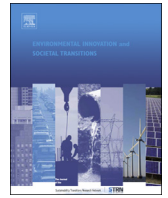


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Original Research Paper

## Strategic niche management in transition pathways: Telework advocacy as groundwork for an incremental transformation



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### ABSTRACT

This article presents telework advocacy in the United States as a case of strategic niche management that contributed to an incremental transformation of office work location practice in the United States. In its first decades, telework advocacy showed elements of strategic niche management including vision and expectations, learning processes, and social networks. Supported by environmental and economic landscape pressures, trip reduction and travel demand management policies opened up protected spaces at the local, state, or federal levels for the practice of telework, with public agencies as experimenters. Niche and incumbent actors shared a strategy of promoting telework in structured circumstances and spoke to organizational and employee benefit alongside societal benefits. Yet as landscape pressures lessened, incumbent actors took greater ownership of the innovations of telework, and shifted their vision to one that considers telecommuting as a function of human resources rather than a societal imperative.

### 1. Introduction

The questions of how societal practices change over time in relation to technology, and the extent to which policy can guide this change towards beneficial outcomes are fundamental to social science. The practice of strategic niche management (SNM) aims to use policy to guide sustainable innovations towards wider adoption (Kemp et al., 1998). Yet notions of a simple substitution of one technology for a more sustainable alternative belie the complexity of sociotechnical systems. The multi-level perspective (MLP) describes interactions in such complex systems across three levels—the landscape which contains broad trends and external structures, the regime level which contains established ways of operating, and the niche level from which new technologies emerge (Geels, 2002). Placing strategic niche management within this multi-level perspective draws attention to a limited role of SNM in enabling systemic change (Schot and Geels, 2008). Transition pathways rather attempt to describe how actors, technologies, and broader societal trends interact across multiple levels to bring about change within sociotechnical systems (Smith et al., 2005; Geels and Schot, 2007). Practitioners of strategic niche management would benefit from guidance that includes knowledge about how their efforts fit within wider transition pathways (Raven et al., 2010). However examples of this role have not yet been well documented by the literature with reference to particular pathways.

This article draws a connection between these literatures through a case study of three decades of telework advocacy in the United States, asking: To what extent does this period represent a case of strategic niche management? How did this contribute to a particular transition pathway within a broader sociotechnical system? The notion of “telecommuting” emerged in the early 1970s, supported by federal research funding, as a strategy to confront societal problems related to the journey between home and workplace. Automobile traffic and its relationship with land use was a central concern of planning in the United States by 1970,

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particularly its connection to roads congestion and air quality. This article finds the decades-long efforts of advocates to advance the notion of telecommuting to be a case of strategic niche management that contributed to an incremental transformation pathway of office work location in the United States.

After an introduction to the concepts of strategic niche management, the multi-level perspective, and transition pathways, this article will describe how they apply to the niche of telework advocacy within the sociotechnical system of office work location. Telework advocacy in its first three decades demonstrates elements of strategic niche management as defined by [Schot and Geels \(2008\)](#): a vision and expectations, learning processes, and social networks among advocates, while providing protected spaces for the practice of telework. Yet such niche activities are also shaped by the societal trends and structures of the times and places in which they occur. The next sections outline these activities and their contexts, starting with the original visioning of telecommuting in Los Angeles, California. Supported by environmental and economic landscape pressures, trip reduction and travel demand management policies opened up protected spaces at the local, state, or federal levels for the practice of telework, with public agencies as experimenters. These programs were evaluated by advocates and formed a shared learning process that informed telework practice and further advocacy. Examples of advocacy from the 1990s, such as telework guides and events, show how lessening landscape pressures and the growing involvement of incumbent actors contributed to the revising of the vision of telecommuting away from one that emphasized societal benefit. Finally, the conclusion considers the outcomes of this case of strategic niche management, identifies plausible transition pathways within existing typologies based on interactions across multiple levels of the MLP, and offers recommendations for practitioners of strategic niche management.

## 2. Conceptual foundation

### 2.1. Strategic niche management in the multi-level perspective

Strategic niche management is an explicit effort to support the development of emerging technologies that present a more sustainable alternative to existing technological regimes ([Kemp et al., 1998](#)). [Weber et al. \(1999\)](#) define strategic niche management as a means to diffuse sustainable innovation beyond the stage of a single experiment. The notion of using policy to create protected spaces is central to SNM, as these allow experimentation, shield resulting innovations from competition, nurture them in their development, and ultimately can help empower them to exist beyond boundaries of protection ([Smith and Raven, 2012](#)). Barriers to the adoption of niche innovations include non-niche factors such as market demand, regulatory frameworks, or cultural practices ([Kemp et al., 1998](#)). Empowering niches can thus occur either by enabling niches to successfully compete with incumbents under the same conditions, or by also supporting changes to these underlying conditions, models that [Smith and Raven \(2012\)](#) call *fit and transform* and *stretch and transform* empowerment. The practice of SNM has been characterized by three factors: an articulation of vision, multi-level learning processes, and the building of social networks among advocates ([Schot and Geels, 2008](#)). The development process that combines these factors may be non-linear as knowledge is generated from diverse experiments, and expectations are iteratively revised ([Geels and Raven, 2006](#)). Usually the creation of niches is by outsiders, but incumbent actors within the regime play a role in their development and in steering transitions broadly ([Kemp et al., 2007](#)).

