

Employer Attitudes and Stated Preferences Toward Telecommuting: An Exploratory Analysis

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The adoption of telecommuting involves two principal categories of decision makers: the employee and the employer. Employee participation in telecommuting programs is in general considered to be voluntary; however, approval from supervisors is required. The employer's decision therefore plays a decisive role in the initiation of a telecommuting program. An exploratory analysis of executives' attitudes and stated preferences toward telecommuting, which are essential to the employer's adoption of telecommuting, are presented. The results indicate that management issues such as employees' productivity, executives' abilities to supervise telecommuters, and data security remain barriers to the employer's adoption of telecommuting. The comparison between the stated preferences of executives and those of employees also shows that executives are more reluctant than employees to adopt telecommuting.

Telecommuting continues to receive attention as a promising transportation demand management strategy that may possibly eliminate a portion of the work trips in peak hours and therefore reduce energy consumption and air pollution. Telecommuting has also been advocated as offering the potential to increase social welfare by providing job opportunities to parents with young children or workers with disabilities who may not be able to work otherwise. Other advantages and disadvantages incurred by both participants and their employers also have been identified in the literature, either as a result of speculation or on the basis of the experience acquired through various pilot projects (1-3).

A growing number of researchers have been involved in telecommuting projects, primarily motivated by the promising results from experiments on the west coast of the United States (4,5); however, several important issues remain to be addressed. Critical among these is the extent to which telecommuting might be adopted, as this would largely determine the eventual impact of telecommuting on transportation and business. To address this issue, it is important to understand the telecommuting adoption process, which is a key determinant of the existence and success of telecommuting programs. Two principal categories of decision makers are involved in this adoption process; the employee and the employer (6). An investigation of the employees' decision process and of the key factors that influence their attitudes and stated preferences toward telecommuting has been conducted (6). The present study is a complementary effort to address issues regarding the other major decision maker in the adoption process.

The employer makes decisions from the organization's viewpoint about whether to let employees telecommute, as well as the conditions and features of the particular program offered to em-

ployees. The complexity of the employer's adoption process is evident as decision processes differ among organizations, depending on the organization's culture, structure, and other characteristics, such as type of business activities. Some organizations may have only one decision maker, the chief executive officer, whereas others may have a decision team consisting of various executives. In addition to the variation of decision rules among organizations, different processes may occur within the same organization. Regardless of the size of the decision group and the underlying decision mechanism, the executives' opinions will strongly affect the organization's adoption of telecommuting, thereby providing the motivation for investigating executives' attitudes and stated preferences toward telecommuting.

This study addresses the employer's telecommuting adoption process using data supplied by executives in response to a telecommuting survey conducted in three cities in Texas. First, the survey method is described and characteristics of the executives and their organizations are summarized. Then executives' responses to attitudinal questions are analyzed, including a confirmatory factor analysis to validate the underlying logic of the questionnaire design, a discussion of the implications from the responses, and a statistical test to identify essential characteristics that affect executives' attitudes toward telecommuting. This is followed by an analysis of executives' stated preferences toward alternative telecommuting scenarios. In addition, results are compared with employees' preferences described in a previous paper by the authors (6). Concluding remarks are presented in the last section.

SURVEY METHOD

Data used in this study are from a survey conducted in three Texas cities: Austin, Dallas, and Houston. Both employees and executives were targeted by the survey, with different questionnaires for each group. The details of the survey procedure and the analysis of the employee data were presented in a previous paper (6). This paper presents an analysis of the executives' responses to a questionnaire that consists of four sections. The first section is intended to capture the general characteristics of the executives and their organizations. These include the executive's job title, management-related information such as the number of subordinates directly supervised by the executive (span of management), and methods of supervision. Also included is the current availability of telecommunications and computer networking facilities in the company. The second section addresses the executives' attitudes, measured by Likert's five-score, bipolar scales (7), toward telecommuting in terms of management concerns such as productivity, morale, absenteeism, and data secu-

rity. The third section seeks to elicit executives' preferences for supporting a telecommuting program in the organization under different program scenarios. The last section regards respondents' sociodemographic characteristics, such as gender, age, and educational levels.

Questionnaires were sent to selected organizations and distributed to their executives through personnel officers. A total of 68 organizations representing various firm sizes and business activities were sampled and 397 questionnaires were mailed for distribution. Among these, 83 usable questionnaires were received from 31 organizations. Table 1 lists the sample distribution by city across the business activity of the responding organizations.

