discussion below). On the other hand, mandating a physical trip to the primary office every two weeks would mean that at most 90% of the work trips could be reduced, rather than 100%. It seemed inappropriate for an air quality agency to impose a restriction that decreased the trip reduction that could be achieved. Thus, it was ultimately decided to leave such policies up to the individual firms involved.

The "Linkage to the Office" and "Job Mix" Guidelines: Distinguishing among Telecommuting Centers, Branch Offices, Field Sites, and Decentralized Functions

Perhaps the weakest of the guidelines is the third, "Linkage to the Office." It fails to adequately distinguish a telecommuting center from a branch office, field site, or decentralized function. In all four cases, a job could be construed to be a "direct extension of the work normally performed at the central work site," with results "transmitted or communicated to the central work site ..." As seen

above, the location of the supervisor is not helpful in making the distinction. If the supervisor is off-site, it may be assumed that the facility is not a branch office or decentralized function, but it could certainly be a field location, for which the supervisor would almost always be off-site. And having an on-site supervisor may mean it's probably not a field location, but it doesn't automatically exclude the facility from being a telecommuting center, in the case where a telecommuting supervisor lives close enough to a telecommuting worker to use the same facility.

How, then, can we distinguish among telecommuting centers, branch offices, field locations, and decentralized functions? Two additional guidelines are proposed. First, consider the *difference between telecommuting and field work*. Telecommuting is location-independent: it can be performed anywhere there are, at most, the same facilities available as in the primary office (and can often be performed with less sophisticated facilities). Field work, on the other hand, is by definition location-dependent: it must be performed at a specific location because of properties intrinsic to that location (e.g., because that's where the customer is, or the equipment to be serviced, or the unit to be audited, or the activity on which data are being collected).

To rephrase this distinction in the form of a guideline (actually a criterion):

- A. **Location-independence:** Work done at a telecommuting center should be capable of being performed anywhere there are, at most, the same facilities available as in the primary office. It should not have to be performed at a specific location because of properties intrinsic to that location.

Second, the main *difference between a telecommuting center and a branch office or decentralized function* seems to be that of organizational structure. Both of the latter two forms generally have a pyramidal structure, with a well-defined hierarchy of reporting. The structure is normally self-contained, meaning that everyone under the top person in the pyramid is on-site. Employees work at that site because of their place in the organization, regardless of residential location.

A telecommuting center, on the other hand, has no intrinsic organizational structure. Telecommuting staff typically report to off-site managers, and telecommuting managers typically have off-site staff reporting to them. Functional units are fragmented, and telecommuting center employees are often working for a variety of company departments (and/or a variety of companies), unrelated to each other. Employees work at that site because of residential location, regardless of their place in the organization. Figure 3 illustrates the distinction between conventional and telecommuting organizational structures, where, in the lower half, "the site" refers to the telecommuting center, not the primary work site.

The "Job Mix" guideline was intended to acknowledge that difference in organizational structure as typical, but it falls short of identifying it as a distinguishing feature between telecommuting centers and other types of facilities. The specific wording was adopted as a compromise between those who wanted the case in which an on-site manager supervises a locally-hired unit to qualify as telecommuting (as discussed under the "Supervisors" guideline) and those who did not. Here, the following stronger criterion is proposed:

- B. **Organizational Structure:** A telecommuting center is characterized by the absence of a self-contained pyramidal organizational structure. Telecommuting staff should report to off-site managers (except in the case where both manager and staff reduce their commutes by working at the same telecommuting center), and telecommuting managers should have at least one off-site staff person reporting to them.

It is worth mentioning that another guideline was discussed by the TAC subcommittee, one dealing with the concept of choice. It was suggested that a facility should be classified a telecommuting center only if an employee could choose between working there or at the primary location, whereas an involuntary assignment to a specific site would suggest a conventional employment arrangement.

It is especially necessary for home-based telecommuting that participation be voluntary (for both the employee and the manager). However, the group as a whole felt that this principle did not hold as strongly for non-home-based telecommuting. A company that makes a substantial investment in a telecommuting center would want to ensure that it is used, and may well choose not to maintain office space for the same employee at both the primary site and the telecommuting center. Thus, some requirement on use of the center might legitimately be imposed. As long as the other guidelines were met, it seemed that such a use should still qualify as telecommuting. Accordingly, a "choice" guideline was not adopted.

The "Distance" Guideline

Finally, it is useful to document the debate that took place surrounding the second of the seven guidelines, "Distance." Early discussions centered on requiring a certain proportion of the commute trip distance to be eliminated to receive full credit for a trip to a telecommuting center. As a precedent, there is an unwritten "rule of thumb" that at least 70% of the commute trip length should be in a bus, van, or carpool to receive full credit as a ridesharing or transit trip under Regulation XV.

