

# **Which telework? Defining and testing a taxonomy of technology-mediated work at a distance**

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**Abstract:** Telework has been the subject of study for more than a quarter century, yet its causes and consequences are poorly understood. A key reason for this shortcoming is that scholars define and use the concept in many different ways. This article presents a taxonomy of telework, distinguishing between three distinct forms: fixed-site telework, mobile telework, and flexiwork. It then offers a series of research questions about the associations between these three types of telework and a variety of other factors. Using data collected in a national telephone survey of more than 1,200 U.S. computer-using workers, we demonstrate empirically that the three types of teleworkers are unique along key dimensions regarding their individual characteristics, organizational and technological contexts, and the impacts on their work.

**Keywords:** telework, telecommuting, home-based work, mobile work, taxonomy, information and communication technologies (ICTs)

## **Introduction**

In the three decades since Nilles (1975) first articulated the concept of “telework,” this activity has emerged as a significant feature of the global work environment (Bailey & Kurland, 2002; Ellison, 1999; Haddon & Brynin, 2005) and has been linked to a broad array of outcomes (Baruch, 2000; Pinsonneault & Boisvert, 2001; Wellman et al., 1996). Telework occurs when workers’ use of information and communication technologies (ICTs) enables them to substitute remote work for work in the same location as their colleagues, employers, or customers. Broadly speaking, telework is work that relies on technology-mediated communication and sophisticated information processing capabilities instead of colocation for the production and delivery of work outputs (Qvortrup, 1998).

As the body of research on telework has grown, so have the number of definitions of this activity. It is evident in the research that the term is now used to refer to several related but distinct phenomena. Different definitions can lead to inconsistent conclusions, as when scholars attempting to address the same questions--for example, how prevalent is telework?; what are its consequences?--use different criteria to define the phenomenon of interest (Bailey & Kurland, 2002; Mokhtarian, Salomon, & Choo, 2005; Qvortrup, 1998). Establishing a clear and consistent definition that is precise enough to be useful is a difficult and controversial task (Davis & Polonko, 2003; Sullivan, 2003).

One approach is to accept a broad definition of telework, and then to specify a series of more narrowly defined subcategories, each corresponding to a distinct subtype. This article offers such a taxonomy of telework in varying contexts, and it also provides

an empirical exploration of telework among contemporary American workers. First, we review the ways in which telework has been defined. The literature provides the basis for our taxonomy and also for a series of research questions intended to explore key differences amongst telework types. Second, we briefly outline our research methodology, describing the sampling strategy and the empirical survey data on which the analyses are based. Third, we analyze these data to demonstrate that we can distinguish empirically among teleworkers engaged in three different types of telework: (1) those whose remote work is from the home or in a satellite office; (2) those whose telework is primarily in the field; and (3) those whose work is “networked” in such a way that they regularly work in a combination of home, work, *and* field contexts. Our analyses suggest that workers in each category are unique along several dimensions and that the different types of work are associated with different assessments by workers of their work environments. Finally, we conclude with a discussion of some implications of these results.

### **Theoretical framework**

There are four dimensions that emerge in the many definitions of telework (Bussing, 1998; Haddon & Brynin, 2005; Sullivan, 2003). The first dimension regards *work location*. Telework is work that occurs somewhere other than a centralized organizational office. Workers supplant or supplement time in the office with time in other locations, such as a home, field site, or a satellite office. The second dimension is the importance of *information and communication technologies (ICTs)*. In most current definitions, out-of-office work activities must be technologically mediated in order to be

considered telework. *Locational time distribution* is the third dimension. Early scholarship focused on full-time teleworkers--that is, those whose work in other locations entirely replaced their office work (in which case the dimension is equivalent to work location). Contemporary research, however, tends to include in the category of teleworker those individuals who regularly spend a significant portion of their work time in other locations but who also work from a central office. Finally, the fourth dimension is the *contractual relationship* between worker and employer. Distinctions among different types of telework are sometimes based on whether workers are regular employees, self employed, or contract workers.

Many of the disparities regarding the concept of and empirical findings about telework are associated with different decisions regarding whether and how to include each of these four dimensions. It is rare for an analysis of telework to consider all four dimensions. Moreover, further disparities in the research are related to differences in defining thresholds for these dimensions (Gareis, 2002; Haddon & Brynin, 2005; Qvortrup, 1998).

In the face of these issues, researchers have begun to recognize the need to focus on how people telework, treating different kinds of telework activities separately. There have been proposals regarding how to distinguish between various forms of telework based on one or more of the four dimensions described above. Ideally, there should be a conceptually guided and empirically validated set of categories that are mutually exclusive--key elements of a strong taxonomy. This ideal has not yet been achieved. For example, Fritz et al. (1995) describe telework in terms of its spatial, temporal, and coordination structures. Although these dimensions are carefully defined, they are not

integrated into a single, coherent taxonomy. Peters et al. (2004) define four separate categories: home-based teleworkers, multi-site teleworkers, freelance teleworkers, and part-time “supplementary” teleworkers (see Table 1). However, they focus exclusively on home-based teleworkers in their analyses, and the empirical validation of the specific divisions proposed is not explored.

[Table 1 about here]

Qvortrup (1998) addresses the need for a taxonomy directly, suggesting that for many analyses it may be appropriate to divide telework into three distinct subcategories based on work locations and organizational affiliation. Table 2 displays his three types. Electronic homeworking refers to work conducted exclusively from home without a traditional employer-employee contract. This is similar to the “freelance teleworker” category proposed by Peters et al., but it is explicitly limited to work done from the home. For Qvortrup, telecommuting is remote work that is carried out for an employer from a variety of locations, including the home or a satellite work center. Flexiworkers are highly mobile, career-oriented individuals whose use of computer technology enables them to work “anytime, anyplace.” Such categories are promising, but they do not cover all types of telework. In particular, the category of flexiworker seems overly broad: it includes quite different configurations of work locations and it does not distinguish on the contractual dimension.