CHARACTERISTICS OF RESPONDING EXECUTIVES AND ORGANIZATIONS

Executive Characteristics

The characteristics of the sampled executives and their organizations are illustrated in Table 2. Most of the respondents (77 percent) were men, and 71 percent were between 31 and 50 years of age. About 97 percent of the executives had achieved a high level of educational attainment, with 89 percent completing college or univer-

sity, and 36 percent attaining a master's degree or Ph.D. Compared with the employees surveyed in the same organizations (6), the executives in general had attained higher educational levels, and a greater fraction of them were men.

As expected, the majority of sampled executives were presidents or vice presidents (24 percent) and general managers (52 percent). Other reported job titles include accountant/attorney (19 percent), agent (1 percent), engineer/researcher (2 percent), and general employee (1 percent). To the extent that managerial characteristics are believed to affect executives' preferences toward initiating a telecommuting program, related questions were also included in the survey. The span of management, for example, varied from none to 145 employees, with a mean of 16.8 and a standard deviation of 23.2. In terms of the methods of supervision, review meetings (88 percent), completed task review (84 percent), on-site supervision (78 percent), and written reports (74 percent) were mentioned by most executives, whereas activity logs (33 percent) were indicated by relatively fewer respondents.

Because telecommuting is not widespread in Texas, it is suspected that executives' limited familiarity with telecommuting might influence their attitudes or preferences. Only 16 percent of the executives reported being very familiar with telecommuting, although 61 percent were somewhat familiar, suggesting that a substantial number of the sampled executives may have only limited

TABLE 1 Number of Executive Questionnaires Sent and Received, by Business Sector, by City

Primary Activity	# of organizations selected				# of questionnaires delivered				# of questionnaires received			
	A	D	H	T*	A	D	H	T	A	D	H	T
Accounting	1	2	3	6	5	7	66	78	3	3	10	16
Advertising	1	1	2	4	5	30	6	41	4	10	1	15
Architecture	0	1	1	2	0	2	11	13	0	0	7	7
Banking	0	0	1	1	0	0	4	4	0	0	0	0
Computer/software	4	3	3	10	17	8	21	46	4	0	4	8
Engineering	1	2	0	3	5	8	0	13	1	6	0	7
General consultant	1	0	1	2	3	0	4	7	0	0	0	0
Government	0	1	1	2	0	2	6	8	0	2	0	2
Hospital/medical	2	1	0	3	8	30	0	38	2	6	0	8
Insurance	1	2	3	6	1	16	8	25	1	0	1	2
Law	1	2	1	4	2	37	1	40	0	3	0	3
Manufacturing	1	1	2	4	2	5	8	15	0	0	1	1
Oil	0	2	3	5	0	8	9	17	0	0	1	1
Publishing/translating	2	0	0	2	7	0	0	7	6	0	0	6
R & D	3	0	0	3	15	0	0	15	0	0	0	0
Real estate	1	1	0	2	2	2	0	4	1	0	0	1
Stocks	1	1	1	3	4	3	2	9	1	1	0	2
Telecommunications	1	1	2	4	1	3	7	11	1	0	1	2
Travel	1	1	0	2	5	1	0	6	2	0	0	2
Total	22	22	24	68	82	162	153	397	26	31	26	83

* A: Austin
D: Dallas
H: Houston
T: Total

TABLE 2 Executive and Organizational Characteristics

Characteristics	Categories	Relative frequency (%)
Gender	Male	77.1
	Female	22.9
Age	Under 30	21.7
	31-40	32.5
	41-50	38.6
	51-60	6.0
	above 60	1.2
Educational level	Finished high school	2.4
	Some college or university	4.8
	Finished college or university	53.0
	Master	31.3
	Ph.D.	4.8
	Other	3.6
Familiarity of telecommuting	very familiar	16.0
	somewhat familiar	60.5
	not familiar	23.5
Awareness of someone who telecommutes	yes	36.6
	no	63.4
Number of subordinates directly supervised	0-5	34.6
	>= 6	65.4
Methods of supervision (check all that apply)	review meetings	87.7
	written reports	74.1
	activity logs	33.3
	on-site supervision	77.8
	time-sheets	64.2
	review completed task	84.0
Number of personal computers available to the staff	0	6.2
	1-4	40.7
	>= 5	53.1
Number of dedicated word processors available to the staff	0	55.6
	1-4	30.8
	>= 5	13.6
Number of mainframe terminals available to the staff	0	55.6
	1	16.0
	2	3.7
	>= 3	24.7
Number of terminals interconnected through an internal network	all	45.8
	more than 75%	15.7
	less than 50%	20.5
	none	18.1
Existence of employees who telecommute in the organization	yes	16.9
	no	66.3
	not aware	16.9
Existence of flex-time programs in the organization	yes	31.7
	no	67.1
	not aware	1.2

appreciation of telecommuting. However, no explicit questions were included to test the extent of familiarity. In addition, about 40 percent of the respondents knew someone who telecommutes.

