Telework and Human Relations Management: the Relationship Between Production Strategy and the Adoption of Telework in Industrial and Service Companies

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Abstract. Telework as an integration of Information and Telecommunication Technologies with Human Resources management, means a new job organisation paradigm for companies working in the New Economy. However there are very few empirical studies that have analyzed the probability of telework adoption in industrial and service companies. This paper contributes with empirical data to the relationship between the use of telework techniques and the implementation of this new work organisation with the company´s production strategy. The paper uses data from Spanish companies to test the relationship between innovation, employee training, and other production strategy performance parameters with the probability of telework adoption.

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Introduction

Telework is a fairly new work organisation which integrates two sources of competitive advantage: the own company´s Human Resources and the new Information and Telecommunication Technologies. Although there is no agreement on the literature about telework definition and its different meanings –telework, telecommuting, remote working, homeworking-, some common elements allow us to consider telework as the complete or partial use of Information and Telecommunication Technologies to enable workers to get access to their labor activities from different and remote locations. The most common modalities of telework are homework and mobile-work, and to a lesser extent the use of telecenters.

There are a few studies in the literature which show the advantages and barriers to telework adoption (i.e. Nilles, 1994; Moorcroft y Bennet, 1995; Turbé-Suetens, 1995; Shin et al, 2000; Watad y Disanzo, 2000). The main telework benefits for a company are the savings in building costs and the increase on their Human Resources productivity. Regarding the employee, telework gives them labor time flexibility and less commuting time. The main telework disadvantages or barriers are the access to technology and the integration of telework with the company´s strategy and organizational structure, as well as the teleworkers motivation and control.

The empirical studies carried out on telework adoption have analyzed mainly the implementation process and the adopters´ features. However, there has been no analysis about the relationship between telework adoption and the company´s production strategy. The aim of this paper is to study the influence of a few production strategy´s variables on the telework adoption and its benefits and barriers. Next section briefs the methodology and the sample of companies surveyed. Then the main results are shown on four subsections: telework benefits and barriers in the companies surveyed; the differences of benefits and barriers according to a few production strategy´s variables; factor analysis of telework benefits and barriers; and regression analysis with a few variables which have influence on the adoption of telework.

Methodology and Sample

The methodology has been a mail survey carried out in the second half of the year 2000. The mailing was addressed to the Human Resources Manager of each company with more than 25 employees located in the Spanish region of Aragon. A total number of 145 questionnaires were received (a response rate of 21%) and a few of these companies were then visited by the authors to get inside information on the feasibility of telework adoption. The companies surveyed belong to the primary industry (6.2%), manfacturing industry (62.8%) and services (31%). The statistical distribution of the sample on company´s sector and size does not show any significant difference with the objetive population.

Results

Benefits and Barriers to Telework

This section shows the benefits and barriers of telework adoption. Table 1 indicates the main benefits for the companies surveyed and their Human Resources. According to the results, the

Human Resources managers perceived that telework would benefit more to their employees than to the company. The most important benefits for the companies were the productivity increase, followed by the labor organisation flexibility and the fixed costs saving; the most important benefits for the employees were a more flexible labor time and less commuting to work.

On the other hand, Table 2 shows the barriers to telework adoption and implementation. The most important barrier to adoption is the resistance to change job procedures because of its costs related to technological and Human Resources adaptation. Secondly, the surveyed companies do not seem to know all the possibilities which telework may offer, and neither they have nearby telework adoption experiences. They also valued over average the costs of new technologies acquisition and software adaptation. Finally, the most important barrier to telework implementation is the management of teleworkers. Neither information security or communication problems with teleworkers are important barriers to implement a telework programme, maybe because the companies have the appropiate Information and Telecommunication Technologies.

See Tables 1 and 2

Mean differences according to production strategy variables

This section of the paper shows the mean differences of telework benefits and barriers, according to a few production strategy variables: firm size, employees involvement in job and task design, degree of innovation, export intensity, and company´s training programme.

