COMPUTER MEDIATED WORK: THE INTERPLAY BETWEEN TECHNOLOGY AND STRUCTURED JOBS - CLAIMS REPRESENTATIVES IN THE SOCIAL SECURITY ADMINISTRATION

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COMPUTER MEDIATED WORK: THE INTERPLAY BETWEEN TECHNOLOGY AND STRUCTURED JOBS - CLAIMS REPRESENTATIVES IN THE SOCIAL SECURITY ADMINISTRATION

Abstract: If general principles for the design of computer mediated work are to emerge, the interplay between the work environment and the characteristics of application systems must be understood better. The results of a study of 620 Claims Representatives in the Social Security Administration, whose job differed only in the form of the application system interface used, are reported. Interactions with clients, operators' perceived task environment and well being are all seen to be influenced by the type of system interface used. Mental strain symptoms is shown to be an important indicator of operator well being. Implications for designers, managers and researchers are considered.

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1.0 INTRODUCTION

Increasingly, office jobs at all levels are being redesigned to incorporate computer and communications technology. Yet, little is known about the extent of the changes in these jobs that are taking place or their consequences for workers and organizations.

One example is the concern, expressed recently, about the effects the use of CRT (VDT) displays have for workers in various settings (Ghiringhelli 1980, Dainoff et al. 1981). Legislation is currently being proposed, by several states, to regulate their use. Yet, by all indications it is not the use of a CRT display, per se, but rather the psychosomatic stress workers experience when using computer systems in offices that is the source of the consistent reports of problems (Sauter 1983, Turner and Karasek 1984) [1]. Simply controlling the use of the CRT display, in itself, will not remedy this situation.

It has been shown that, rather than influencing outcomes, such as job satisfaction, emotional exhaustion, absenteeism or performance, directly, the use of computer systems in structured jobs creates a new work environment, to which operators then respond (Turner and Karasek 1984, Turner 1984). Consequently, it is the interplay between the work environment and the characteristics of application systems that must be better understood if general principles useful for the guiding of system design are to emerge.

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[1] - Of course, it is possible to design a work station that produces musculo-skeletal stress in operators.

In this study, the ways that the processing organization of application systems shape the content of structured work are investigated. A model, centering on the information need by workers for task execution, is used as the basis of an empirical test using a sample of 620 claims representatives in the Social Security Administration. Implications for researchers, system designers and managers are discussed.

2.0 MODEL

Workers are conceived as open social systems that must deal with uncertainty in their jobs. That is, they must cope with the difference between the knowledge needed for task execution and the knowledge available to them. This uncertainty emanates from two sources: lack of knowledge about how to perform a task, and lack of knowledge about what to do when exception conditions are encountered (Perrow 1967). Exception conditions primarily arise from variations in inputs (e.g., in the situations of clients or conditions of raw materials) and in variations in the performance of tools.

If workers are to deal with these sources of work related uncertainty, a critical factor is their ability to obtain and interpret (that is, process) information that they do not possess (Galbraith 1973). Information can come from a number of sources including documentation, as well as from co-workers and supervisors, both within and external to the work group. A basic function of structure is, thus, to create work unit configurations as well as the linkages among these units that facilitate information flow.

Consequently, five factors contribute to task related uncertainty: the nature of the task; the condition of the inputs; the tools available to perform the task; the worker's experience and skill; and the structural arrangements among workers that govern information flow.

2.1 Task Environment

The perceived effort involved in task execution involves the interplay among at least five factors [2].

1. The sub-task to be performed (for example, calculation or data retrieval) determines the specific transformations (that is, the operations and the data to which the operations apply) the operator actually invokes. These are a function of the content and level of the job.

2. The tools available to the operator for assisting in performing a sub-task and their characteristics. These can alter the the sequence and content of sub-tasks performed by the worker.

3. The degree of uncertainty with which the operator must cope.

4. The amount of work to be done is related to the load imposed by the execution of sub-tasks, the demand or backlog of work, and the extra load that results when exception conditions are encountered (Perrow 1967).