Organizational Characteristics

With respect to the penetration of the technologies normally associated with telecommuting, about 53 percent of the executives indi-

cated that at least five personal computers were available to their staff, with 35 percent indicating at least 10; 44 percent of the executives reported the availability of at least one mainframe terminal and 28 percent reported at least two. Statistically, the average number of personal computers among sampled organizations was 18.9, and 4.3 for mainframe terminals. Additionally, on a per-employee basis, the average number of personal computers per supervised staff member was 1.1 across the surveyed organizations, which dropped to 0.2 for mainframe terminals. In terms of the current

availability of optional work arrangement in the organization, 32 percent of the executives mentioned that there was a flexible work schedule program, and about 17 percent reported that some employees telecommuted at least on a part-time basis.

In addition to statistics based on individual executives, information from each organization as a unit was also analyzed. Among the sixteen organizations with only one executive questionnaire received, three indicated a flex-time program (FTP) and four reported that telecommuting is available in the organization. Within the other fifteen organizations with more than one questionnaire, six had a consensus on the availability of a FTP among the sampled executives, with only one indicating yes and five indicating no; there was consensus among all sampled executives in seven organizations that telecommuting is not available. For organizations without agreement among the responding executives, six had more than half of the responding executives answering yes to the availability of an FTP and three had more than half of the responding executives answering no; two had more than half of the executives answering yes to the availability of telecommuting, and six had more than half answering no. The results revealed that only about half of the organizations with more than one sampled executive had a consensus on the company's current offering of an FTP or telecommuting, and the consensus was overwhelmingly on the lack of availability of such programs. Further investigation showed that six organizations had inconsistent responses from their executives on both questions; all of them had more than 200 employees, indicating that the inconsistency may result from the relatively large size of the organization.

EMPLOYER ATTITUDES TOWARD TELECOMMUTING

This section discusses executives' responses to questions intended to capture their attitude towards telecommuting. First, the logic underlying the design of the attitudinal questions is validated by a confirmatory factor analysis of the responses. A discussion of the responses is presented next, followed by statistical tests aimed at identifying the principal characteristics of the executives and their organizations that influence the executives' attitudes.

Question Design Logic and Confirmatory Factor Analysis

Twelve attitudinal questions included in the executive survey are indicated in Table 3. Those questions were designed to measure four general attitudes that are believed to affect the employer's likelihood of adopting telecommuting. These attitudes pertain to the effects of a telecommuting program on the following:

1. Telecommuting workers and public image of the organization (Questions 1, 2, 5, and 8);
2. Nontelecommuting workers (Questions 3 and 6);
3. Workers overall (Questions 4 and 7); and
4. Managerial effectiveness and related concerns (Questions 9, 10, 11, and 12).

TABLE 3 Responses to Attitudinal Questions

Questions	Responses (relative frequency, in %)				
	1 <i>very negative</i>	2	3 <i>neutral</i>	4	5 <i>very positive</i>
Suppose your staff were part of a voluntary telecommuting program in which eligible employees worked from their homes twice a week. What effect do you think such a telecommuting program would have on:					
1. the firm's ability to retain and recruit employees ?	4.9	11.1	29.6	39.5	14.8
2. telecommuting employee productivity ?	18.3	31.7	31.7	13.4	4.9
3. non-telecommuting employee productivity ?	16.0	28.4	48.1	7.4	0.0
4. overall staff productivity ?	17.1	30.5	30.5	20.7	1.2
5. telecommuting employee morale ?	8.6	4.9	19.8	50.6	16.0
6. non-telecommuting employee morale ?	11.1	32.1	45.7	11.1	0.0
7. overall employee absenteeism ?	11.0	13.4	52.4	18.3	4.9
8. the firm's public image ?	12.2	17.1	45.1	20.7	4.9
9. your ability to manage your workload ?	19.5	36.6	23.2	13.4	7.3
10. your ability to communicate with your staff ?	20.7	37.8	30.5	8.5	2.4
11. your ability to supervise your staff ?	29.3	40.2	24.4	4.9	1.2
12. security of data and information ?	14.6	25.6	50.0	4.9	4.9

A confirmatory factor analysis using the SAS CALIS procedure (8) was performed to verify whether the variation of responses to those twelve questions could be explained by the four general attitudes. The measured variables in the factor analysis model corresponded to the responses to these questions. Formal testing indicated significant correlation between responses to the questions (9). Therefore, a factor analysis was appropriate.