1. Firm size. Smaller companies have valued more the telework benefits and barriers than larger companies. The significant differences are found in the reduction of fixed costs and the productivity increase (Table 3). Regarding the barriers, the most significant difference appears to be the ignorance of telework possibilities. Smaller companies also think that labor management and supervision would be more difficult for them than for the large companies.

See Table 3

2. Employee involvement in task design. Companies where employees are involved in task design, have assigned more value to benefits and barriers than other companies. The only significant differences (Table 4) are found in the cost and access to communication equipment.

See Table 4

3. Degree of innovation. The more innovative companies have valued more the telework benefits and barriers. Table 5 indicates the significant differences. The most significant barrier is the resistance to change job procedures; this result suggests that innovative companies realize the real difficulties aroused by an organizational change such as telework. Therefore, these companies think that they would have more difficulties to change the present work procedures.

See Table 5

4. Export intensity. The only significant difference for this variable (Table 6) is the difficulty to manage teleworkers. High export intensity may be one of the reasons to introduce a telework programme in order to serve foreign markets and customers on-line.

See Table 6

5. Company´s training. Companies with training programmes have assigned less importance to telework barriers, being significant most of the differences (Table 7), mainly the employees opposition and teleworkers management. The fact that companies with training programmes trust more their employees than other companies, agrees with other studies where training is found to overcome employees opposition to technological and organizational change.

See Table 7

Technology and Human Resources Telework Factor Analysis

A factor analysis of main components has been made to extract the factor groups of telework benefits and barriers. The purpose of this analysis was to compare the importance of factors related to technology with factors related to Human Resources. Our hypothesis was that those factors related to the company´s production and technology strategy should have more importance as telework barriers than those factors related to the organisation and management of teleworkers. Table 8 and 9 show, respectively, the results of the factor analysis made to telework benefits and barriers. The factor analysis of the benefits clearly cuts between the company´s and the employee benefits: advantages related to employees are a much more important factor than the telework advantages for the companies themselves.

See Tables 8 and 9

However, from the barriers point of view (Table 9) the factor of employee difficulties (EMPLOYEES) is located in fourth position and it only explains 6.7% of variance, while it explains 61% of variance in the benefits factor analysis. The most important benefit factor is the initial investment, which it explains 32% of variance. This factor includes the cost equipment but also the managers reluctance to introduce an organizational change that imposes the modification of the company´s document platforms and communications software. This result would support that companies valued telework as an innovation more benefitial to employees than to the company itself. As long as those introduction factors which are cost barriers do not improve significantly, the probability of telework adoption would keep low.

Telework Adoption Feasibility

In order to analyze the determinants of telework adoption in the surveyed companies, according to the company´s production strategy, two regression analysis have been made. First, a logit regression to explain the feasibility of a telework programme, and secondly a linear regression to explain the diffusion rate of telework. The logit regression has used the telework feasibility as a dependent variable, and as independent variables: the company´s degree of innovation (INNOV), the employee involvement in job design and program (INVOLV), firm size (SIZE), the company´s age (AGE), and the availability of a company´s training programme to employees (TRAIN).

It was expected that telework feasibility was explained positively with the employees involvement in job design (INVOLV) because this involvement implies an employee positive attitude to join those voluntary programmes such as telework. Similarly, it was supposed that those companies with a training programme to employees (TRAIN) should be more favorable to an organizational change which it is mostly based on a learning effort. Regarding the innovation variable (INNOV), it is expected that the most innovative companies are less opposed to organizational change, because those companies are more used to changes from their innovation activities. The variable AGE is measured by the company´s founding year and it is expected to explain negatively the telework feasibility because older companies are generally more reluctant to change. Finally, the variable SIZE (number of employees) is expected to be positively correlated because larger companies have more resources to invest in Information and Telecommunication Technologies. The results of the regression analysis are shown in Table 10. The only significant variable is the employees involvement in job design and program.