5. The degree of discretion an operator has determines the extent to which different work methods and problem solving strategies can be employed and, ultimately, the performance of the operator.

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[2] - Of course, many more factors could have been used to describe the task portion of the work environment, including variety, task identity, feedback, etc. Due to a practical limitation on the number of factors that can be represented and because other studies have found many of these variables to be highly intercorrelated, factors have been selected that are relatively independent and are likely also to be meaningful for system designers.

The interplay among these variables is mediated by the extent to which sub-tasks are self contained or interdependent. When workers must seek assistance from others, the specific structural arrangements provided for exchanging information, the social context of the work environment and the norms developed from past experience influence the worker's perception of how much effort (and time) need be expended to obtain assistance (Salancik and Pfeffer 1978).

In this study, sub-tasks are considered to be the same since only one job is being investigated. The tools are the two treatments. The amount of work, discretion and interdependence among workers form the description of the task environment.

Job demands and job discretion, as well as the various structural factors have been shown to be associated, to varying degrees and with varying levels of consistency, with measures of job satisfaction, performance, absenteeism, emotional exhaustion, alienation, and many other variables (Aldag and Brief 1979, Hackman and Oldham 1980).

2.2 Task Impact Model

Diagram 1 shows the task impact model. Outcomes, such as job satisfaction, emotional exhaustion and productivity are influenced by the work environment, consisting of task and structural factors, including discretion, work load, problems and interdependence. These, in turn, are effected by the characteristics and extent of application system use. That is, workers' attitudes and performance are a function of task characteristics and structural arrangements which are, in turn, a function of the use and characteristics of an

application system.

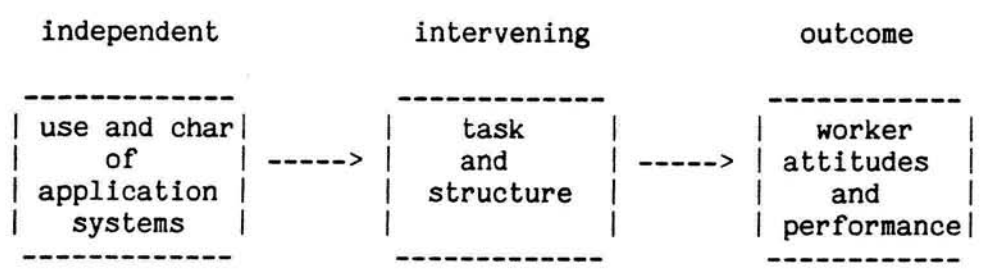

Diagram 1

Task Impact Model

The presence of an application system in a particular job results in a new human-machine division of labor and, consequently, a different set of tasks for the operator to perform. These tasks involve different sequences of operations than before, pose a new set of problems for which the worker must cope, and create new interdependencies with co-workers and supervisors. This, in turn, requires training and, often, the acquisition of new skills. It is in responding to this work environment that an operator experiences changes in job satisfaction or mental strain symptoms [3].

2.3 Methodological Issues

There are two additional issues that warrant discussion. The current view of individual information processing is based heavily on the social interaction model of Salancik and Pfeffer (1978). In this model, reactions of workers to tasks are seen to be related to information available to them at the time they express their attitude

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[3] - Other factors, such as changes in performance-reward relationships, supervisor style, social interactions, etc. are also likely to influence these outcomes.

or need. An important source of information is the person's immediate social environment (that is, co-workers, organizational norms, culture, etc.) which provides cues that individuals use to interpret and construct events and in deciding what their attitudes and opinions should be.

Consequently, any attempt to assess task characteristics from self reports of job incumbents must contend with the potential bias induced by the prevailing attitudes and culture of specific work settings. One strategy for coping with this problem is to include enough work groups in a sample to allow considering any specific attitude as occurring randomly.

Second, as Aldag, Barr and Brief (1981) observe, there is some question as to whether perceived task characteristics are an accurate reflection of actual tasks content. While this may be true, it is the worker's perceptions of the task environment that govern behavior rather than actual tasks performed.