The specified factor pattern and estimated results are indicated in Table 4. Correlations between factors are also specified in the model. The results in Table 4 indicate that all loadings were significantly different from 0 at the 0.01 level. In addition, ten variables loaded on the specified factors with values greater than 0.60, usually considered a high loading, whereas no variable had a loading less than 0.30, a low loading. Statistics such as the goodness-of-fit index (GFI = 0.86) and adjusted GFI (0.77) and inspection of the residual correlation matrix indicated that the models fit the observed data well and therefore support the design structure.

Discussion of Responses

Executives' responses to the attitudinal questions are summarized in Table 3. With respect to the possible effects of a telecommuting program on telecommuters and the image of the organization, 26 percent of the executives believed that the effect on the image would be positive, but about the same fraction believed that the effect would be negative (Question 8). However, more than half of the executives (54 percent) believed that instituting a telecommuting program would help the organization retain and recruit employees (Question 1). Interestingly, whereas 67 percent of the respondents indicated that the effect on the telecommuting workers' moral would be positive (Question 5), only 18 percent believed that telecommuters would increase their productivity (Question 2). This result clearly reflects the executives' concerns about the telecommuters' work performance.

Executives generally expected a telecommuting program to exert a negative influence on workers who do not telecommute. In response to Questions 3 and 6, 44 percent of the executives believed that the effect would be negative on both the productivity and morale of nontelecommuting workers, whereas only about 10 percent thought it would be positive in both cases. In addition, about 50 percent of the executives expected a negative effect on overall staff productivity, whereas only 22 percent expected a positive effect (Question 4). The effect on overall employee absenteeism is believed to be neutral, with 24 percent indicating positive and an equal fraction indicating negative impacts (Question 7).

Management issues have long been considered to be the major barrier to an employer's adoption of telecommuting. The responses to related questions (9 through 12) indicate that more than half of the executives thought telecommuting would have negative effects on their ability to manage the workload (56 percent), their communications with the staff (59 percent), and their supervision (70 percent). Additionally, more executives (40 percent) believed that telecommuting would have a negative effect on data security than did executives (10 percent) who thought the effect would be positive. These findings confirm widely expressed thoughts in the literature that some managers are reluctant to adopt telecommuting because of serious concerns about their ability to retain proper management control.

Cross-Tabulated Tests

To identify the factors that influence executives' attitudes toward telecommuting, the responses to each attitudinal question were cross-tabulated with the characteristics of the executives and their organizations listed in Table 2 to examine their independence. Because of the relatively small executive sample, Fisher's exact tests (10), instead of the commonly used chi-squared test, were performed for the test. Table 5 summarizes the test results for seven of

TABLE 4 Estimated Factor Pattern from Confirmatory Factor Analysis

Variables	Factor 1	Factor 2	Factor 3	Factor 4
1	0.62(5.8)			
2	0.85(8.9)			
3		0.98(8.2)		
4			0.88(8.7)	
5	0.62(5.9)			
6		0.65(5.6)		
7			0.58(5.4)	
8	0.62(5.8)			
9				0.68(6.6)
10				0.85(8.9)
11				0.90(9.8)
12				0.40(3.5)

* The t values are listed in the parentheses.

TABLE 5 Results of Fisher's Exact Tests of Responses to Attitudinal Questions

Variables	Attitudinal questions											
	1	2	3	4	5	6	7	8	9	10	11	12
job title									*			
number of subordinates directly supervised	#	+			*				*			
method of supervision		+							#	*		
familiarity with telecommuting		*			+					*	*	
awareness of someone who telecommutes		#	#	*			*			*		*
penetration of telecommunications and computing technologies				+							*	
presence of telecommuters in the organization			*						*	*	*	#

+ : significant at the 0.10 level, but not at the 0.05 level

* : significant at the 0.05 level, but not at the 0.01 level

: significant at the 0.01 level

null hypothesis: The responses to attitudinal questions are independent to the variables listed in the first column.

the above variables that have statistically significant effects on the responses to at least one question. In marked contrast to the data on employees (6), none of the executives' socioeconomic characteristics appeared to exert significant effects on their attitudes toward telecommuting. Instead their attitudes were primarily influenced by management-related characteristics and the availability of telecommunications facilities in the organizations.