[Table 2 about here]

Based on the ideas and frameworks summarized above, we suggest a taxonomy for distinguishing types of teleworkers. The definition of telework that we adopt requires

that out-of-office work activities be supported by ICTs that provide a rich information/communications environment enabling the performance of complex information processing tasks.<sup>1</sup> Our emphasis on the centrality of ICTs relates to the significant debate over which technologies are essential to telework. Some scholars argue that work away from the office must be supported by computer technologies, others hold that a telephone is sufficient, and a few have suggested that any means of information exchange (for example, a bike courier) is adequate (see Sullivan, 2003 for a review).

We recognize that work at home or away from a traditional office by information workers predates the widespread use of work-related ICTs, but view telework as unique. In order to constitute telework, the technologies employed must reproduce, at a distance, significant aspects of the centralized work environment, providing access to necessary information resources while supporting multiple modes of information manipulation (e.g., browse/search, edit, calculate, etc.) and/or exchange (e.g., voice, text, images, etc.). In this view, doing computer-supported work at home or in the field, whether networked or not, or accessing work-related information via a web-enabled phone while away from the office meets our ICT-use criterion for telework (but taking paperwork home, using a courier service, or calling the office via a mobile phone do not). Defining telework in terms of these modalities provides a reasoned basis for foregrounding the ICTs that have become a central element of most contemporary telework definitions.

In our taxonomy, the various types of teleworkers are differentiated by their patterns on two dimensions: (1) their contractual relationship with the employer; and (2) locational time distribution. The first dimension distinguishes workers who are employees of an organization from those who are not -- contract workers or the self-

employed -- whom we characterize generally as “freelance” teleworkers. In some circumstances it might be useful to distinguish between these two forms of freelance work, as the groups might differ in some important ways. The aim of this article, however, is to demonstrate the value of a framework based on broad worker categories, so our analysis combines the groups. The second, and more critical dimension is based on the pattern of work locations: (1) those who do some work at home or in a satellite office, whom we term fixed-site teleworkers; (2) those who work predominantly in the field, whom we term mobile teleworkers; and (3) those who mix office work with work in the home *and* in the field, whom we term flexiworkers. The resultant taxonomy is shown in Table 3.

[Table 3 about here]

One key feature distinguishing this taxonomy from most prior ones is the decision to treat telework occurring in the field as distinct from telework that occurs at fixed locations away from the office, particularly at home. This decision reflects the fact that significant numbers of workers regularly use computers to complete tasks on the road or by/on customers’ premises instead of returning to their offices (Gareis, 2002; Haddon & Brynin, 2005; Hill, Hawkins, & Miller, 1996; Kurland & Bailey, 1999; Lindstrom, Moberg, & Rapp, 1997; Stanworth, 1998).

There are two potential distinctions by which we do *not* attempt to divide teleworkers in our taxonomy. First, the taxonomy does not distinguish between telework that substitutes for and telework that supplements work in the office. For example, the group we term fixed-site teleworkers includes both traditional telecommuters--individuals

who work at least one full day a week without traveling to a central office--and those who work out of the office for shorter intervals or after hours. Some fixed-site teleworkers choose to substitute work from home for work in the office for just a few hours in order to avoid interruptions. Others use the capabilities afforded by new ICTs to complete the extra work from home rather than arriving to the office early or staying late (Venkatesh & Vitalari, 1992). Such part-time or supplemental telework constitutes an important form of technology-mediated remote work (Bailey & Kurland, 2002).

Though supplemental and substitute work from home differ, research suggests that these teleworkers' experiences are comparable. Telecommuters, who typically only stay home one or two days a week, and supplemental teleworkers, who spend most of their work day in the office, tend to have comparable access to social networks and resources, to face similar levels of managerial supervision, and so on (Bailey & Kurland, 2002). Substitute and supplemental teleworkers are distinct from office workers, however, by virtue of their more prominent and more fluid out-of-office work patterns. We do not wish to suggest that substitute and supplemental telework are indistinguishable; rather, we argue that at the level of this taxonomy, it is reasonable to consider them together.

Second, the taxonomy does not distinguish telework by its influence on commute time. This distinction is fundamental to definitions of *telecommuting*, and it is a crucial concern in the transportation planning literature (*JALA International: Telework definitions*; Mokhtarian, 1991; Nilles, 1975). Transportation planners clearly need to distinguish among teleworkers who work at home in order to eliminate a commute, those who work at home part of the day to avoid peak traffic travel, and those who work

at home before or after hours, experiencing no change in their commute patterns. For purposes of generating a broadly applicable taxonomy, however, we have opted not to treat this as a defining characteristic of telework.

Most prior telework taxonomies have not been tested empirically. Providing an empirical analysis of the types of teleworkers we propose in Table 3 is a central objective of this article. This empirical analysis focuses primarily on analyzing the differences between the organizationally-affiliated telework types, and it does not examine freelance telework in detail. This latter exclusion is necessary because, as we report below, freelance teleworkers currently constitute a very small proportion of our national sample of computer-using workers and the number of cases in each type ranges from 36 to only 18. Ultimately, a full empirical assessment of our taxonomy should consider the three freelance forms of teleworkers in the same manner as we analyze organizationally-affiliated teleworkers in the remainder of this article.

In the subsequent sections, we demonstrate the utility of the three organizationally-affiliated subcategories of teleworkers in two stages. First, we compare *characteristics* of the individuals, their organizations, and their technological capabilities across the three teleworker types in order to assess whether the groups are distinct. Second, we explore differences in the *consequences* on work of the three forms of telework by comparing workers' perceptions of their work environments.

## **Characterizing teleworker types**

Our approach is to examine whether there are statistically significant differences between fixed-site teleworkers, flexiworkers, and mobile teleworkers in terms of individual worker characteristics, organizational context, technological context, and work environment impacts. Since there is limited empirical research to guide the formulation of hypotheses we propose a series of research questions that are informed by existing research and that we can test empirically. This analysis should help to clarify both the validity of the taxonomy and help to lay the foundation for future research.