See Table 10

The second regression analysis has used the telework diffusion rate as an independent variable and measured as the percentage of company jobs which could be teleworked. The first proposed explaining variable is the company´s degree of innovation (INNOV). It was expected a positive relationship because the most innovative companies could introduce this work organization at a higher rate. Secondly, the variable TECHNO refers to the company´s knowledge and use of some Information and Telecommunication Technologies; a positive relationship is also expected because these technologies are required to telework. The third explanatory variable has been the firm size (SIZE) with a positive relationship expected because smaller companies should have more difficulty to introduce telework at a large scale. It was also expected that older companies would be more reluctant to diffuse the telework within the organisation since they are more institutionalized. Table 11 shows the regression results.

See Table 11

The two significant variables are the company´s degree of innovation (INNOV) and the company´s knowledge and use of some Information and Telecommunication Technologies (TECHNO). The significance of the first variable may be explained because there is usually a positive relationship between a company´s innovation external effort (new product development) and the diffusion of an organizative innovation (telework). Besides the measure used of company innovation is the design and commercialization of new products, and marketing is precisely one of the main company functions where telework is being introduced. Regarding the second significant variable, its positive relationship is explained because the factor analysis already showed that technological investment was the main barrier to telework adoption.

Concluding Remarks

The empirical results of this paper show that telework adoption is related to some variables which influence on the company´s production strategy. For example, those companies with employee training programmes indicated lower barriers to telework. The variance of barriers

to telework adoption is explained much more by technological issues than by Human Resources. The diffusion rate of telework is positively related with the company´s degree of innovation and the knowledge and use of Information and Telecommunication Technologies required to telework implementation.

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Table 1. Telework benefits according to the surveyed companies

For the company		For the employee	
Productivity increase	2.86	Labor time flexibility	3.05
Work organisation flexibility	2.80	Less commuting to work	2.97
Fixed cost reduction	2.79	Autonomy	2.83
		Easier work life	2.77

Note: The importance of each benefit was measured on a Likert scale from 1 (no importance) to 4 (very important). N = 145.

Table 2. Barriers to telework

Barriers to telework adoption		Barriers to telework implementation	
Resistance to change job procedures	3.12	Teleworkers management	3.05
Little telework knowledge	3.08	Work and job control	2.97
Computer and communication costs	2.83	Customer direct contact	2.95
Telework introduction costs	2.77	Labor activity management	2.93
Managers resistance	2.60	Information security	2.90
Access to telecommunication equipment	2.51	Communication difficulties	2.70
Employees opposition	2.50	Teleworkers isolation	2.70
Unions reluctance	2.28	Loss of corporate identity	2.67
Health and security	2.05	Teleworkers selection	2.56

Note: The barriers to telework adoption and implementation were measured on a Likert scale from 1 (no importance) to 4 (very important). N = 145.

Table 3. Significant differences on the assesment of telework benefits and barriers according to company size

	<188 employees	≥188 employees
Benefits		
Cost fixed reduction	2.88**	2.33
Productivity increase	2.93*	2.50
Barriers to adoption		
Little telework knowledge	3.16**	2.71
Health and security	2.12**	1.67
Managers resistance	2.64*	2.38
Employees opposition	2.54*	2.29
Barriers to implementation		
Work and job control	3.04**	2.58
Labor activity management	3.00**	2.58
Teleworkers selection	2.62**	2.25

**p<0.05 *p<0.1

Table 4. Significant differences on the assesment of telework benefits and barriers according to employees involvement in work design and procedures

	Yes	No
Barriers to adoption		
Access to telecommunication equipment	2.38	2.72**
Computer and communication costs	2.69	3.05**
Barriers to implementation		
Customer direct contact	3.08*	2.75

**p<0.05 *p<0.1

Table 5. Significant differences on the assesment of telework benefits and barriers according to company´s innovation degree