The executive's expectation of the effect of telecommuting on his/her ability to manage the workload was influenced by the job title: fewer presidents or vice presidents (5 percent), who generally possess greater power in the decision process than others (20 percent), believed the effect is positive. As expected, executives with fewer subordinates were more likely to have positive attitudes than others: 29 percent of the executives with less than six subordinates, traditionally the recommended span (Group 1), felt that telecommuters would increase their productivity, a feeling shared by only 13 percent of other executives (Group 2). Similarly, about 32 percent of the executives in Group 1 expected a negative effect on the telecommuter's productivity, whereas 58 percent in Group 2 had the same expectation. Apparently, spans of management also affected the executives' attitudes toward the influence of telecommuting on their workload. Whereas less than half (46 percent) of the executives in Group 1 thought that this influence would be negative, more than half (60 percent) of the executives in Group 2 thought so.

The test results indicate that methods of supervision affect the executives' attitudes as well: 58 percent of the executives who rely on "reviewing completed tasks" as a way of supervising subordinates felt that telecommuting would negatively affect their communications with the staff, whereas a larger portion (69 percent) of executives not using this method had the same expectation. In addition, whereas only 22 percent of executives who use "written reports" but not "on-site supervision" believed that telecommuters would decrease their productivity, about 55 percent of the other executives

believed so. Clearly, executives who supervise employees by reviewing the final accomplishment, and not by looking over their shoulders during work hours, are more inclined to report positive attitudes toward telecommuting.

To the extent that telecommuting has not been widely adopted in Texas, the executives' awareness of telecommuting is expected to affect their attitudes. The test results are consistent with this hypothesis. In general, fewer executives who were familiar with telecommuting (Group 1) than others (Group 2) expected a negative effect from telecommuting: 53 percent of the executives in Group 1 expected a negative effect on their communication with staff, compared with 84 percent in Group 2. Extremely, almost all executives (95 percent) in Group 2 believed their ability to effectively supervise would be negatively affected. This percentage, however, dropped to 62 percent for respondents in Group 1. In addition, among executives who know someone who telecommutes, more respondents (33 percent) believed that telecommuters' productivity would increase than did respondents (23 percent) who believed that productivity would decrease. On the other hand, among executives who are not aware of someone who telecommutes, a large fraction (67 percent) believed that the productivity would decrease, whereas only about 10 percent believed that productivity would increase.

The penetration of relevant technologies within the organization has positive impacts on executives' attitudes. About 38 percent of the executives in organizations with more than five personal computers and two mainframe terminals believed that telecommuting would increase the productivity of staff overall, whereas only 19 percent of the other executives had the same expectation. In addition, whereas only 38 percent of the executives in organizations with technology penetration thought that telecommuting would have a negative effect on their ability to supervise, 75 percent of the other executives thought so. Executives in organizations with a telecommuting program (Group 1) are more likely to exhibit posi-

tive attitudes as well: in this group, more respondents (43 percent) believed that the effect on their workload would be positive than respondents (36 percent) who believed it would be negative. In addition, about 72 percent of the respondents in organizations without such a program (Group 2) believed that the effect on their ability to supervise would be negative, whereas only 43 percent in Group 1 had the same expectation. Different attitudes between the two groups were also manifested with respect to the influence of telecommuting on data security. In Group 2, 48 percent thought the influence would be negative and only 2 percent thought it would be positive. On the other hand, 36 percent of the executives in Group 1 expected a negative effect, and an equal percentage expected a positive effect.

STATED PREFERENCES FOR TELECOMMUTING ALTERNATIVES

This section discusses responses to questions about the executives' willingness to support a telecommuting program in an organization under various program scenarios. After a discussion of the re-

sponses to each scenario, an exploratory analysis of some of the underlying factors influencing these responses is presented.