[Geels \(2002\)](#) offers the layered multi-level perspective (MLP) as a framing concept for understanding how complex systems undergo change, based on interactions between the landscape layer, a regime layer, and niche innovations ([Smith et al., 2010](#)). Changing of the regime can result from different combinations of top-down landscape pressure such as broad changes in socio-economic conditions, and the bottom-up acceptance of niche innovations. Strategic niche management benefits from being seen within this broader framework of the MLP as it points to factors beyond the technical that contribute to changes in the dominant regime ([Schot and Geels, 2008](#)). For example [Shove and Walker \(2007\)](#) argue that technological changes towards sustainability are inadequate without changes to accompanying social practices, and a generational shift from weekly to daily bathing serves as an example of how technologies are just one part of a practice that is embedded with both cultural meanings and with energy usage ([Shove and Walker, 2010, 2014](#)).

### 2.2. Transition pathways

Efforts to model change within the multi-level perspective describe the combinations of interactions on different levels that comprise viable pathways to sociotechnical transition. Pathways can differ on the endogeneity or exogeneity of actors and technologies to the regime ([Smith et al., 2005](#); [Geels et al., 2016](#)). Exogenous actors bring innovations from the niche layer to the regime, yet endogenous actors within the regime may still play a role in transition. For example incumbent firms may strategically undergo creative accumulation as they both maintain and improve existing technologies and integrate new technologies ([Bergek et al., 2013](#)). Non-actor-driven pressure can similarly come from inside the regime or from the outside, such as the landscape layer, niches, or other regimes. This paper considers its case against two sets of proposed transition pathways, which are summarized in [Table 1](#).

[Geels and Schot \(2007\)](#) offer four transition pathways: technological *substitution* where niches have matured when a landscape shift prompts their widespread adoption, *transformation* when pressure from the landscape prompts the adoption of less-mature innovations, *reconfiguration* where innovations are adopted piecemeal to solve specific problems prompting a change process within the regime, and *realignment* when problems within the regime have no clear solutions and spur a search for innovations. A later rendering of these transition pathways takes into account the interactions of incumbent actors with institutions and technologies, creating subcategories within these categories, such as allowing transformation to be either incremental or a more substantial re-orientation ([Geels et al., 2016](#)). The second typology determined by [Smith et al. \(2005\)](#) considers pathways based on the extent to

**Table 1**  
Typologies of Transition Pathways.

Geels and Schot (2007); Geels et al. (2016)	Substitution	External actors with new technologies supplant incumbent actors through competition
	Transformation	Incumbent actors adjust to new technologies either incrementally or as a reorientation
	Reconfiguration	Incumbent actors align with external actors to combine technologies
	De-alignment and Re-alignment	External actors develop new technologies after the collapse of incumbent actors
Berkhout et al. (2004); Smith et al. (2005)	Endogenous renewal	Incumbent actors coordinate to adapt new technologies
	Re-orientation of trajectories	Incumbent actors react to a systemic shock to develop or adapt new technologies
	Emergent transformation	External actors using new technologies successfully compete against incumbent actors
	Purposive transitions	External actors coordinate to replace or change incumbent actors using old technologies

which they are coordinated by actors and to which these actors are part of the existing regime, leading to four pathways. *Endogenous renewal* and *re-orientation of trajectories* involve incumbent actors either coordinating or reacting to adopt new innovations, while *emergent transformation* and *purposive transitions* involve external actors with new innovations replacing or integrating with incumbent actors (Smith et al., 2005).

### 2.3. Transportation systems in transition

Transportation systems have been of interest to authors within the SNM and broader sociotechnical transitions literature. Geels (2002) uses personal land transportation as an example of a sociotechnical system, showing how the notion of personal driving binds together vehicle technologies, infrastructures for road and fuel, systems of regulation, distribution networks for vehicles and supplies, and cultural meanings concerning freedom and independence. Cohen (2010) points to the growth of private commercial aviation as an example of a niche innovation that contributes to less sustainable outcomes as it prioritizes other objectives. Several scholars have considered transportation in relation to strategic niche management. Hoogma et al. (2005) uses innovations such as electric vehicles and car sharing as examples of how niche innovations fail to effect practice beyond the demonstration stage. A case study of tramways in France points to the importance of landmark projects, neighboring regimes, and a clear early vision that is revised based on experimentation over time (Turnheim and Geels, 2019). Finally Xue et al. (2016) studied the strategic niche management of electric vehicles in China, finding that financial incentives were most helpful as protective spaces, and that landscape factors related to location contributed to different outcomes in different places.




### 2.4. Main objective

Internal processes of strategic niche management have been well established by the literature (Kemp et al. 1998, Schot and Geels, 2008; Smith and Raven, 2012). The relationship of SNM to transition pathways in the multi-level perspective, on the other hand, is less well explored. To empower niche innovation, protected spaces for some transitions must support changes to the underlying selection processes (Smith and Raven, 2012). Existing typologies of transition pathways (Geels et al., 2016; Smith et al., 2005) describe interactions that determine such outcomes, and thus present an opportunity to connect SNM to wider societal transitions. This paper will inform an understanding of the role of SNM in broader transitions by conceptualizing US telework advocacy as strategic niche management functioning within a particular transition pathway.

## 3. Methods and sources

A case study consists of a comprehensive descriptive analysis of one unit, with an implicit or explicit comparison against an ideal type (Gerring, 2004). For this study, the unit of analysis is telework advocacy during a time period ranging from the mid 1970s through the mid 2000s. The ideal type for comparison is the theoretical framework of strategic niche management developed by the sociotechnical transitions literature. The empirical data that informs this case study consists of primary sources from the decades under study, and secondary sources providing perspectives relevant to these decades. Primary sources include evaluations of specific telework programs and plans for the implementation of programs, as well as advocacy materials intended to promote the adoption and practice of telework. The Internet Archive allowed the text of websites to be viewed at a particular point in time. Legislation was included in the analysis from the periods under study including federal, state, local laws, and executive orders. Finally contemporaneous newspapers include *The Washington Post*, *The New York Times*, *The Wall Street Journal*, and *The Los Angeles Times*. Secondary sources included scholarly research on telework and other retrospective materials. Analysis consisted of deductive coding of texts to identify elements of SNM, as well as inductive coding of select advocacy sources to identify how telework was marketed.