	High	Low
Benefits		
Cost fixed reduction	3.21***	2.61
Productivity increase	3.14**	2.74
Less commuting to work	3.19*	2.88
Barriers to adoption		
Resistance to change job procedures	3.40***	3.00
Little telework knowledge	3.38***	2.96
Telework introduction costs	3.00**	2.67
Access to telecommunication equipment	2.79**	2.40
Employees opposition	2.69*	2.42
Unions reluctance	2.50*	2.18
Barriers to implementation		
Teleworkers management	3.36***	2.92
Communication difficulties	2.98**	2.59

***p<0.001 **p<0.05 *p<0.1

Table 6. Significant differences on the assesment of telework benefits and barriers according to company´s exports

	High (>60%)	Low (<60%)
Barriers to implementation		
Teleworkers management	3.40*	3.02

*p<0.1

Table 7. Significant differences on the assesment of telework benefits and barriers according to company´s training programme

	Yes	No
Barriers to adoption		
Telework introduction costs	2.61	3.17****
Employees opposition	2.32	2.95****
Little telework knowledge	2.95	3.41***
Resistance to change job procedures	3.04	3.32**
Access to telecommunication equipment	2.36	2.90***
Computer and communication costs	2.70	3.17***
Health and security	1.94	2.32**
Barriers to implementation		
Teleworkers management	2.88	3.46****
Teleworkers selection	2.42	2.90***
Communication difficulties	2.57	3.05***
Work and job control	2.87	3.22**
Labor activity management	2.83	3.20**

****p<0.0001 ***p<0.001 **p<0.05

Table 8. Factor analysis of telework benefits

Factor	Eigenvalue	Components	Communality	% variance
EMPLOYEE	4.271	• Easier work life	0.894	61.01
		• Autonomy	0.881	
		• Labor time flexibility	0.850	
		• Less commuting to work	0.736	
COMPANY	1.268	• Productivity increase	0.909	18.11
		• Fixed cost reduction	0.908	
		• Work organisation flexibility	0.686	

Note: Factor analysis methodology – Main components and Varimax rotation

Table 9. Factor analysis of telework barriers

Factor	Eigenvalue	Components	Communality	% variance
INVESTMENT	5.840	• Telework introduction costs	0.843	32.44
		• Access to telecommunication equipment	0.803	
		• Computer and communication costs	0.794	
		• Managers resistance	0.539	
MANAGEMENT	1.756	• Work and job control	0.899	9.75
		• Labor activity management	0.848	
		• Teleworkers management	0.725	
CULTURE	1.466	• Teleworkers isolation	0.742	8.14
		• Loss of corporate identity	0.709	
		• Customer direct contact	0.674	
EMPLOYEES	1.209	• Unions reluctance	0.803	6.71
		• Employees opposition	0.732	
		• Health and security	0.572	
		• Teleworkers selection	0.484	
CHANGE	1.119	• Resistance to change job procedures	0.737	6.21
		• Little telework knowledge	0.590	
TRUST	0.972	• Communication difficulties	0.759	5.40
		• Information security	0.528	

Note: Factor analysis methodology – Main components and Varimax rotation

Table 10. Logit regression of telework feasibility

Variable	Coefficient	Wald-value	p-value
Constant	-3.791	1.132	0.287
INVOLV	0.830	3.657	0.056
SIZE	0.001	2.083	0.149
AGE	0.001	0.326	0.567
INNOV	0.001	0.048	0.825
TRAIN	0.001	0.001	0.924
2-Log Likehood = 155.78 p = 0.111			

Table 11. Linear regression of telework diffusion rate

Constant	2.204
	(0.312)
INNOV	0.064***
	(3.098)
TECHNO	5.679***
	(2.661)
SIZE	-0.001
	(0.996)
AGE	-0.002
	(0.539)
TRAIN	-0.003
	(0.294)
R = 0.321 R^2 = 0.103 F = 3.20 p = 0.009 n = 145	

Note: t-values between brackets. ***p<0.001