2.4 Research Questions

The following research questions were investigated:

1. To what extent is the perceived task environment (i.e., task characteristics and structure) of workers influenced by the form of an application system?

2. Are quality of work life outcomes, such as satisfaction or symptoms of mental strain, affected by the form of an application system?

3. Is worker performance altered by the form of an application system?

3.0 METHOD

The study consisted of a questionnaire survey of 620 claims representatives in 48 offices of the Social Security Administration (SSA) in New York and New Jersey. This represented about a 35% sample of SSA offices in the area and a 34% sample of SSA workers.

3.1 The Job

Claims Representatives (CR) conduct face to face and telephone interviews with the general public in order to assist them in completing applications and submitting all evidence necessary to establish their entitlement to Social Security Benefits and/or Supplemental Security Income (SSI). The CR explains the claimants rights and benefits, and certifies the award for payment.

When conducting an interview, a CR reviews a claimant's record to see if the claimant has previously applied. If the claimant has applied before, the CR checks the current status of the claim. In order to determine claim status, the CR accesses a computer application system that stores claim information on a nation-wide basis. If the claimant has not filed the claim before and eligibility is established, the CR initiates the claim.

CRs also perform desk work during slack periods or before/after normal hours the office is open to the public. This involves completing paper work on files, retrieving information from the system, updating the system, filling out forms, handling delayed work and normal administrative chores.

3.2 Application System

Although one application system is used to maintain claimant records, two different front ends provide access to the system [4]. A CR is trained in one or the other interface depending on the equipment available in a SSA office.

3.2.1 ARS -

The Advanced Record System (ARS) is a serial processing interface that uses a teletype telecommunications network to transmit messages to a central processor for data access and file maintenance. A CR enters a request either directly from a teletype keyboard, or by using a punched paper tape prepared off-line. Depending upon the load and availability of the network and the queue length at the central processor, the CR may have to wait anywhere from 10 minutes to 8 hours for a response in order to proceed with an interview. If typing errors are made in the request, they can not be corrected; the request must be retransmitted. Also, the system provides no assistance to the CR in, for example, calculating the amount of a benefit.

3.2.2 SSADARS -

SSADARS is a parallel system interface that is on-line with CRT

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[4] - The actual equipment configuration at the time of the study was two IBM 370-168 processors with over 30 billion bytes of disk storage running MVS located in Baltimore, MD. TOTAL was used for data base management and INTERCOM for message handling. ARS used a GSA teletype network that fed into IBM 3705s while SSADARS used GTE CRT terminals connected to regional concentrators which were tied to the 3705s.

terminals for data entry and response (it uses the same file maintenance processor as ARS). Since the message is not transmitted until it is completely entered, a CR has an opportunity to correct mistakes. Response to a message is almost immediate. Calculations of certain benefit amounts can also be done by the system.

3.3 Measurement

The questionnaire consisted of items designed to measure psychosocial factors of a job that represent potential stressors or stress moderators. These include task characteristics, work load, interface type and usage, as well as various outcomes including job satisfaction, strain symptoms, absenteeism and performance. Constraints on the amount of time required to complete a questionnaire prevented standard instruments from being applied. Instead, key questions that have loaded heavily on measures used in prior studies were selected and modified to suit the situation. All measures, except those specific to the CR job, have been used previously in other studies with acceptable reliability and validity (Turner 1984). Reliability coefficients for this study are reported below. The questionnaire contained 39 questions and took about 15 minutes to complete.

The measures used in the study included:

1. Computer Use Frequency: During an interview, how often do you use the system or output from the system?

2. Computer Use Duration: During an interview, how long do you spend using the system or reports from the system?

3. Interface Type: SSADARS or ARS

4. System Performance:

a. system response time: how long do you have to wait for a message or response from the system? (distribution).

b. system access time: how long do you have to wait to get access to the system? (distribution).

c. lost messages: proportion of time your messages do not come back?

5. Work Load: Number of interviews handled per day? (distribution). Length of interview? (distribution).

6. Job Discretion: Make decisions about the time scheduling of work tasks; make decisions about how to organize work tasks; influence policies that effect work? (alpha = .77) (McMahn and Ivancevich 1976, Hackman and Oldham 1975).