**Table 2**  
Office Work Location in the Multi-Level Perspective.

Landscape Layer		Economic trends Political trends Environmental trends Social trends
Regime Layer		Workplace policies and norms Workplace project/team structuring Workplace computing infrastructure Manager and employee attitudes Office work as a social practice
Niche Layer		Home-based telework Center-based telework Flexible work location policies

#### 4. Telework as strategic niche management in the multi-level perspective

The sociotechnical system of concern to this article is office work location. This system is conceived in the multi-level perspective in Table 2. The regime consists of workplace policies and infrastructure, and attitudes of managers and employees towards work location. At the inception of this paper’s case study, this regime supported work within designated office buildings at designated times, which together comprise a powerful reproduced social practice embedded with meanings of home and workplace. Neighboring regimes can also influence transitions (Turnheim and Geels, 2019). For the regime of office work location, neighboring regimes include computing and personal transportation. It is notable that computing infrastructure changed greatly during the decades under consideration, from centralized mainframe systems to the introduction of personal computing, and finally to mobile cloud computing enabled through the Internet, influencing workplace infrastructure.

The landscape layer consists of contextual and structural factors that are exogenous to the regime of office work location, yet are not a part of neighboring regimes. These include economic trends such as periods of recession or growth, political trends such as outcomes of elections, environmental trends such as concerns and actions taken about air quality and land use, and social trends such as family life. These exert pressure on the regime and play a role in establishing transition pathways. One of the challenges of considering telework as a niche innovation is that telework is a hybrid of organizational and technological innovations. However Witkamp et al. (2011) and Cohen (2010) have shown that niches include social innovations. Niche actors promoted several different telework configurations during the period covered by this study. Home-based telework, center-based telework, and flexible work policies each represented a different conception of alternative work location practice. Niche actors consisted of advocates in academia and government agencies, telework consultants, and enthusiastic adopters within organizations. The incumbent actors with whom they interacted consisted of management and employees of firms.

The practice of strategic niche management has been characterized by three factors: an articulation of vision, multi-level learning processes, and the building of social networks among advocates (Schot and Geels, 2008). These factors and the concept of protected spaces will be adopted to describe the case of telework advocacy in the United States (Table 3). The following sections use empirical data to show that US telework advocacy represents a case of strategic niche management. Through the concept of “telecommuting,” it possessed a clear vision for solving societal problems related to the automobile. Furthermore it allowed for protected spaces in which experimentation could take place, and from which its advocates created and shared knowledge across social networks

##### 4.1. “Telecommuting” context and vision

The original vision of telework in the United States formed in 1970s Los Angeles, a city that was facing significant problems of traffic congestion and air pollution related to the automobile. What success new freeways had found in the 1950s at reducing congestion did little to dampen LA’s reputation for traffic jams (Hill, 1953; Mullen, 1967). The first “freeway revolt” grew out of opposition to a freeway extension in San Francisco, before emerging elsewhere (Mohl, 2004). California’s policy of freeway building in response to demand had become financially unsustainable by the mid-1970s, and supported a shift toward multimodal planning

**Table 3**  
Characteristics of Strategic Niche Management for US Telework Niches.

Characteristic	Mechanism in US Telework Niche
Articulation of vision and expectations	Stated in original telecommuting study as supporting solutions to societal problems related to automobile commuting through structured applications (Nilles et al., 1976)
Creation of protected spaces	Trip reduction legislation and ordinances at state and local levels
Experimentation	Telecommuting pilot programs by public agencies in states and localities subject to protected spaces, and by federal agencies and some firms
Assessment of experiments	Research to evaluate telecommuting pilot programs conducted by agencies, academics, consultants
Sharing across social networks	Collaboration on documents and events; Common strategies for marketing telecommuting to firms

Characteristics adapted from Kemp et al. (1998); Schot and Geels (2008); Smith and Raven (2012).

(Taylor, 1995). Air pollution too, in part related to vehicle emissions, was a growing problem. In 1955, a long spell of smog prompted Los Angeles to issue its first “smog alert” (Hill, 1955). Vehicles, industry, and mountain ranges that trapped pollutants, were considered to blame for the poor air quality. The Federal Clean Air Act of 1970, required metropolitan regions to meet standards on five categories of pollutants. Los Angeles was one of three large cities nationally to fail to meet any of these standards (“EPA Says” 1975).

Jack Nilles was Director of Interdisciplinary Research at the University of Southern California when he led the publishing of *The Telecommunications-Transportation Tradeoff* in 1976. The case study presented in the book—a hypothetical “telecommuting” scenario based on a local insurance firm—had been funded by a National Science Foundation (NSF) grant under the Research Applied to National Needs (RANN) program (Nilles, 1974). This NSF program granted nearly half a billion dollars between 1971 and 1976 to solving societal problems through multidisciplinary research (Green and Lepkowski, 2006). The societal problems identified by Nilles et al. in *The Telecommunications-Transportation Tradeoff* (1976) were the environmental and economic costs of automobile commuting. A future-oriented view was evident in its subtitle “Options for Tomorrow”, and a stated hope that the scenarios outlined in the book could “be used to get us out of future difficulties” (Nilles et al., 1976). In addition to demonstrating that telecommuting could reduce traffic congestion and pollution, as well as conserve money and energy, Nilles et al. (1976) showed clear expectations for its implementation. In the case studies the authors maintain a focus on cost, and explain the use of the term “tradeoff” as pointing to a need to evaluate the specifics of the contexts in which it is applied and acknowledges that it is not appropriate for all types of jobs (Nilles et al., 1976).