### **Individual characteristics**

There is reason to expect that individual characteristics might differ across types of telework. First, research has shown that individuals who are allowed by their employer to work from home using ICTs are a select group who tend to be especially well educated (Gareis, 2002; Haddon & Brynin, 2005; Peters, Tijdens, & Wetzels, 2004). In contrast, some evidence suggests that mobile telework is often deployed as part of a systematic effort to automate work in the field, in which case those engaged in mobile telework would not necessarily differ from their non-teleworking peers with regard to education (Gareis, 2002).

Second, professional status might influence workers' opportunity to telework. The opportunity to participate in fixed-site telework might serve as a perk for employees in the higher status occupational categories, affording them greater flexibility and autonomy (Bailey & Kurland, 2002). In contrast, however, technology-supported clerical work

conducted from home tends to be dominated by low-status workers (Kraut, 1989; Olson & Primps, 1990). Either way, mobile teleworkers and flexiworkers might represent a more diverse range of occupations, since there are reasons inherent in the tasks associated with their jobs that might lead the organization to see productivity advantages in allowing mobile telework and flexiwork across a broader range of occupations.

Third, workers' ages have historically been negatively correlated with telecommuting adoption. It is not clear, however, that this remains true among mobile teleworkers or flexiworkers. For example, age should not influence mobile telework adoption if this practice is the result of an organizationally-driven transformation of work routines.

Finally, research has yielded inconsistent results regarding gender and telework adoption, with some studies showing teleworkers to be predominantly female, other suggesting that they are predominantly male, and still others claiming that there is no relationship between gender and telework (Bélanger, 1999; Peters, Tijdens, & Wetzels, 2004). Given the disparity in these results, we consider the possibility that gender distributions will differ across telework types.

Our objective is to determine whether the group differences suggested by the existing literature are significant in the context of a single study. The following broad research question addresses this issue:

- RQ1.*** *Are there significant differences among fixed-site teleworkers, flexiworkers, and mobile teleworkers in terms of workers':*
- a. educational attainment,*

*b. patterns of occupational classification,*

*c. age,*

*d. gender?*

### Organizational characteristics

Changing organizational structures have been credited with creating an environment that is more conducive to telework, facilitating new styles of control and forms of incentives that are especially compatible with fixed-site teleworking (Peters, Tijdens, & Wetzels, 2004). Organizational infrastructure can also be an important factor influencing the uses of ICTs for work. For example, it is often assumed that digitized information plays a more significant role in organizations that are larger and more complex. We might infer that, for similar reasons, certain types of telework will be more common in larger, more complex organizations. It is also possible that the sophistication and extensiveness of an organization's technical infrastructure will influence each type of telework differently. For example, technically-sophisticated companies may be particularly conducive to telecommuting and other fixed-site telework. These aspects of the organization's information technology environment will be measured by the extent to which the organization is perceived to be more innovative in using ICTs, the extent to which the organization has become "paperless," and worker's ability to remotely access networked information resources.

**RQ2.** *Are there significant differences among fixed-site teleworkers, flexiworkers, and mobile teleworkers in terms of their organization's:*

- a. size,*
- b. complexity,*
- c. innovativeness,*
- d. extent of “paperless” information,*
- e. provision of networked electronic resources?*

### Work Outcomes

We also suspect that individuals engaged in different types of telework have different experiences regarding their work environment. Research suggests that fixed-site teleworkers and flexiworkers experience telework as an opportunity and a discretionary resource, affording them enhanced influence over other workers and increased job satisfaction (Duxbury & Neufeld, 1999; Hill, Hawkins, & Miller, 1996; Salaff, 2002). In contrast, mobile teleworkers might perceive telework more as a means of enhancing productivity and increasing managerial control of their work. Thus, in comparison to fixed-site teleworkers and flexiworkers, mobile teleworkers might report relatively lower levels of job influence and job satisfaction, even as they attribute relatively higher productivity gains to their use of ICTs.

It is also possible that flexiworkers and especially fixed-site teleworkers will report higher levels of job pressure, since their work now follows them into the home and other work settings (Dimitrova, 2003; Salaff, 2002, p. 491). These patterns are expected

to be less evident among mobile teleworkers, since telework for them might represent automation and routinization of existing work processes.

- RQ3.** *Are there significant differences among fixed-site teleworkers, flexiworkers, and mobile teleworkers in terms of their levels of:*
- a. computer-based monitoring,*
  - b. influence over their job,*
  - c. job satisfaction,*
  - d. productivity,*
  - e. job-related stress?*

### **Methods and descriptive data**

To examine the differences among the various teleworker types, we use data collected in a national telephone survey of computer-using workers conducted in 2004. We contacted individuals living in 12 metropolitan areas in the United States, and we limited participation to individuals who work at least 30 hours per week and spend at least five of those work hours using a computer. (See Appendix A for more information about the survey methodology.) The 30-hour threshold was selected so that we could focus on full-time, computer-using workers, a valuable and important sample for distinguishing among the different types of telework. The data do not, however, provide representative descriptive statistics regarding the prevalence of telework nationally, since

they exclude part-time workers (as well as those who do not use computing to a notable degree in their work).

Table 4 provides some basic descriptive data about the 1,202 respondents. Most respondents are between the ages of 35 and 55, with a median age of 44 years old. The majority of respondents have high levels of educational attainment: two-thirds (67.6%) are college graduates. In terms of occupation, nearly two-thirds of respondents are classified as either professionals (39.4%) or management/business/financial (24.5%). Our respondents report using computing in their work for an average of 36 hours per week. Thus they are generally individuals who are likely to make extensive use of information in their work.