7. Task Demands: How heavy is the work load; how often face time pressure to get the work done? (alpha = .50) (Insel and Moos 1974, Karasek 1979).

8. Problems: Frequency of exceptions that require special handling; time spent resolving exceptions? (alpha = .52) (Perrow 1967).

9. Task Interdependence: Frequency of working with co-workers, supervisor, workers and supervisors outside of work unit in performing job? (Lynch 1974).

10. Job Level: What level of skill in terms of formal education or training are necessary to perform job. How many years of experience are necessary to perform job?

11. Mental Strain Indicators: How often have difficulty rising and getting started in the morning; totally exhausted at end of the day; feel nervous, anxious, or jittery; difficulty sleeping? (alpha = .87) (Seiler 1973, Karasek 1979).

12. Job Satisfaction: (The degree to which members of a social system have a positive orientation toward membership in the system.) Would you take this same job again; would you recommend this job to a friend? (alpha = .92) (Quinn et al. 1973, Price 1972).

13. Absenteeism: The average number of leave days taken over the last year.

14. Performance: Interview outcomes (distribution).

15. Demographics: Age, sex, length of time working, length of time in SSA, length of time in position, grade.

3.4 Administration

The questionnaire was pretested on a sample of CRs late in 1982 and then slightly modified. An assistant to the researcher (who was employed in one of the SSA offices) administered the questionnaire in many of the offices. For some offices, the questionnaires were sent to a CR or a supervisor who then distributed them along with a return envelope. All CRs who were present on the day the questionnaire was distributed participated. Confidentiality of responses was assured. A 97% response rate was obtained.

3.5 Demographics

The sample was 56% female and 44% male with an average age of 34 years. Subjects had worked in their present job for an average of 5.9 years, although 57% had 5 or less years in the job. They had worked for the SSA an average of 4-8 years and and had 9-15 years on the average working experience. Eighty three percent or 514 subjects were grade 10, 10% or 62 were grade 9 and 7% or 34 were grade 7. Fifty one percent of the subjects used the SSADARS interface while 49% used ARS. The average office size was 13.

3.6 Analysis Of Data

Three sets of data analyses were performed:

1. Univariate Group Comparisons. The users of the two interface types were compared on measures of perceived system, task, well being and work load factors.

2. Bivariate Associations. First order correlation coefficients were used to explore associations between interface type and measures of use, work load, task and well being.

3. Correlates of Well Being. Job satisfaction, mental strain symptoms, and claim outcomes were regressed, in four separate stepwise analyses, on interface type and selected task, work load and demographic factors.

4.0 RESULTS AND DISCUSSION

4.1 Univariate Comparisons

Table 1 compares system, task, well being, quality, work load and demographic factors for subjects using the SSADARS and ARS interfaces. The most evident differences between subjects using the two interfaces is the long average time to gain access to the ARS, rather than the response time of the system, and the high proportion of lost messages. Unexpectedly, the high proportion of lost messages in ARS does not appear to influence an operator's confidence in the information obtained from the system.

Scales	Sample Means SSADARS (N=315)	ARS (N=304)
System Factors		
Computer Use	2.44	2.46
Access Time (min)	3.52**	250.50
Response Time (min)	8.88	9.07
Lost Messages	4.46%**	26.07%
Task Factors		
Job Level	4.13	4.12
Grade	9.68	9.90
Interdep. with wkrs.	3.62	3.65
Interdep. with sup.	2.87	2.90
Task Demands	3.84**	3.62
Problems	1.99**	1.81
Job Discretion	1.72	1.64
Well Being		
Mental Strain Ind.	2.69**	1.76
Job Satisfaction	2.90**	3.57
Absenteeism	3.87*	3.64
Quality		
Award Claim	32.06%	32.83%
Deny Claim	41.16%**	34.46%
Reconsideration or Hearing	20.71%**	12.17%
Confidence in Information	3.90	3.98
Work Load		
Type of Claim	3.12	3.10
Number of Interviews	6.87**	4.86
Length of Interview	63.87**	89.90
Desk Time	24.71%	24.03%
Demographics		
Sex	1.47	1.41
Age	32.18**	34.89

indices scaled low to high
** - p< .001 ANOVA
* - p< .01 ANOVA

Group Comparisons for SSADARS (On-Line/Parallel) and ARS (Teletype/Serial) Interfaces