Telecommuting was tried as a policy tool on a wide scale during the 1984 Olympic games. Known as the “freeway Olympics,” traffic congestion was considered a challenge (Lindsey, 1984b). A transportation management strategy featured a system of buses, and a publicity campaign asked employers to use flex times and provide opportunities to work from home (Lindsey, 1984a). In response, some companies shifted schedules, and Pacific Bell launched a telecommuting program using suburban subcenters and some working from home (O’Leary, 1991). The Olympics passed without major problems, with credit being claimed by the Olympic bus service, but an analysis found that the elimination of work trips improved freeway speeds by 31 %, and that work scheduling contributed an additional 5 % (Giuliano, 1988).

#### 4.2. Protected spaces through trip reduction and TDM

At this time telecommuting became aligned with other niches that sought to impact demand for automobile travel, such as flexible scheduling and carpooling supported by high occupancy vehicle (HOV) lanes during rush hours. Niche advocates shared concern for societal problems related to the automobile such as congestion and air quality. Protective spaces provide situations in which experiments could be carried out in real world contexts where they co-evolve along with organizational policies and individual preferences, and be evaluated. For telecommuting and other demand-oriented niches, protected spaces took the form of trip reduction mandates and standardized policies of transportation demand management at the local, state, or federal levels that created incentives for telework, supported by economic and environmental landscape pressures based on concerns about gasoline prices and air quality.

Trip reduction, used in Los Angeles as a temporary strategy, was first approved as a full-time regional trip reduction measure—Regulation XV—by the South Coast Air Quality Management District in 1987 affecting firms with 100 or more employees (Stammer, 1987). Trip reduction was considered necessary as a means to reduce air pollution from mobile sources to meet standards established under the Clean Air Act. At a local level trip reduction ordinances emerged from the mid-1980s, most often to deal with problems of congestion, or a combination of congestion and air quality in larger municipalities and counties (Jewell et al., 1990). A 1990 survey of local policies formed in the 1980s found that over two-thirds of trip reduction ordinances were in California (Ferguson, 1990).

State trip reduction legislation mandated and guided local ordinances. Concern about air quality was the primary stated motivation for protected spaces in Arizona and Washington. Arizona’s 1988 Air Quality Bill was passed after a lawsuit mandated the creation of a State Implementation Plan for air quality. The law required employers in Maricopa county with 100 or more employees to implement trip reduction (“ARS 49-581, 1988). Washington State’s 1991 Commute Trip Reduction law similarly impacted large urban employers (“RCW 70.94.537, 1991). In California voters approved Proposition 111 (1990), which doubled the gas tax and approved spending on infrastructure and a congestion management program (CMP) requiring urbanized counties to prepare trip reduction plans.

At a Federal level, legislation mandating employer trip reduction had a short lifespan that failed to more widely expand such protected space. The Clean Air Act Amendments of 1990 required states with metropolitan areas failing to meet ozone standards to implement an employer trip reduction program. This requirement, added in conference, was not widely noted at the time. However in 1995, after complaints from affected states about the effectiveness, costs, and hardships of car and vanpooling, the program was amended by Congress to be made voluntary (H. Rept. 104-387, 1996). Among the evidence presented were challenges of dual career families to carpooling, and the experiences of Compaq Computer which invested in carpooling, bus service, bike facilities, and telecommuting, but yielded only minimal change to commuting.

As for the specific niches that employers could adopt to comply with trip reduction policies, car pooling and vanpooling took center stage. However telecommuting was often present as an option. Like many ordinances, the Los Angeles trip reduction plan left firms to decide how to achieve the target reduction of employee trips—with “telecommuting” among the board’s suggestions—however the plan was largely viewed as a “ride sharing” measure promoting employee car and van pooling (Stammer, 1987; Milstein, 1988). While Washington’s law initially did not mention telecommuting as a strategy, the Washington State Energy Office had conducted the Puget Sound Telecommuting Demonstration a year earlier, which incorporated home-based and center-based telecommuting for 280 telecommuters at multiple organizations in the region (Ulberg et al., 1993). California’s Congestion



Management Program only listed telecommuting as one of “other strategies, including, but not limited to, flexible work hours, telecommuting, and parking management programs” (65088.10, 1990).

The protected spaces that allowed experimentation with telecommuting and other travel demand-reducing niches were distributed unevenly in the United States. Efforts to mandate their creation at the Federal level had failed, leaving states such as California, Washington, Arizona, and Oregon as leaders. Yet the discipline of planning helped to promote trip reduction more widely. From the late 1980’s telecommuting was nearly always considered an option for the elimination of trips in trip reduction plans, and was often paired with flexible work hours as a strategy. And by the turn of the century telecommuting was codified as a standard part of what came to be known as travel demand management (TDM), and was listed as one of six goals in the model TDM statute in the influential *Growing Smart Legislative Guidebook* (Meck, 2002). Yet for firms to widely adopt telework, social networks of advocates needed to supply examples of its practice, alongside knowledge derived from an assessment of that practice.

#### 4.3. Experimenting through public employee telecommuting

The protected spaces provided by trip reduction and TDM—even limited to a few states—provided opportunities for experimentation with telework. Furthermore the ideas of trip reduction and telecommuting had spread—in part through the discipline of planning—beyond those places where legislation had been implemented. For niche advocates, some of whom inhabited transportation and energy agencies, public employee telecommuting was a way to pilot programs at small or large scales. The connection between trip reduction and public employee telecommuting is evident in that most of the states to pilot telecommuting were also the first to implement trip reduction.