[Table 4 about here]

The central concern of this article is to establish a definitional framework of telework and its various sub-categories. For purposes of this analysis, we operationalize teleworkers as those who spend at least 10% of their work time using a computer while working somewhere other than the office. Our operationalization is unique in that it does not explicitly require that respondents substitute work out of the office for work in the office. Rather, we identify those who spend a substantial amount of out-of-office work time using computers and thus seem to be engaged in some form of telework. (It is also worth noting that shifting the threshold of computing use outside the office to a level higher than 10% does not substantially alter the results reported below).

Our taxonomy posits that teleworkers are appropriately categorized on the basis of both the worker's contractual relationship with an employer and also the proportion of

time spent in each location in which the remote work occurs. In addition to the 10% out-of-the-office threshold for telework, *fixed-site teleworkers* must work in the home or split their time between the home and the office. Fixed-site teleworkers spend more than 90% of their time working in these two locations. *Mobile teleworkers* are defined as those who spend more than 90% of their time in the field or split between the field and an office. *Flexiworkers* are teleworkers who spent at least 10% of their work time in each of three work locations: the office, the home, and the field.

We are not arguing that other scholars should embrace these thresholds, since there might be compelling reasons to select thresholds appropriate to their research interests or to treat the extent of remote work as an important variable. (For a discussion of these ideas, see Bailey & Kurland, 2002; Sullivan, 2003). Nevertheless, to operationalize the concepts for our purposes it is necessary to establish boundaries between the various telework types.

Table 5 indicates that, according to our general definition of telework, about one in three computer-using workers (32.4%) is engaged in some form of telework. Note that this is a higher proportion of teleworkers than one would find in a sample of all American workers, because we analyze only those who use computers at least five hours per week in their jobs. A number of private sector organizations have collected data on the prevalence of telework, providing a useful point of comparison, although it is not always clear how telework has been defined in these surveys (see Mokhtarian, Salomon, & Choo, 2005 for a detailed discussion of this issue). Among recent studies, a national random sample telephone survey conducted in 2001 estimated that about one in five working Americans was a teleworker (Davis & Polonko, 2001, 2003). A consumer

survey conducted in late 2005 suggested that about 16.4% of the Americans used a computer to work from home at least once a week (Smith, 2005).

Data collected by the U.S. Bureau of Labor Statistics (*Work at home in 2004*, 2005) provides another point of comparison, indicating that one in six (15.1%) of all U.S. workers (non-agricultural) works at home at least once a week, irregardless of their use of a computer. In contrast, more than one in three (37.5%, not shown in table) of the respondents in our sample did some work from home (only some of whom are classified as teleworkers). BLS data also indicate that one in twenty (5.1%) self-employed Americans regularly works from home, whereas about one in nine self-employed workers (11.5%, not shown in table) in our sample works from home. In sum, the BLS data further demonstrate that out-of-the-office work, which includes the various forms of telework, is more prevalent in our sample of computer-using workers than it is among all workers.

[Table 5 about here]

Given our classificatory framework, about one in nine workers in our sample is a fixed-site teleworker, slightly less than one in eleven is a mobile teleworker, and one in twenty is a flexiworker. Do teleworkers differ from their non-teleworking colleagues? (Recall that all those in our analysis are full-time, computer-using workers). There are several patterns worth noting (see Table 6). Fixed-site teleworkers and flexiworkers are both more highly educated than office workers: about four in five of these teleworkers hold a college or graduate degree, compared to only three in five office workers. There is also a higher proportion of males among every form of telework in comparison to the

proportion of males among non-teleworkers. Turning to total work time, teleworkers, who average close to 50 hours a week, work longer hours than office workers, who average less than 45 hours. As we would expect, members of all three teleworking groups spend significantly less time in the office than their non-teleworking peers, who spent an average of only 3% of their work time out of the office. In contrast, fixed-site teleworkers spend about a third of their work time out of the office, while mobile workers and flexiworkers spend slightly more than half their time out of the office. All three teleworker types also use computers substantially more than the 10% inclusion threshold, with fixed-site teleworkers spending almost one-third of their total work time using the computer at home, and mobile and flexiworkers spending half of their working hours using a computer out of the office. All the differences between teleworkers and their non-teleworking colleagues described in this paragraph are statistically significant.<sup>2</sup>

[Table 6 about here]

The concept of telework seems more slippery for those using computing primarily in the field, since it is possible that ICT use mainly serves to automate existing work processes, and it is unclear how strongly ICT-supported work is linked to changing work locations. However, the data suggest that our classifications are reasonable. Among those who work in the field, mobile teleworkers spend an average of 46% of their work hours in the field engaged in remote computing activities, considerably more than the 10% required by our definition. In contrast, those field workers who are not classified as teleworkers average less than 2% of their work hours in the field using computing (see Table 6). Even more persuasive is that fact that mobile teleworkers spend a significantly higher proportion of their work hours out of the office than other field workers--58%

versus 42% (t-statistic = 3.478,  $p < .01$ )--despite a similar distribution of occupations between the two groups ( $\chi^2 = 4.371$ , NS). This suggests that these mobile teleworkers' more extensive use of computers allows them to conduct some work in the field that would otherwise occur in a traditional office.

## **Findings**

### Individual characteristics

Do the different types of teleworkers differ with respect to their individual characteristics? Data addressing this first research question are presented in Table 7. (The wording of survey items for these and other variables of interest is included in Appendix B.) Although mobile teleworkers appear to have less education on average than either fixed-site teleworkers or flexiworkers, these differences are not statistically significant. Similarly, age does not differ significantly across the three types of teleworkers.

There is, however, a highly significant pattern of occupational differences among the teleworker types. Fixed-site teleworking is most prevalent among professionals, who constitute nearly three in five fixed-site teleworkers. In contrast, only about two in five flexiworkers are professionals and one in three mobile teleworkers is a professional. Sales occupations are at their highest incidence among flexiworkers (28%), while only 5% of fixed-site teleworkers are in sales. Mobile teleworkers are most evenly distributed between management and professional occupations, with about one in three mobile teleworkers in each of these occupational domains. At this point, few teleworkers of any type are engaged in office administration. Overall, these data suggest that there are

substantial differences in the likelihood that those in certain occupations will engage in these distinct forms of telework.