Discussion of Responses

Table 6 lists the executives' responses to nine different telecommuting program scenarios, defined on the basis of who assumes the additional costs of telecommuting and the corresponding salary changes to telecommuting employees. For each scenario, executives were asked to state their willingness to support such a telecommuting program in the organization from one of the following responses: 1, yes; 2, possibly; and 3, no.

Scenario 1 was designed as the cost-neutral "status quo" from the employer's standpoint: the employee's salary (ES) remains the same and the employer incurs no additional costs. Under this scenario, about 67 percent of the executives would support the telecommuting program. Keeping the ES fixed, this percentage decreases as the costs incurred by the employer increase. This is confirmed by the results of Questions 2 and 3: the percentage decreased to 51 percent under Scenario 2 (some costs assumed by the em-

TABLE 6 Responses to Stated Preference Questions for Telecommuting Program Scenarios

Telecommuting and Program Scenario	Responses (relative frequency, in percent)		
	1 Yes	2 Possibly	3 No
1. Employee's salary stays the same; employer incurs no costs	33.3 (35.5)	33.3 (29.0)	33.3 (35.5)
2. Employee's salary stays the same; employer assumes some costs	25.9 (25.8)	24.7 (19.4)	49.4 (54.8)
3. Employee's salary stays the same; employer pays all costs	25.9 (32.3)	14.8 (12.9)	59.3 (54.8)
4. Employee's salary decreases 5%; employer incurs no costs	8.8 (0.0)	31.3 (38.7)	60.0 (61.3)
5. Employee's salary decreases 5%; employer assumes some costs	5.0 (0.0)	28.8 (22.6)	66.3 (77.4)
6. Employee's salary decreases 5%; employer pays all costs	7.5 (0.0)	15.0 (16.1)	77.5 (83.9)
7. Employee's salary increases 5%; employer incurs no costs	7.5 (9.7)	15.0 (16.1)	77.5 (74.2)
8. Employee's salary increases 5%; employer assumes some costs	7.5 (9.7)	8.8 (9.7)	83.8 (80.6)
9. Employee's salary increases 5%; employer pays all costs	8.8 (9.7)	7.5 (6.5)	83.8 (83.9)

Note: Numbers in parentheses are relative frequency in terms of responding organizations. Responses were received from executives in 31 organizations.

ployer) and further to 41 percent under Scenario 3 (all costs are paid by the employer).

A priori, Scenario 4 (the ES decreases 5 percent and the employer incurs no additional cost) was thought to dominate all others from the employer's point of view. However, the results do not support this assumption. Compared with Scenario 1, the percentage of telecommuting supporters dropped to 40 percent under Scenario 4, to 34 percent under Scenario 5 (the ES decreases 5 percent and the employer assumes some costs), and to 23 percent under Scenario 6 (the ES decreases 5 percent and the employer pays all costs). Apparently, a 5 percent decrease in the employee's salary does not stimulate executives' willingness to support telecommuting. On the contrary, it appears to decrease the percentage of supporters by about 20 percentage points (when the organization does not incur additional costs). This somewhat unexpected finding suggests that executives probably recognize that it would be unfair to penalize employees who wish to telecommute if they continue to perform the same job duties. Furthermore, executives undoubtedly recognize that a program that reduces employees' salaries will not be viewed favorably by the employees and would therefore lead to poor public image. Results from Scenarios 4 through 6 also exhibit the tendency noted earlier of decreasing support for telecommuting by executives as the additional costs incurred by the employer increase.

Although executives in general do not seem inclined to reduce telecommuters' salaries, they certainly do not believe that telecommuters should receive a salary increase. The latter appears to be even less tolerable than the former. Under Scenario 7 (the ES increases 5 percent and no additional cost to the employer), the percent of telecommuting supporters dropped to 23 percent and further dropped to 16 percent if the employer was required to assume some or all costs (Scenarios 8 and 9, respectively). Again, the tendency of telecommuting support to decrease as the employer's additional costs increase remains.

With these results it is possible to estimate the percentage of "hard-core" telecommuting supporters (executives who answered yes to every scenario) at less than 10 percent and those who would not support telecommuting under any circumstances at over 35 percent. Compared with employees' results, about 15 percent for both extremes (6), the present result implies that executives are more reluctant to adopt telecommuting than are employees. However, because voluntary telecommuters require the approval of their supervisors, the executive's attitudes and preferences play a decisive role in the initiation and adoption of a telecommuting program (11). The implication from these results is that an effort to remove management barriers would be essential to encourage a telecommuting adoption.