The State of California used its own employees to test telecommuting, with the goals of reducing traffic congestion and protecting air quality, but also the productivity-minded concerns of saving money on office space and energy, and increasing effectiveness of work. The project was proposed in 1984, planned in 1985, and implemented in 1988, with 17 departments allowing over 300 employees to conduct work from home (Kitamura et al., 1990; Nilles, 1990). It had the support of the Governor through a 1988 executive order that mandated trip reduction for state workers and expedited the pilot (Exec. Order No. D-73-88, 1988). After a 1989 earthquake, he required agencies to reassign affected employees to office locations closer to their home and implement telecommuting policies allowing more employees to work from home (Exec. Order No. D-82-89, 1989). Finally the California State Telecommuting Program became law in 1990, at which time the department of General Services created an office to oversee programs (14200-14203, 1990).

Other states that experimented included those that enacted early trip reduction, Arizona and Washington. Arizona piloted a telecommuting program for employees in 1988 that was adopted through executive order in 1994, with reference to the state’s Air Quality Bill and requirement of private large employers to reduce trips (Exec. Order No. 93-4, 1994). In Washington, the 1991 Commute Trip Reduction law contains a section with regulations for state agencies, requiring them to develop trip reduction plans (“RCW 70.94.537, 1991”). Florida enacted a state program in 1990 that authorized agencies to submit proposals for telecommuting programs to the Department of Administration (“State employee telecommuting program, 1990”). Finally, in Virginia, the General Assembly resolved in 1990 to study the feasibility of telecommuting, resulting in a recommendation to start a program the following year, citing benefits as “traffic congestion, environmental and societal” (“The potential benefits of telecommuting, 1990”).

The Federal government was also an early telework experimenter, with air pollution and cost savings as stated key motivators. In the late 1980s, the US Environmental Protection Agency (EPA) began a pilot program that allowed some employees to work from home (Weisskopf, 1989). It was an implementation of the Federal Flexible Workplace Pilot, called “Flexiplace” for short. Frank Wolf, a congressman from Virginia where many Federal workers lived, advocated for this policy spanning multiple Federal Agencies each with its own implementation, and introduced a 1990 bill to fund installation of phone lines in employee homes to allow workers to connect to government databases (Causey, 1990). A document outlining the EPA implementation lists automobile-related concerns as a key reason for adoption:

EPA is expected to be a leader in promoting new methods to reduce risk and prevent pollution. Commuting-based traffic congestion and associated air pollution emissions can be reduced by applying alternate work scheduling and work deployment techniques. (Environmental Protection Agency, 1991)

The policy combined scheduling changes with telecommuting, but officials and supervisors had control over who could participate in the program. Flexiplace was also implemented at the Agriculture Department, the General Services Administration (GSA) and the Justice Department (McAllister, 1993). By 1992, 550 federal workers had enrolled in the program, below a projected 2000 workers (Taylor, 1992). The General Services Administration funded satellite telework centers on the outskirts of Washington DC, such as the Shenandoah Valley Telecommuting Center, to accommodate Federal employees who live more than three hours commuting time distance (Fehr, 1993). These numbered 17 around Washington at their peak in 2000, and were run through local organizations utilizing GSA funding. Federal agencies were initially subsidized in their use of the centers (Gardner, 1995).

Utility firms were also experimenters with telecommuting. Mountain Bell launched a pilot program in 1980 in which managers whose job consisted of writing instructional material were permitted to work from home. After a positive experience with a temporary program during the 1984 Olympics, Pacific Bell launched a permanent program that had telecommuters working both from home, and from centers located in suburbs outside the central business district (O’Leary, 1991). Bell Atlantic had a popular telecommuting program in place from 1993 for managers, but the union vetoed a proposal from the company for a plan to introduce telecommuting for non-management roles (Stets, 1995). Early-adopter public agencies and utility firms were not just experimenters with telecommuting; they were often also participants in a social network of niche and incumbent actors in the United States that

created and shared knowledge about its outcomes and an evolving vision, and which reached a peak in the 1990s.

#### 4.4. Assessing telecommuting

The original study of telecommuting was hypothetical and its publication provided the basis for *The Telecommunications-Transportation Tradeoff* (Nilles et al., 1976), offering guidance for practice, particularly on the types of “information industry” work that were applicable for telecommuting. But it was efforts to evaluate telecommuting pilots—some of which involved Nilles’ consulting firm—that sought to create detailed knowledge to inform future programs. The questions that were of interest concerned telecommuting’s impact on automobile travel, productivity, and perceptions of managers and workers.

Most evaluations of the effect of telecommuting on travel found that it works in its primary goal of reducing travel. Results from the 1988 California state pilot showed a reduction in trips for telecommuters, but also a reduction in nonwork trips by family members (Kitamura et al., 1990). The effect of telecommuting from neighborhood centers on travel was tested through California’s Residential Area Based Offices project, finding that while number of trips was not impacted (since participants commuted to centers), they traveled fewer miles (Balepur et al., 1998). A meta-analysis considered 35 empirical studies, and found that nearly all of them showed telecommuting reducing travel (Andreev et al., 2010).

Regarding productivity, evaluations found that while telecommuting can increase productivity, in wider applications it is not greatly affected. An analysis of Fortune 100 programs found that productivity was not different among home workers compared to office workers (Olson, 1989). Where gains have been found is with cases of structured work with measurable outcomes. An empirical study on the determinants of telecommuting productivity showed it was the existence of an internal method of evaluating outcomes that was most important to productivity and satisfaction (Hartman et al., 1991). Similarly, DuBrin (1991) found that productivity and satisfaction of telecommuters doing repetitive tasks was higher than office workers. An early and oft-cited example of telecommuting productivity was a 1980 program at Blue Cross/Blue Shield, wherein home-based workers filed 50 % more claims per day with 50 % less errors (“Work from home by computer, 1987”). The California State pilot found that management and supervisor support, as well as adequate training were essential to success, and that telecommuting only be applied to jobs for which it can be effective (Nilles, 1990).