Gender also varies significantly across the three types of telework. A slight majority (53%) of fixed-site teleworkers are female, while a slight majority (55%) of flexiworkers is male. It is notable that men constitute more than three-fourths of current mobile teleworkers. This difference is substantially greater than the gender difference among those field workers who are not teleworkers.

[Table 7 about here]

### Organizational characteristics

The relationship between organizational characteristics and the types of teleworkers that were proposed in the second research question are explored in Table 8. There are significant differences across teleworker types in terms of organizational complexity, but not in terms of organizational size. Although the majority of each teleworker type is employed by organizations with multiple work sites, flexiworkers are most likely to be employed by complex organizations. Nine in 10 flexiworkers work in organizations with multiple sites, versus only eight in 10 mobile teleworkers and seven in 10 fixed-site teleworkers.

There is also a significant difference across teleworker types regarding the extent to which their organization is on the leading edge of ICT use. The majority of fixed-site teleworkers describe their organizations as being on the leading edge and less than one in five are in organizations on the trailing edge. Flexiworkers, on the other hand, are more

evenly distributed across organizations on the leading edge or on the trailing edge of technology, and have the lowest mean level of technological innovation. Mobile teleworkers include the highest proportion of workers who rank their organization in the middle regarding innovative ICT use. There are, however, no significant differences across the three types of teleworkers regarding the extent to which their organization has become a virtual, “paperless” organization, or regarding the teleworker’s capacity for remote access to work-related information. As one might expect, more than three-fourths of all types of teleworkers have remote access to organizational data. Actually, it might be most surprising that one in four teleworkers does *not* have remote access to such data.

[Table 8 about here]

### Work Outcomes

In analyzing teleworkers’ appraisals of work and the work environment (research question 3), there is additional evidence that the three teleworker types are distinct (see Table 9). Flexiworkers are most likely to feel they have high levels of influence over their job, while mobile teleworkers are most likely to feel that their influence is low. Mobile teleworkers are also substantially more likely than the other two teleworker types to view computers as a mechanism for work surveillance. Yet mobile teleworkers are also significantly more positive in reporting that they are able to keep up with their workload, while fixed-site teleworkers are least likely to report successful management of their workload. Interestingly, there are no significant differences among the three types of teleworkers regarding levels of job satisfaction. This might be in part related to the fact that job satisfaction is very high among all teleworkers. Similarly, there are no significant

differences across the various types of teleworkers regarding their assessments of the extent to which computers have enhanced productivity. The large majority of all types of teleworkers attribute productivity enhancements to computing.

[Table 9 about here]

## **Discussion & conclusion**

This article makes three contributions to our understanding of telework. First, it provides a taxonomy of telework, guided by existing research and primarily based on a conceptualization of the locational distribution of ICT-supported work. Second, it analyzes empirical data from a large sample of American computer-using workers to assess whether these types of teleworkers are empirically distinct. And third, it provides an initial examination of a series of research questions about the associations between the specified types of teleworkers and other classes of variables, including the characteristics of the individual teleworker, the organizational context, and the nature of the individual's work environment.

We have defined teleworkers as those workers who utilize computers at least 10% of their work time in settings away from a traditional office. Our empirical data, based on a U.S. national sample of 1,202 computer-using, full-time workers, enabled us to distinguish these teleworkers from other office workers. We identified various types of teleworkers, who constitute about one in three of the workers in the sample. Those teleworkers who are direct employees of organizations constitute one-fourth of all computer-using workers and were the primary focus of our analyses. Among this group,

we posited three types of teleworkers: fixed-site teleworkers, flexiworkers and mobile teleworkers. We have suggested that fixed-site teleworkers are typically characterized by significant work time at home, flexiworkers operate in a combination of office, home and field locations, and mobile teleworkers function primarily in the field, but might also work in an office or home. The average proportion of time that teleworkers use computers away from the office ranges from 29.0% (for fixed-site teleworkers) to 47.5% (for flexiworkers). This compares to less than 5% of work time using computers away from the office for the two-thirds of the sample who are not engaged in telework.

We offered a series of research questions regarding the possible differences between the three types of teleworkers. In our analyses, we looked for significant variation among these three types regarding their individual characteristics, organizational and technological contexts, and work environment consequences. Table 10 summarizes the results.

[Table 10 about here]

Our empirical analysis generally supports the view that the three types of teleworkers can be distinguished from each other. There are sufficient empirical differences across these three types of teleworkers on such factors as occupation type, organizational context, personal characteristics, and work environment impacts to persuade us that there is value in utilizing this taxonomy of teleworkers as a basis for better understanding the dynamic processes associated with telework. Significant differences occur on seven of the fourteen variables in the analysis. And half of the variables in each of the three explanatory categories differ across the three types of

teleworkers. Moreover, the pattern of relatively high, medium, and low measures in Table 10 indicates considerable diversity. Indeed, among the seven variables with significant differences, no two patterns are the same across the three types of teleworkers.

In reality, the diverse capabilities of ICTs have made the possible configuration of computer-using workers' job locations increasingly complex, since many such workers now have more options about where to do their work. In some instances, these options are defined by the employer but often they are at least partly at the discretion of the individual worker. Although we do not have longitudinal data at this point, we believe that there will be an increasing proportion of computer-using workers who are teleworkers of each of the three types we have defined.