Table 1

Significant differences are found in task demands and problems between subjects using the two interfaces, but not in job discretion or interdependence. Unexpectedly, workers using the faster, on-line system appear to have the greater task demands and number of problems [5]. Consistent with this finding, workers using the on-line system

show significantly higher levels of mental strain symptoms, lower job satisfaction, and higher absenteeism.

Interestingly, workers using the on-line interface have a greater number of interviews per day and a shorter average interview length than subjects using the serial system. Yet, a comparison of the product of these factors suggests that there is no difference in the total amount of client contact time, although it could be argued that, since on-line system workers see a greater number of clients, they, to a certain extent, do more work.

Although there is no difference in the probability of awarding claims, on-line system workers are more likely to deny a claim. One might speculate that better information available from the on-line system provides operators with support for denying a claim (since, if the claim is reconsidered, they would not want the decision to be reversed). The greater likelihood of having claims reconsidered probably results from the higher rate of denying a claim.

On the basis of this analysis, on-line system operators appear to face greater stress and uncertainty as a result of an increased number of interviews. This, in turn, results in a poorer perceived task environment and poorer perceived working life quality.

4.2 Bivariate Analysis

Table 2 provides a comparison of the first order product moment

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[5] - It could be reasoned that if a system acted as an impediment to accomplishing a task, improved performance of the system would result in less demands and problems for operators.

correlation coefficients for the complete sample in order to show associations among variables. Use of the on-line system is negatively associated with increased task demands and problems, increased mental strain symptoms and absenteeism, decreased job satisfaction, a greater number of interviews and shorter interview length.

Scales	1	2	3	4	5	6	7	8	9
System Factors									
1. Interface Type	-								
2. Turnaround Tm.	.78**	-							
Task Factors									
3. Demands	-.16**	-.11*	-						
4. Problems	-.13**	-.11*	.03	-					
5. Job Discretion	-.05	-.10*	-.18**	.07	-				
Well Being									
6. Mental Strain	-.42**	-.37**	.16**	.20**	.22**	-			
7. Job Satisfact.	.25**	.25**	-.15**	-.10*	-.02	-.47**	-		
8. Absenteeism	-.12**	-.13**	.02	.08	.06	.16**	-.03	-	
Work Load									
9. No. Interv.	-.43**	-.35**	.07	.10*	.02	.22**	-.12**	-.04	-
10.Length Interv.	.49**	.44**	-.04	-.01	-.14**	-.37**	.22**	-.03	-.26**

indices scaled low to high
low type=SSADARS (on-line/parallel); high type=ARS (teletype/serial)
N=620
** - p< .001
* - p< .01

Intercorrelations Among Selected Study Measures for Claims Representatives Using SSADARS and ARS Interfaces

Table 2

Consistent with the findings of previous studies, both task demands and problems are positively associated with mental strain symptoms and negatively associated with job satisfaction (Turner 1984). Problems are positively associated with the number of interviews, suggesting that part of the reason more interviews may represent a greater work load is the exception conditions (uncertainty) they produce. Job discretion is positively associated

with mental strain symptoms and negatively associated with the length of interviews. It may be that some workers do not have sufficient discretion to terminate interactions with clients.

As found in most other studies, mental strain symptoms and job satisfaction are strongly negatively associated, while mental strain symptoms are positively associated with absenteeism suggesting face validity for the measures (Aldag and Brief 1979, Karasek 1979, Turner 1984). Mental strain is also strongly positively associated with the number of interviews and strongly negatively associated with interview length. Job satisfaction shows the reverse relationships.