The adoption of telecommuting also rests on worker and manager perceptions. A 1988 study of attitudes toward telecommuting found that managers had a slightly more negative view than employees, but that both had concerns about career development (Duxbury et al., 1987). Professional isolation was found problematic for telecommuters since it’s often informal or spontaneous, such as the proverbial water cooler (Cooper and Kurland, 2002). Interviews with employees in a study of IBM telecommuters show that lack of office interactions negatively effected teamwork, and that benefits to work-life balance were offset by blurred boundaries between work and home (Hill et al., 2000).

Through its first decades niche advocates were grounded in the experiments and evaluations that created knowledge to inform a future where telework resolved societal problems related to daily commute by automobile. But amid lessened economic and environmental pressures, to what extent has telework been adopted as an observable practice? According to the US Census, in 1980 the level of full-time home-based work in the United States was just 2.2 % of the labor force. Prior to 1980 the incidence of homework had been higher due to factors unrelated to telecommunications such as home manufacturing and agriculture. From 1980–1990, fulltime home-based work increased to 3 % of the labor force, representing 1.2 million new home workers. By 2010 it had increased to 3.6 % of the labor force representing an additional 1.9 million home workers. Data does not exist for these periods to show trends in occasional home work, yet an AT&T study quoted in 1984 found 6 % of the labor force did some work at home, and the 2010 Survey on Income Program Participation shows that 9.5 % of workers reported working from home either full time or occasionally. The upward trend in full-time home-based work from 1980 has continued and accelerated beyond 2005 as shown in Fig. 1, to 5 % of the labor force in 2017.

Among advocates and practitioners of telework in the 1990s—members of DOTs, other government agencies, utility firms, firms impacted by trip reduction policies, as well as planners, telecommuting consultants and new advocacy organizations—knowledge generated by pilot evaluations and academic studies was both influential and shared. For example, the study on telecommuting commissioned by the state of Virginia was instructed to learn from the experiences of California, as many others did as well (“The

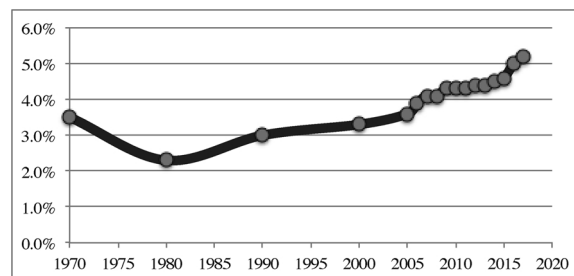


Fig. 1. Worked from Home Without Commuting to Workplace (Percent of US Workers 16 and Older, Primary Means of Travel to Work in Previous Week).

Source: US Census Bureau

potential benefits of telecommuting, 1990). By this time, telecommuting advocates faced a situation in which, on the basis of shared knowledge, telecommuting had clear benefits for trip reduction, yet no clear effect on productivity except in very specific circumstances, and mixed feelings among workers and managers.

#### 4.5. Social network sharing by niche and incumbent actors

In seeking wider adoption of telecommuting, advocates turned to creating materials to guide organizations towards successful applications of telecommuting. Furthermore, incumbent firms increasingly joined niche advocates in these efforts. Four strategies for selling telecommuting were most often applied in combination. One was to *promote telecommuting in selected and structured circumstances*. A second was to *highlight benefits to organizations from these selective applications*. A third strategy was to *promote telecommuting on the basis of benefits to societal problems of traffic congestion, air quality and energy usage*. A fourth was to craft materials to *anticipate the resistance of upper and middle management*. These four strategies are grounded in the original vision and expectations of telecommuting, which sought societal benefit through carefully managed cost-saving telework arrangements. The following first two examples showcase the role of niche advocates, while a third demonstrates how incumbent actors assumed a larger role in coordinating telework in the late 1990s. Furthermore, the balance in the application of strategies differs for each example, yet two of them demonstrate a shift in the original vision in that they downplay societal benefits and highlight firm and employee benefits.

##### 4.5.1. Guides by the California Department of Transportation

Findings from the 1988 California State telecommuting pilot program evaluation showed that having “champions” and support from senior management were important to the success of telecommuting programs (Nilles, 1990). It was in part to address such challenges that the California Department of Transportation (DOT) in 1991 released two guides for telecommuting, one aimed at employees interested in telecommuting and one specifically at executives (Shirazi et al., 1991; Pratt et al., 1991). The guides were prepared by the California-based nonprofit Commuter Transportation Services Inc. in collaboration with California DOT, and funded with grants from the US Department of Transportation and Federal Highway Administration. One featured nine authors and involved eight different organizations, highlighting the collaborative network nature of telework advocacy (Shirazi et al., 1991).

The more general guide, *Telecommuting: Moving the Work to the Workers: A Handbook to Help you Set up a Program at your Company* exhibits all four strategies to promote telecommuting. Firstly, despite raising the option of less formal arrangements, the majority of the guide’s materials are geared towards setting up selective and structured telecommuting programs (Shirazi et al., 1991, p. i). The guide provides three sample documents for formalizing structured arrangements, including sample policy, sample agreement, and forms specifying rules and tasks to be signed by participants (p. 48–55). The timelines for setting up a program covers seven stages including weeks for training, and ending with an ongoing process of evaluation. In selecting participants, it considers ideal qualities, noting, “not every employee, supervisor, or job is appropriate for telecommuting” (p. 15). Qualities of the “ideal” telecommuter read as a list of ideal workers generally, consisting of being self-motivated, disciplined, productive, knowledgeable, and skilled (p. 16). The selection survey is four pages and collects quantitative and qualitative data on tasks, desire to telecommute, habits, skills, and relationship with supervisor (p. 59–62).