On the other hand, some members of the group felt that it should not be an "all or nothing" proposition. For very long commutes, the absolute number of miles saved should be considered, even if the 70% (or some other arbitrary) threshold were not met. For example, suppose a worker lived at Lake Arrowhead in the San Bernardino Mountains and commuted to Fullerton in Orange County, about 80 miles away (by no means unheard of for Southern California). If a telecommuting center were established in Riverside, about halfway between Lake Arrowhead and Fullerton, the employee should get credit for eliminating the 40 most highly-congested miles of the commute, even though it was only 50% of the total distance.

This position turned out to be controversial. Other members of the group felt that such long-distance commutes should not be encouraged at all, because they may contribute to urban sprawl and to degradation of the quality of life in small resort communities. Eventually, it was decided to opt for simplicity, which led to the unelaborated concept of distance reduction quoted above. As a fallback option (that is, if the AQMD were unwilling to grant full credit for proportionately small distance reductions), an alternate guideline was prepared but not presented to AQMD. This guideline would grant partial credit to commute reductions of less than 70%:

"... If an employee saves 70% or more on vehicle miles traveled (VMT), then that employee will be given full credit as a telecommuter for the days during which the employee travels to the telecommuting center, for Regulation XV average vehicle ridership survey purposes. If an employee saves less than 70% on vehicle miles traveled, then credit will be given in direct proportion to the vehicle miles saved (e.g., 50% VMT saved will equal 0.5 telecommuter credit for that employee)."

Outcome of the Telecommuting Advisory Council Proposal

At the time of this writing, the AQMD has not issued a formal response to the TAC's proposed definitions, policy, and guidelines. In one sense, there was not a need for urgency, as few or no companies had claimed credit for telecommuting centers in their Transportation Demand Management plans (any that do are dealt with on a case-by-case basis). However, that is perhaps a self-perpetuating phenomenon: companies will be reluctant to establish telecommuting centers when it is not clear how they will be treated under Regulation XV. Thus, the AQMD could have an important catalytic effect by adopting some set of guidelines and publicly supporting telecommuting centers as an appropriate element of a TDM plan.

In the meantime, the definitions and policy proposed by the Telecommuting Advisory Council have been formally endorsed by the Southern California Association of Governments (46) and the Riverside County Transportation Commission (47).

SUMMARY

This paper clarifies the definitions of telecommuting and its various subforms. It suggests that telecommuting is only part of the universe of remote work types, and is often confused with other members of that universe. Based on the etymology of the word "telecommuting", two simple criteria are proposed for determining whether or not a form of remote work is telecommuting: (a) Is there remote supervision? and (b) Is the commute trip reduced? Under these two criteria, it is argued that telecommuting need not require a computer, or even, in the strictest sense, telecommunications on every occasion; and need not involve an "information worker" (although it will usually involve "information work").

The case is also made for learning from related forms of remote work. Forms that involve remote supervision can provide insight into the management of telecommuters (and vice versa), and forms that involve commute reduction should not be overlooked by transportation planners.

This paper further reports on progress made "Toward a Definition of Non-Home-Based Telecommuting", or telecommuting centers. The Telecommuting Advisory Council proposal to the South Coast Air Quality Management District is presented as an important first step toward the acceptance of telecommuting centers as a useful strategy for reducing peak period travel and improving air quality. Perhaps the most valuable contribution of the TAC proposal is its set of guidelines for determining what constitutes non-home-based telecommuting. The seven original guidelines (numbered 1 through 7) proposed by the TAC are augmented in this paper by two

additional guidelines (labeled "A" and "B"), designed to help distinguish telecommuting centers from field work sites, branch offices, and decentralized functions.

We have gotten further "toward" defining telecommuting centers; it is not clear that we are "there" yet. It is likely that definitions, policies, and guidelines will continue to be refined as additional empirical experience with telecommuting centers is gained. It is hoped that documenting the process undergone in one part of the United States will benefit other areas seeking to encourage the adoption of telecommuting as a transportation/air quality strategy.