Most studies of the impact of office technology use job satisfaction as the primary dependent variable. The results of this bivariate analysis make clear the importance of mental strain symptoms (emotional exhaustion) as an indicator of employee well being. In every case, the associations with the other variables in the study are stronger than those with job satisfaction.

It is quite evident that workers using the on-line system have a poorer task environment than workers using the serial system in that they have a greater number of interviews which tend to be of shorter duration, more problems and greater task demands. This manifests itself in increased mental strain symptoms and absenteeism, and decreased job satisfaction for these workers.

4.3 Correlates Of Well Being And Performance

Table 3 shows the results of an analysis in which selected interface, task, demographic and work load variables were regressed, in a stepwise procedure, on mental strain indicators and on job satisfaction for the complete sample. The largest contributors to mental strain are job satisfaction (negative), use of the on-line system, interdependence with the office manager, job discretion and office number. The largest contributor to job satisfaction is mental strain symptoms (negative). Task demands is the only common factor among the two well being measures.

	Mental Strain Indicators			Job Satisfaction		
Regressor	Reg. Coef.	Std. Reg. Coef.	Partial Coef.	Reg. Coef.	Std. Reg. Coef.	Partial Coef.
Job Satisfaction	-.22	-.25	-.26	-	-	-
Mental Strain Ind.	-	-	-	-.56	-.46	-.46
Interface Type	-.32	-.14	-.15	*	*	*
Interdep with Mgr.	.65	.16	.20	*	*	*
Job Discretion	.18	.13	.16	*	*	*
Office Number	.00	.13	.15	*	*	*
Reconsideration	.01	.11	.15	*	*	*
Problems	.17	.10	.14	*	*	*
Length of Interv.	-.01	-.12	-.14	*	*	*
Absenteeism	.09	.09	.12	*	*	*
Task Demands	.14	.10	.13	-.13	-.08	-.09
Confid. in Data	-.14	-.08	-.10	*	*	*
Age	*	*	*	.02	.11	.13
	df - 516			df - 516		
	mult. R - .68			mult. R - .51		
	adj. R sq. - .45			adj. R sq. - .26		
	F - 39.78			F - 62.33		
	p - .000			p - .000		

* - stepped out of model at 0.1 level

Regression of Mental Strain Indicators and Job Satisfaction

Table 3

With the variables in the equation, 45% of the variation in mental strain symptoms and 26% of the variation in job satisfaction can be explained. Again, this analysis illustrates the importance of mental strain symptoms as a measure of operator well being.

Table 4 shows the result of regressing selected variables on the major outcomes of a client interview. Claim type indicates whether interviews are mostly initial claims (low) or post entitlements (high), while eligibility refers to the extent claimants were judged, in initial interviews, to be eligible for benefits.

	Award a Claim			Deny a Claim		
Regressor	Reg. Coef.	Std. Reg. Coef.	Partial Coef.	Reg. Coef.	Std. Reg. Coef.	Partial Coef.
Eligibility	13.65	.64	.67	-10.12	-.43	-.46
Claim Type	-5.21	-.24	-.32	*	*	*
Reconsideration	*	*	*	.44	.32	.36
Discretion	*	*	*	-6.39	-.17	-.22
Access Time	*	*	*	-.02	-.09	-.12
* - stepped out of model at 0.1 level						
df - 519				df - 527		
mult. R - .71				mult. R - .66		
adj. R sq. - .52				adj. R sq. - .44		
F - 276.82				F - 103.14		
p - .000				p - .000		

Regression of Claim Outcomes

Table 4

Eligibility is the largest contributor to claim outcomes in both cases. Discretion also contributes negatively to the likelihood of denying a claim. The variables in the equation permit explaining 52% of the variation in awarding a claim and 44% of the variation in

denying a claim.

4.4 Alternate Explanations

There are at least two possible explanations for these findings. Differences in the characteristics of the interface systems, for example, the long access time of the serial system, result in changes to the pattern of interaction with clients. This, in turn, alters the task environment and well being of the worker. Alternately, and considerably less likely, management may have decided to install the more productive system in offices with the greatest demand for service. That is, the on-line system may have been installed in offices with clients that have cases involving more problems, greater demands, and more mental strain. This still would not explain the greater number of clients and shorter average interview length (assuming in both treatments there was always an interview queue [6]).