The benefits of telecommuting are presented in three sections: “What’s in it for your company”, “What’s in it for your employers”, and “Impacts on the community”; with the latter section as just one short paragraph, while benefits for company and employees are spelled out across multiple pages (Shirazi et al., 1991, p. 2–6). Stated company benefits are productivity gains, reduced absenteeism, employee satisfaction, less overhead, but are contingent upon the program being “well designed” (p. 2). Employee benefits are stated as avoiding traffic, saving money on commutes, and flexibility. The final strategy embodied in the guide is efforts to anticipate management concerns. Upper management is concerned by the “bottom line” and are best convinced with evidence from successful programs such as those that show increased productivity, while middle managers are considered a bigger challenge because they need to adjust to “manage by results” rather than by observing work hours (p. 7–8).

##### 4.5.2. Marketing by the Oregon Office of Energy telework team

During the 1990’s the Oregon Office of Energy offered assistance to employers setting up telecommuting programs in conjunction with a tax credit. The Business Energy Tax Credit covered thirty five percent of project costs over five years, but projects had to be approved in advance by the department’s telework team (“Tax credits for telework equipment, 1998). The office provided access to numerous documents in printed, electronic, or online formats, as well as three video guides (“Telework tools, 1997). These materials exhibited all four marketing strategies: encouraging selective and structured telecommuting, highlighting specific organizational benefits, highlighting societal benefits, and anticipating management resistance.

Telecommuting was recommended as suitable to “the right kind of worker” with “the right kind of job” and “the right home environment.” A Teleworker Selection Guide provided by the office, ensured that employees in telecommuting programs were self-motivated, organized, already successful, and in a suitable job with measurable activities (“Teleworker selection guide, 1997). In a presentation, managers were told “don’t let people telework you are unsure of”, and to start with a pilot and track results (“Telework: What’s in it for the manager?, 1997).

In advocating, the office blended arguments of telecommuting benefitting both firms and society. They state that the Office of Energy promotes telecommuting, “because it conserves fuel, relieves traffic congestion, and improves air quality – and because it makes good business sense,” and provided case studies showing measurable benefits, such as productivity gains and savings on parking space (“Case studies of successful telework programs, 1996). Yet while numerous potential benefits for the organization are offered, the societal benefits are also put front and center in the model “Telecommuting Work Option Policy” that employers are



encouraged to use, which opens with:

*Traffic congestion, air quality and energy use are increasing. The measures employers take today directly impact the quality of life in our community and neighborhoods.* (“[Sample telecommuting work option policy, 1996](#)”)

Finally, they considered manager concerns as a potential obstacle to adoption. To that end they offered “The Manager’s Telework Kit” with a video and booklet entitled *Manager’s Quick and Easy Guide to Telework*. Additionally, a presentation sought to show telecommuting as an opportunity to be a more “innovative, progressive, and successful, manager” pointing to the potential to have satisfied and effective employees (“[Telework: What’s in it for the manager?, 1997](#)”). By 2001, the Oregon Office of Energy claimed to have assisted 504 organizations ([Finlayson, 2001](#)).

#### 4.5.3. Events through Telecommute America ‘97

Whereas the previous examples highlighted niche actors, the last example of advocacy will highlight the greater involvement of incumbent regime actors. Multiple telework associations formed in the 1990s. Many were chapters of the national Telecommuting Advisory Council, which was founded in 1993. By 1996 it was renamed “TAC - the International Telework Association”. Regional telecommuting advisory councils (TACs) were formed by coalitions of firms, government agencies, and nonprofits. In 1997—arguably the peak year of telework advocacy—TAC listed 17 regional chapters (“[Chapters, 1997](#)”). Other notable advocacy groups at the time included Smart Valley, a coalition of Silicon Valley technology firms, and the Telecommuting Association of Minnesota (TAM), which managed its own annual conference (“[Welcome to smart valley, 1998; Annual conference, 1997](#)”).

The Telecommute America initiative brought together local organizations to hold a biennial week of events along with a survey in 1995 and 1997 to promote wider adoption of telecommuting. The founding members were the Association for Commuter Transportation, AT&T, and three Federal agencies: GSA, EPA, and the Department of Commerce. Telecommute America’ 97 encouraged firms to “Discover a New Workplace” (“[Telecommute America week, 1997](#)”). The initiative partnered with local associations, government agencies, and universities in hosting events, including Smart Valley in the Bay Area, the USF Center for Transportation Research in Florida, and three local TACs: the Metro Atlanta TAC, the New York TAC, and the Mid Atlantic TAC. The Telecommuting Association of Minnesota was also a partner in 1997.

Telecommute America’ 97 was an umbrella under which niche advocates and incumbent actors could exchange ideas. Yet with numerous firms showcasing their telework arrangements, and technology vendors promoting telework-enabling technologies, it also highlighted the growing role of incumbent actors in driving transition. The event defined the concept of telework broadly as “alternate office arrangements” including home-based telecommuting, center-based telecommuting, and desk-sharing. Yet within this umbrella the four strategies of telecommuting advocacy are apparent. Using selective, structured programs and speaking to organizational benefits are most prominent, while speaking to societal benefits and anticipating management resistance are present, but less prominent.

A national website asked firms to support Telecommute America Week by signing a pledge, publicizing an existing telecommuting program, or taking steps towards starting a telecommuting program (“[Telecommute America’ 97, 1997](#)”). Local events focused on providing organizations information to help them launch programs to unlock organizational benefits. An event in New Jersey hosted by Lucent offered “The Business Benefits Case” for telecommuting, while across the river an event in Manhattan guided interested firms towards “achieving strategic advantages through telework” (“[New Jersey Association for Computer Transportation, 1997, NYU/Fordham, 1997](#)”). A similar event in Boston also focused on applying telecommuting “as a strategic initiative.” In Minnesota, sessions focused on “costs and benefits” and appropriate “types of job functions”, while in Silicon Valley telecommuting was considered an “investment” (“[Summary of local team events, 1997](#)”).