Based on these findings, we offer the following generalizations regarding the three types of teleworkers. *Fixed-site teleworkers*, whose ICT-supported remote work is primarily at home, constitute about 11% of all computer-using workers. Fixed-site teleworkers seem to be work-pressured professionals employed in technologically-sophisticated organizations. Members of this group express relatively high job autonomy. Less than one in 10 say they have little influence over their job, and they are the group least likely to express concern about computerized work monitoring (only two in five view computers as a surveillance tool). At the same time, fixed-site teleworkers also experience more work-related stress than either flexiworkers or mobile teleworkers: almost three in five report having trouble keeping up with their workload. Fixed-site teleworkers use computers outside their office during 30% of their work hours. The fact that fixed-site teleworkers, like other types of teleworkers, work longer hours than office workers could be both a cause and a consequence of the technology. For some fixed-site

teleworkers, having home access to work resources might enable them to do more of their existing after-hours work in the home. That is, longer hours might make telework more likely. For others, the flexibility afforded by telework might increase their sense of obligation to the employer. For this group, longer hours overall are a consequence of teleworking (Salaff, 2002; Steward, 2000).

*Flexiworkers*, who constitute about 5% of all computer-using workers, are the teleworkers who tend to use ICTs to support work in both the home and the field. Our analysis offers some support for Qvortrop's (1998) suggestion that these individuals are career-oriented workers who use ICTs in an effort to gain a professional advantage. Flexiworkers come from a variety of competitive occupations. Among all teleworkers, they include the largest proportion in sales, followed closely by management/business/financial occupations and by professional occupations. They report the highest level of influence over their job of any type of teleworker (more than three-quarters say they are very influential). Flexiworkers appear highly committed to their work but also highly pressured: the majority of them have difficulty keeping up with their work despite working the longest hours of any type of workers considered here. They also use computers outside the office for a larger proportion of the time than any other type of worker in our survey. They are arguably the group closest to the current conception of the "anytime/anyplace" technology-enabled worker. It is noteworthy that flexiworkers are twice as likely as either of the other teleworker types to describe their organization as technically unsophisticated, suggesting that they have the highest expectations about how ICTs can support their work and that they might take more initiative in adopting and shaping their use of these technologies.

*Mobile teleworking* (9% of computer-using workers) represents a different approach to telework, emphasizing use of ICTs in field locations. The use of the technology by this group appears less likely to be viewed as a discretionary privilege: it is deployed more broadly among workers, and it is met with more suspicion. Mobile teleworkers represent a wider range of occupations, including the highest proportions of “other” jobs (which tend to be less information intensive) and also of managerial workers. Moreover, mobile teleworkers are more likely than other teleworkers or non-teleworking field workers to view computers as a tool for monitoring their work, and they are twice as likely as other teleworkers to report low job influence. On the positive side, mobile teleworkers are also far less likely to report difficulty keeping up with their workload compared to other types of teleworkers.

These results help us to understand that there are different forms of telework, Empirical telework research, especially in the U.S., has rarely analyzed a variety of distinct work location configurations. This might help explain the failure to identify which factors consistently characterize teleworkers and promote more positive utilization of telework. Demographic characteristics, commute times, job suitability, and status have all been tested, and many have been shown to be significantly linked to telework in some studies; but overall the results have been inconclusive (Bailey & Kurland, 2002). There has been some promising research focused specifically on telecommuting (Peters, Tijdens, & Wetzels, 2004), but this leaves open questions related to mobile telework and flexiwork.

Studying the different types of telework separately may also yield insights regarding consequences for the work environment, from the perspectives of both the

employee and the organization. Increasing productivity, job satisfaction, and autonomy are oft-predicted outcomes of telework, yet there is little empirical support for these claims. The data reported here suggest that work-related outcomes vary across the different teleworker types. It seems, for example, that the anytime/anyplace teleworkers (flexiworkers) experience less job pressure and more control over their jobs than teleworkers who primarily balance work in the office and at home (fixed-site teleworkers).

We suggest that ongoing efforts to understand the causes, nature, and consequences of telework will be advanced by focusing on the types identified here. There are several avenues for further study. For example, multivariate statistical methods might be employed to specify relationships reported in this analysis more fully, since many of the individual and organizational attributes examined in this article might be interrelated. A larger sample of freelance teleworkers would be desirable to explore empirically whether the contractual dimension of the taxonomy is an important distinction. A comparative analysis of full-time versus part-time teleworkers or of those teleworkers with and without networked ICTs might refine our insights about telework. The impacts of various modes of telework on commuting behavior are another issue that merits study.

Both the remarkable advances in remote information and communications technologies and the extent to which organizations and workers are integrating these ICTs seem central to the emerging world of anytime/anyplace telework. We are persuaded that telework is an important concept, and that the use of ICT capabilities away from the office will become more widespread and more significant. Telework has

been defined and used in many different ways in the research literature. We recognize that there will be no universally accepted taxonomy of telework. However, understanding the modalities and impacts of telework necessitates greater conceptual clarity. We hope that this article contributes to such clarifications, which must also be empirically grounded. We offer the categories of fixed-site teleworker, flexiworker and mobile teleworker, our research questions, and our solid empirical data as a basis for further analysis and concept development.

**Appendix A: Sampling frame**

These data are from a probability sample of twelve MSAs in the United States: Austin-San Marcos, TX; Boston, MA; Des Moines, IA; Ft. Collins-Loveland, CO; Middleton-Summerset-Hunterdon, NJ; Minneapolis-St. Paul, MN; Olympia, WA; Orange County, CA; Washington DC-MD-VA. These MSAs were selected based on measures identifying them as among the most connected in the U.S. regarding Internet technologies. The survey was conducted during April to July 2004. The data were collected using a random-digit-dialing process, drawing 100 respondents from each of the 12 MSAs. The overall response rate for the survey was 44.3% using AAPOR response rate method 2.

## **Appendix B: Survey questions**

### *Telework classification questions*

About how many hours do you usually work each week including any overtime or extra hours?

How many of the [given] hours are spent working at your workplace (office away from home)?

How many of the [given] hours are spent working at home?

How many of the [given] hours are spent working in the field, that is, at other locations than your office or home?

Roughly, about how many hours a day would you say you use a computer at your home for work purposes?

Roughly, about how many hours a day would you say you use a computer in the field for work purposes?

[If R uses an Internet-connected handheld] On average, about how many minutes per day are you on-line with your handheld computer for work-related activities?