ACKNOWLEDGEMENTS

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TELECOMMUTING

satellite work center
neighborhood work center

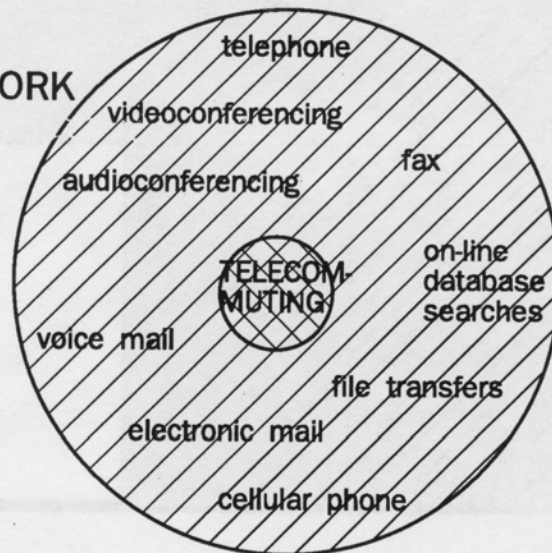
work-at-home
telecommuting

primary home-based businesses
home-based moonlighting
at-home overtime

WORK AT HOME

Telecommuting ≠ *Work at Home*

TELEWORK



Telecommuting ≠ *Telework*

FIGURE 1
Telecommuting and Related Work Types

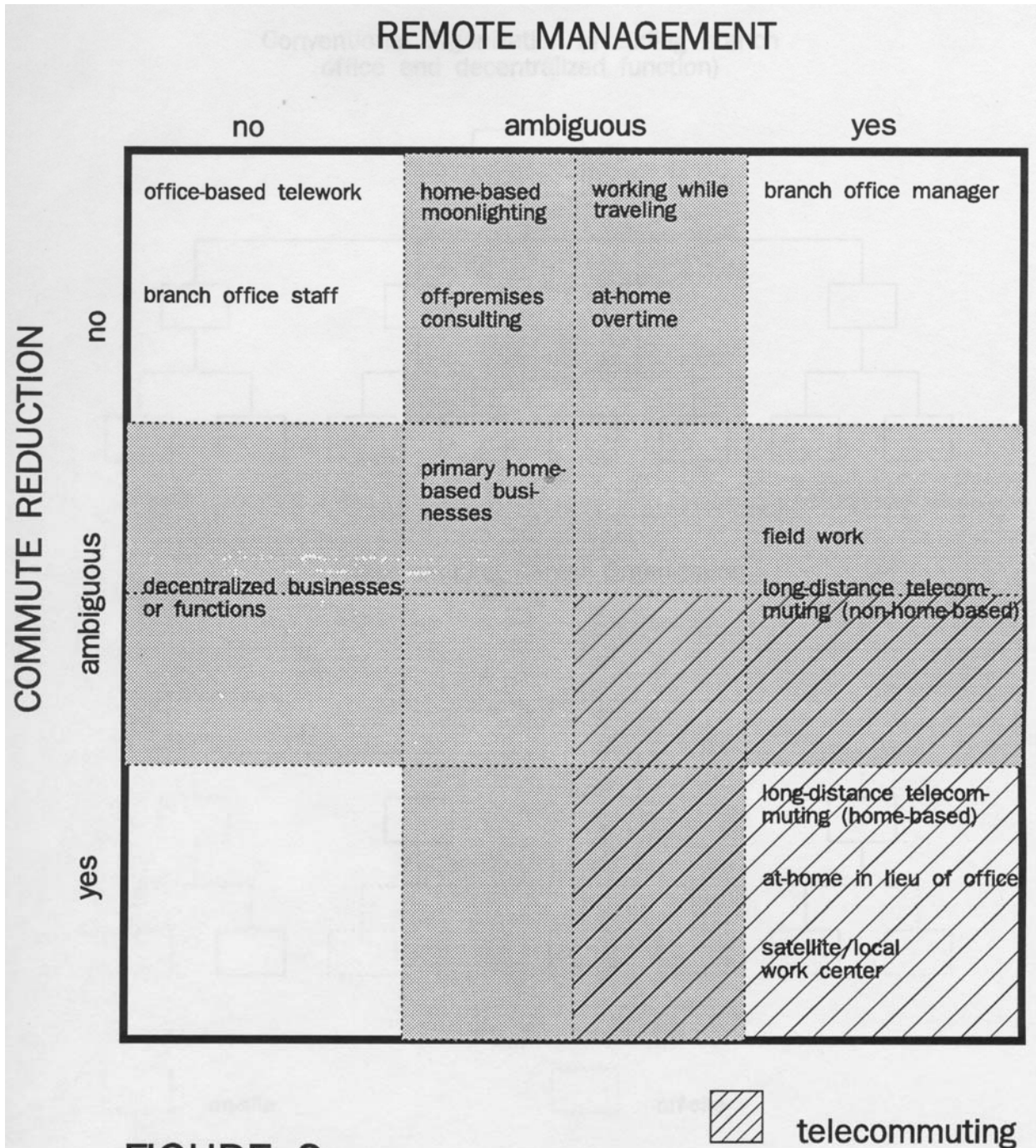


FIGURE 2

Classification of Remote (and Related) Work Types