The stated preferences for telecommuting program scenarios are also summarized on the basis of the responding organizations and are listed in Table 6 (in parentheses, below the percentage of executives). Overall, the relative frequency distributions are comparable to those based on the individual executive's responses. For organizations with more than one sampled executive, the organizational response to each question is represented by the majority of its sampled executives. Further investigation of the responses within these organizations indicates that most of the inconsistencies appear to be in responses to the first three scenarios.

Cross-Tabulated Tests

Responses to alternative telecommuting scenarios were also cross-tabulated using Fisher's procedure with respect to the same variables considered in the analysis of the executives' attitudes. Only four variables, indicated in Table 7, were found to significantly affect the executives' stated preferences toward telecommuting. Variables that did not affect the executives' attitudes have no bearing on their preferences either.

TABLE 7 Results of Fisher's Exact Tests of Responses to Stated Preference Questions

Variables	Stated preference questions								
	1	2	3	4	5	6	7	8	9
job title	#	*	*						
number of subordinates directly supervised	#	*	+						
method of supervision									
familiarity with telecommuting									
awareness of someone who telecommutes	+			+			*	#	#
telecommunications technology adoption	*	+	+		*				
existence of telecommuters in the organization									

+ : significant at the 0.10 level, but not at the 0.05 level

* : significant at the 0.05 level, but not at the 0.01 level

: significant at the 0.01 level

Null hypothesis: The responses to attitudinal questions are independent to the variables listed in the first column.

Consistent with the attitudinal results, executives with less power in the decision-making process exhibited a stronger preference for supporting a telecommuting program: whereas relatively few presidents or vice presidents indicated their support under the first three scenarios (30, 25, and 15 percent, respectively), more than 50 percent of other executives indicated such support (78, 58, and 50 percent, respectively). Spans of management affect executives' preferences as well. A large fraction of executives with less than six subordinates would support telecommuting (89 percent, 67 percent, and 55 percent for the first three scenarios, compared with 54, 40, and 31 percent, respectively, of other executives). As expected, the executive's awareness of someone who telecommutes increases his or her support for telecommuting: about 79 percent of such executives would support telecommuting under the first scenario, whereas 59 percent of the other executives would.

The penetration of related technologies is the only organizational characteristic that significantly influences executives' preferences. Again, these effects are manifested mainly under the first three scenarios. The percentage of telecommuting supporters drops from 69, 69, and 62 percent (for Scenarios 1 through 3, respectively) of executives whose organizations have more than five personal computers and two mainframe terminals (Group 1) to 65, 45, and 35 percent, respectively, of the other executives (Group 2). Another interesting result appears from this analysis. Although the percentage of telecommuting supporters in Group 1 remains approximately the same from Scenarios 1 through 3, the corresponding percentage drops substantially in Group 2 as the additional costs incurred by the organization increase. As indicated earlier, most of the effects of these four variables are exhibited by the executives' preferences under the first three scenarios. This may result from the fact that considerably fewer executives would support telecommuting under the other scenarios, especially the last four.

COMPARISON OF EMPLOYEE AND EXECUTIVE STATED PREFERENCES FOR TELECOMMUTING ALTERNATIVES

Data obtained from both employees and executives in the same organizations provide an opportunity to compare their respective preferences toward telecommuting. The responses from five organizations with at least three sampled executives were selected for this comparison. Again, the Fisher's exact test was used for independence tests because of the small executive sample in each selected organization.

Test results (Table 8) of the responses to six scenarios asked of both employees and executives clearly reveal that employees have stronger preferences for telecommuting than executives. Among all respondents, for example, most employees (88 percent) would like to telecommute under Scenario 3 (employee salary remains the same and employer pays all costs), whereas only 41 percent of the executives would support such a program. The divergence between the responses from the two groups is maximal under Scenario 6, theoretically the best scenario for employees and the worst for executives (employee salary increases 5 percent and employer pays all costs). Whereas about 87 percent of the employees would like to telecommute under this scenario, only 16 percent of the executives would support it.