### *Individual and organizational characteristics questions*

What is the highest level of education you completed? (High school or less, trade or vocational school, some college, college graduate, graduate degree)

What is your occupation? (Verbatim response recorded, then coded according to the U.S. Census Bureau's Standard Occupational Classification)

In what year were you born?

Does the company where you work have only one location or more than one location?

Approximately, how many employees work in the company at your location? About how many employees work for your company at all its locations combined?

My company always attempts to be on the leading edge in computer hardware and software. (5-point Likert scale anchored by 1=Strongly disagree and 5=Strongly agree)

In my company, all forms, reports and information are handled electronically rather than on paper. (5-point Likert scale)

At home, are you able to connect to any of your company's databases or software?

In the field, are you able to connect to any of your company's databases or software?

[If R uses an Internet-connected handheld] Do you use the handheld on-line to access work-related information and databases?

I have a lot of say over what happens in my job. (5-point Likert scale)

Computers increase the ability of others to monitor my work. (5-point Likert scale)

Thinking about your job, on the whole, are you very satisfied, somewhat satisfied, somewhat dissatisfied or very dissatisfied?

I never seem to have enough time to get my job done. (5-point Likert scale)

Computers make me a much more productive worker. (5-point Likert scale)

**Endnotes:**

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<sup>1</sup>This is not to say that we view ICTs as necessarily causing telework; on the contrary, many other factors, such as organizational policies and individual choice, have been shown to be important (see Bélanger, 1999; Peters, Tijdens, & Wetzels, 2004).

<sup>2</sup> For these significance tests, fixed-site teleworkers and flexiworkers are compared to office workers, and mobile teleworkers are compared to non-teleworking field workers.

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## **Biosketches**

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A taxonomy of telework – tables

Work Locations	Contractual Relationship	
	Organizationally-affiliated employment (employees)	Organization-independent employment (self-employed/contract work)
Home	Home-based teleworker (or supplementary teleworker)	Freelance teleworker
Home, office, and field	Multi-site teleworker (or supplementary teleworker)	

**Table 1. Peters et al.'s (2004) telework categories**

A taxonomy of telework – tables

Work Locations	Contractual Relationship	
	Organizationally-affiliated employment (employees)	Organization-independent employment (self-employed/contract work)
Home or satellite office	Telecommuter	Electronic homemaker
Home, office, and field		Flexiworker

**Table 2. Qvortrup's (1998) telework categories**

A taxonomy of telework – tables

Work Locations	Contractual Relationship	
	Organizationally-affiliated employment (employees)	Organization-independent employment (self-employed/contract work)
Home or satellite office	Fixed-site teleworker	Freelance fixed-site teleworker
Field	Mobile teleworker	Freelance mobile teleworker
Home, office, and field	Flexiworker	Freelance flexiworker

**Table 3. Proposed telework taxonomy**

A taxonomy of telework – tables

	Frequency	Percent
<b>Type of work (Standard Occupation Classification)</b>		
Professional & related	473	39.4%
Management, business & financial	295	24.5%
Office & administrative support	135	11.2%
Sales & related	102	8.5%
Other	94	7.8%
<i>Total</i>	<i>1099<sup>a</sup></i>	<i>91.4%</i>
<b>Educational attainment</b>		
Some college or less	380	31.6%
College	453	37.7%
Graduate degree	359	29.9%
<i>Total</i>	<i>1192</i>	<i>99.2%</i>
<b>Gender</b>		
Male	576	47.9%
Female	626	52.1%
<i>Total</i>	<i>1202</i>	<i>100.0%</i>
<b>Age</b>		
18 – 24	51	4.2%
25 – 34	215	17.9%
35 – 44	348	29.0%
45 – 54	321	26.7%
55 and older	223	18.6%
<i>Total</i>	<i>1202</i>	<i>100.0%</i>

a. Missing cases due to insufficient information to classify or no respondent answer.

**Table 4. Characteristics of the Respondents**

A taxonomy of telework – tables

	Frequency	Percent
Office worker	705	58.7%
Field worker	107	8.9%
Home worker	1	0.1%
<i>Subtotal non-teleworkers</i>	<i>813</i>	<i>67.6%</i>
Fixed-site teleworker	132	11.0%
Mobile teleworker	105	8.7%
Flexiworker	62	5.2%
<i>Subtotal teleworkers</i>	<i>299</i>	<i>24.9%</i>
Freelance fixed-site teleworkers	36	3.0%
Freelance mobile teleworkers	36	3.0%
Freelance flexiworkers	18	1.5%
<i>Subtotal freelance teleworkers</i>	<i>90</i>	<i>7.5%</i>
<i>Subtotal all teleworkers</i>	<i>389</i>	<i>32.4%</i>
Total	1202	100.0%

**Table 5. Frequency of teleworker types and non-teleworkers in sample**

A taxonomy of telework – tables

	Teleworkers				
	Office worker	Field worker	Fixed-site teleworker	Mobile teleworker	Flexi-worker
(N)	675–705 <sup>a</sup>	94–107	127–132	92–105	57–62
<b>Standard Occupational Classification</b>					
Management, business & financial	24.8%	25.3%	27.6%	33.7%	29.8%
Professional & related	43.1	35.8	58.3	34.8	40.4
Sales & related	5.4	14.7	5.5	17.4	28.1
Office & admin. support	18.8	3.2	5.5	3.3	0.0
Other	7.9	21.1	3.1	10.9	1.8
<b>Educational attainment</b>					
Some college or less	36.3%	32.7%	19.8%	30.8%	21.0%
College	37.8	33.6	35.9	40.4	35.5
Graduate degree	25.9	25.9	44.3	28.8	43.5
<b>Gender</b>					
Male	40.6%	62.6%	47.0%	77.1%	54.8%
Female	59.4	37.4	53.0	22.9	45.2
<b>Age</b>					
18 – 24	4.9%	5.7%	2.3%	4.9%	3.3%
25 – 34	20.0	17.9	21.1	20.4	8.2
35 – 44	29.2	34.9	32.0	32.0	31.1
45 – 54	26.8	25.5	28.1	20.4	39.3
55 and older	19.1	16.0	16.4	22.3	18.0
<b>Average weekly work hours</b>					
Mean	44.6	47.7	48.1	48.1	49.3
	hours	hours	hours	hours	hours
Std. Dev.	8.8	9.5	10.2	10.6	12.3
<b>Percent of work hours out of office</b>					
Mean	3.0%	41.8%	32.2%	57.5%	55.4%
Std. Dev.	9.8	29.8	25.5	35.5	19.2
<b>Percent of work hours using computers out of office</b>					
Mean	2.1%	1.7%	29.0%	46.3%	47.5%
Std. Dev.	8.1	4.2	25.3	30.4	27.9

a. Except Standard Occupation Classification, for which the N is 649.