Benefits to society were not as central. The employer pledge mentions, “improving the environment” without specifics. Yet it does break out organizational benefits of increasing productivity, decreasing overhead costs, flexibility for employees, and disaster response, while only one session considered the benefit of not physically commuting (“[Telecommute America’ 97, 1997](#)”). Concerns about management resistance also do not appear as prominently, however an event in Cincinnati considered “the effects of telecommuting on managers” and one in Boston sought to address “manager’s concerns”. In addition to the four strategies, events also devoted time to telecommuting technologies and their applications, such as video conferencing (“[Summary of local team events, 1997](#)”).

The localized advocacy that enabled more than 30 physical events in over 20 localities at Telecommuting America’ 97 was less apparent in 1999. The national TAC, which changed its name to the International Telework Advisory Council (ITAC), listed just four domestic chapters remaining in Arizona, the Mid-Atlantic, Atlanta, and New York (“[Links to ITAC chapters and local affiliates, 1999](#)”). Telecommute America—renamed “Telework America”—became a project under ITAC, and in 1999 celebrated Telework America Day, which asked participants to work from home or a center on October 27<sup>th</sup>. Rather than numerous local events in a week, five action summits were held, and Telework America hosted an online chat and provided guidance on setting up telecommuting programs through materials posted on the ITAC website (“[Telework America, 1999](#)”). AT&T and the GSA still partly supported the initiative, which included the survey, and added recommendations from an ITAC panel of experts (“[Telework America, 1999](#)”).

In 2005, a human resources association named WorldAtWork acquired ITAC, a step that was approved by the ITAC board because the “strong financial backing and staff resources” of WorldAtWork would better accomplish its goal of promoting telework (“[Frequently asked questions WorldAtWork, 2005](#)”). Telework—a niche that once lived squarely outside of the standard practices of firms—had been adopted by an association that helps to govern these standard practices. Yet as the above examples of telework advocacy show, this adoption was promoted in a limited strategic way that came to emphasize organizational and employee benefit over societal benefits.

## 5. Strategic niche management as groundwork for pathways

The three decades of telecommuting advocacy covered by this article conform to the theoretical framework of strategic niche management. Trip reduction legislation established protected spaces for experimentation with telework, much of which was carried out by public agencies. A social network of niche advocates evaluated these experiments and shared findings with each other and a wider audience. These advocates also shared a clear early vision for telework that saw it seeking to solve societal challenges such as pollution and congestion. These activities allowed its protected spaces to shield and nurture, but not quite empower, the innovations of telework, per the roles defined by Smith and Raven (2012). However over time, the growing involvement of incumbent actors, as evidenced by the wide participation of incumbent firms in Telecommute America, alongside evaluation results showing limited affects on productivity and satisfaction, contributed to a revised vision for telecommuting that deemphasized these societal benefits in favor of greater focus on strategic implementations to support organizational goals. An indication of this change in vision was the bringing of ITAC—a leading telework advocacy organization—into the fold of a human resources association. Such an iterative revising of original vision was also observed in a case study of the adoption of French tramways with different results (Turnheim and Geels, 2019).

Transition pathways seek to capture complex interactions within the multi-level perspective that lead to system change. Identifying which transition pathway matches a case entails examining not only the placement and coordination of actors, but also the role of landscape factors. Early on in the case of telework there was significant landscape pressure from environmental and economic conditions related to air quality and energy prices. Nilles et al. (1976) seemed aware of the need for such landscape pressure to continue for telecommuting to be more widely adopted, writing in 1976, “as problems of urban growth, energy shortages, and transportation congestion continue to worsen [telework] will achieve increasing importance and recognition.” However these landscape concerns abated over time from the perspective of incumbent actors.

Based on actor behavior, landscape pressures, and neighboring regimes, the case of telecommuting advocacy conforms to an *incremental transformation* pathway within the typology of transition pathways provide by Geels et al. (2016), in which incumbent actors adjust to new technologies in small stages. Sustained landscape pressure did not exist in a way that would enable a fuller reorientation, nor was the position of incumbents precarious enough to enable niche actors to take control of the transition. In terms of the transition pathway typology provided by Smith et al. (2005), the case similarly fits a pathway of *endogenous renewal*, in which the transition is coordinated by incumbent actors from the inside. For the case of telecommuting advocacy, the control of incumbents was not immediate but was established over time alongside a revising of the original vision. Again the absence of strong landscape pressure prevented a more significant reorientation pathway.

Telecommuting began as an innovation that sought to confront societal problems related to the journey to work for the regime of office work location. Yet by the 1990s, landscape pressure from environmental and economic conditions abated, and actors were supporting a revised vision that spoke more strongly to employee and firm benefit over societal benefit. Most local telework advocacy groups dissolved after this time, and some national groups ceased to be active. Yet the adoption rate in Fig. 1 shows increasing teleworking to 2017, as an incremental transformation compiles, and a neighboring regime of computing exerts pressure through new mobile cloud computing infrastructures. Exploring telework through the frameworks of strategic niche management and transition pathways sheds light on how the efforts of early niche telecommuting advocates resonates within this sociotechnical system even decades later.

For practitioners of strategic niche management this case points to a need to consider their efforts as not independently transformative, but rather as laying groundwork for longer-term transitions within defined pathways. This perspective also means acknowledging the limits of advocates in influencing outcomes such as in the face of existing or lacking landscape pressures. Yet awareness by both niche and incumbent actors of their position in a wider transition can also highlight where goals have shifted, and point to opportunities for future action. For this paper’s case, the recent discourse on the urgency of limiting and adapting to climate change could point to opportunities for reconsidering how telework can contribute to these efforts.

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