Similar results were found within individual organizations. For example, a dominant majority of employees (95 percent) from the publishing firm would like to telecommute under Scenario 3, but only 40 percent of the executives would support it. The difference within the architectural firm is also dramatic: about 83 percent of its employees desire to telecommute under Scenario 6, supported by only 29 percent of its executives. These results are confirmed by Kendall's tau-b measures (*T*), as listed in Table 9, most of which

TABLE 8 Results of Fisher's Exact Tests of Responses from Employees and Executives to Various Telecommuting Program Scenarios

Organizations	Scenario					
	1	2	3	4	5	6
1 accounting firm [07;3]						
2 advertising firm [17;4]			#			*
3 architects firm [12;7]		*				+
4 computer software firm [28;3]					*	#
5 publishing firm [109;5]			#		+	#
6 all firms [695;83]	#		#	#	#	

Note 1: Numbers in brackets are [# of employee responses received; # of executive responses received].

Note 2 (scenarios)

- | | |
|------------------------------|---|
| 1: employee salary: the same | employer: some costs (employee: a new telephone number) |
| 2: employee salary: the same | employer: some costs (employee: a personal computer) |
| 3: employee salary: the same | employer: all costs |
| 4: employee salary: - 5% | employer: all costs |
| 5: employee salary: + 5% | employer: some costs |
| 6: employee salary: + 5% | employer: all costs |

Note 3

- + : significant at the 0.10 level, but not at the 0.05 level
- * : significant at the 0.05 level, but not at the 0.01 level
- # : significant at the 0.01 level

TABLE 9 Results of Kendall's TAU-B Measures of Responses from Employees and Executives to Various Telecommuting Program Scenarios

Organizations	Scenarios					
	1	2	3	4	5	6
1 accounting firm [07;3]	.27 (.24)		.59 (.16)	.32 (.13)	.59 (.16)	.66 (.18)
2 advertising firm [17;4]	.42 (.14)	.32 (.15)	.57 (.12)		.45 (.11)	.51 (.12)
3 architects firm [12;7]			.34 (.21)		.24 (.22)	.27 (.24)
4 computer software firm [28;3]				.24 (.07)	.41 (.11)	.52 (.13)
5 publishing firm [109;5]	.11 (.09)		.29 (.11)		.19 (.06)	.26 (.08)
6 all firms [695;83]	.11 (.04)		.30 (.04)	.12 (.03)	.31 (.03)	.37 (.03)

Note 1: Numbers in brackets are [# of employee responses received; # of executive responses received].

Note 2 (scenarios)

1: employee salary: the same

2: employee salary: the same

3: employee salary: the same

4: employee salary: - 5%

5: employee salary: + 5%

6: employee salary: + 5%

employer: some costs (employee: a new telephone number)

employer: some costs (employee: a personal computer)

employer: all costs

employer: all costs

employer: some costs

employer: all costs

Note 3: Standard error estimates for 95% confidence intervals are listed in parentheses.

are positive and significantly different from 0 at the 5 percent level. For the given measure design (for respondents: 1 if an employee and 2 if an executive; for responses: 1 if yes, 2 if possibly, and 3 if no), positive measures indicate that executives are more likely to answer no than employees.

CONCLUSION

It has been at least two decades since the notion of telecommuting emerged in the United States. However, information and evidence about the adoption of telecommuting programs by employers are still limited. This paper has presented an exploratory analysis of the responses to a detailed survey of the attitudes and stated preferences of executives toward telecommuting in selected organizations in three Texas cities. The goal was to develop a better understanding of the decision processes and factors underlying the adoption process. The results of this study have confirmed some speculation in the literature that management issues constitute the major barrier against greater support of telecommuting programs by executives. The results also indicate that executives' awareness of telecommuting substantially reduces this barrier, suggesting that as the concept of telecommuting becomes more familiar to executives, more adoption of telecommuting may be expected. The responding executives were not inclined to support telecommuting programs in which the participating employee's salary would be reduced. This finding should alleviate some employee concerns because the financial aspects of telecommuting programs have been found (6) to be a major concern of most employees.

The survey results also strongly indicate that executives are overall more reluctant than employees to support telecommuting. To the extent that public policy objectives favor greater adoption of telecommuting, it appears that there should be a greater effort to inform executives, especially those in the upper echelons of the decision-making process, such as presidents or vice presidents. In addition, management concerns about employees' productivity, executives' ability to supervise telecommuters, and security of data need to be alleviated.

Although the results from this study are undoubtedly limited by the relatively small sample, the analysis yielded useful insights into factors most likely to influence an employer's adoption of telecommuting. In addition to their direct substantive interest and policy relevance, these insights provide useful guidelines for the development of formal mathematical models of adopting telecommuting for both employees and employers and the subsequent development of a predictive capability in this regard.

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