**Table 6. Comparing characteristics of worker types**

A taxonomy of telework – tables

	Fixed-site teleworker	Flexiworker	Mobile teleworker	$\chi^2$
(N)	127–131	57–62	92–104	
<b>Education</b>				7.602
Less than college	19.8%	21.0%	30.8%	
College degree	35.9	35.5	40.4	
Graduate degree	44.3	43.5	28.8	
<b>Type of work</b>				33.798 ***
Management, business & financial	27.6%	29.8%	33.7%	
Professional & related	58.3	40.4	34.8	
Sales & related	5.5	28.1	17.4	
Office & administrative support	5.5	0.0	3.3	
Other	3.1	1.8	10.9	
<b>Gender</b>				22.658 ***
Male	47.0%	54.8%	77.1%	
Female	53.0	45.2	22.9	
<b>Age</b>				11.357
18 – 24	2.3%	3.3%	4.9%	
25 – 34	21.1	8.2	20.4	
35 – 44	32.0	31.1	32.0	
45 – 54	28.1	39.3	20.4	
55 and older	16.4	18.0	22.3	

\* p<.05; \*\* p<.01; \*\*\* p<.001

**Table 7. Individual characteristics associated with teleworker types**

A taxonomy of telework – tables

	Fixed-site teleworker	Flexiworker	Mobile teleworker	$\chi^2$
(N)	131–132 <sup>a</sup>	57–62	85–105	
<b>Organizational size</b>				11.797 <sup>b</sup>
Less than 10	10.2%	17.5%	15.4%	
10 – 50	5.1	0.0	8.8	
50 – 250	22.9	24.6	22.0	
250 – 1000	13.6	15.8	5.5	
1000 or more	48.3	42.1	48.4	
<b>Organizational complexity</b>				10.082 <sup>**</sup>
One location	30.5%	11.8%	21.1%	
More than one location	69.5	88.2	78.9	
<b>Adoption of “leading edge” technologies</b>				12.062 <sup>*</sup>
High	51.9%	40.0%	44.8%	
Medium	26.7	16.7	34.3	
Low	21.4	43.3	21.0	
<b>Organization is “paperless”</b>				1.821
High	49.2%	50.0%	34.6%	
Medium	27.3	27.4	31.8	
Low	23.5	22.6	33.6	
<b>Remote access to organizational data</b>				.470
Yes	78.8%	75.2%	75.8%	
No	21.2	24.8	24.2	

\* p<.05; \*\* p<.01; \*\*\* p<.001

a. Except Organizational size and Organizational complexity, for which the N is 118.

b. Two cells had expected counts of less than 5.

**Table 8. Organizational characteristics associated with teleworker types**

A taxonomy of telework – tables

	Fixed-site teleworker	Flexiworker	Mobile teleworker	$\chi^2$
(N)	131–132	57–62	86–105	
<b>Influence over job</b>				10.130 *
High	62.2%	77.2%	60.5%	
Medium	28.6	12.3	20.9	
Low	9.2	10.5	18.6	
<b>Computers facilitate work monitoring</b>				9.616 *
Agree	41.5%	45.6%	61.2%	
Neutral	21.2	15.8	17.6	
Disagree	37.3	38.6	21.2	
<b>Job Satisfaction</b>				3.017
Satisfied	95.4%	91.9%	89.5%	
Neutral	0.0	0.0	0.0	
Dissatisfied	4.6	8.1	10.5	
<b>Ability to keep up with workload</b>				16.140 **
High	22.7%	33.9%	41.9%	
Medium	17.4	11.3	21.9	
Low	59.8	54.8	36.2	
<b>Computers enhance productivity</b>				4.106 <sup>a</sup>
Agree	82.6%	79.6%	85.5	
Neutral	12.9	10.5	8.1	
Disagree	4.5	10.5	6.5	

\* p<.05; \*\* p<.01; \*\*\* p<.001

a. one cell had an expected count of less than 5.

**Table 9. Work outcomes associated with teleworker types**

A taxonomy of telework – tables

Is there a significant difference between teleworker types in relation to:	Result	Level on measure relative to other types		
		Fixed-site teleworker	Flexiworker	Mobile teleworker
<b>Individual's Characteristics</b>				
Educational attainment level	No	–	–	–
Occupation	Yes	Mostly professionals	Mix of professional, management, and sales	Most diverse mix
Age	No	–	–	–
Gender	Yes	Slightly more female	Predominantly male	Slightly more male
<b>Organizational Characteristics</b>				
Organizational size	No	–	–	–
Organizational complexity	Yes	Lowest	Highest	Middle
“Leading edge” technology	Yes	Highest	Lowest	Middle
“Paperless” organization	No	–	–	–
<b>Work Outcomes</b>				
Remote data access	No	–	–	–
Computer-enabled monitoring	Yes	Lowest	Middle	Highest
Job influence	Yes	Middle	Highest	Lowest
Job satisfaction	No	–	–	–
Computer-enabled productivity	No	–	–	–
Workload pressure	Yes	Highest	Middle	Lowest

**Table 10. Summary of findings**