In an attempt to resolve this dilemma, the two offices that had both interfaces in operation were analyzed in detail. It was reasoned that claims representatives in each office were likely to face the same demand for service independent of the interface used, and consequently any differences in task, well being or work load could be attributed to differences in interfaces characteristics. While differences were found, in the expected directions, for system factors, no significant differences were found in any of the other factors, due to the small sample size (less than 20 subjects).

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[6] - Discussions with SSA managers have indicated that this assumption is reasonable. The size of the CR staff in an office was based on the number of clients served and there was always to be a queue.

Consequently, while it is most likely that differences in task and well being result from the parameters of interfaces used, it can not be ruled out that different client populations are also involved.

4.5 Summary

It has been shown that for one structured office job:

1. The characteristics of the application system interface influence the interaction with clients, the perceived task environment and well being of claims representatives.

2. That the use of an on-line system, in this situation, permitted reducing message preparation time, which in turn, allowed decreasing interview length and having a greater number of interviews per representative.

3. That task demands and problems increase for representatives using the on-line system.

4. That mental strain symptoms and absenteeism increase, and job satisfaction decreases for representatives using the on-line system.

5. That representatives using the on-line system were more likely to deny a claim and consequently to be involved in reconsideration or a hearing.

6. No difference was found in job level, interdependence among workers or with the supervisor, job discretion, or in the confidence workers had in data on the basis of the interface used.

5.0 CONCLUSION

Claims Representatives (CR) in the Social Security Administration (SSA) conduct interviews to establish entitlements for benefits. Two system interfaces, one serial using a teletype and the other parallel on-line, are used to provide access to a common claims data base.

Based on the findings of prior research (e.g., Turner and Karasek 1984) it might be expected that an interface with poor performance would act as an impediment to accomplishing a job. Improving the performance of the interface, it could be argued, would then be expected to improve the task environment of the worker, for example, by reducing amount of work to be performed.

In this study, however, it was found that CRs using the parallel on-line interface had a poorer work environment and indicators of well being than operators using the serial system. This result is attributed to these workers (parallel on-line interface) having a greater number of interviews per day and consequently interacting with more clients. Interacting with clients implies interview initiation stress, decision stress, and some probability that the interview will involve uncertainty (either with the client or the system) resulting in additional stress. The more clients served the greater the operator stress. It appears that involvement with clients, with their associated problems and the resulting expenditure of emotional energy, is more detrimental to operator well being than the frustration associated with a poor performing system interface, even though total client contact time is the same [7].

With regard to the research questions, it is concluded that the task environment of operators, their quality of working life and performance are all influenced by the form of an application system,

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[7] - Discussions with SSA managers have revealed that a rapid interview process was instituted in some offices after installation of the parallel on-line interface terminals. Although this does not appear to have been one of the reasons for the system upgrade it is an example of how the presence of a system with certain characteristics can be used to alter the tasks workers perform.

although some of the interactions are more complicated than expected. The restructuring of work permitted by the new technology has a greater impact on operators than the technology itself.

The implication of this study is that the whole job must be considered when attempting to predict the consequences of using technology in a work setting. In this situation dealing with the mechanics of the technology was prefable to interacting with clients. The technology provided a filler, even possibly a distraction, from the problems and emotional interchange involved in client contact.

Thus, the switch to an on-line interface, with supposed benefits to CRs actually resulted in a poorer work environment and indications of operator well being. How much of this was intended and how much occurred by chance is not known.

For researchers, this study illustrates how broadly a net must be cast to capture the interplay between the task environment of workers and the characteristics of application systems. Mental strain symptoms emerge, in this study, as an important indicator of operator well being. Designers of future studies should be careful to rule out differences in client populations as potential factors influencing outcomes.

The improvement in productivity associated with the parallel on-line system, in terms of increased number of interviews per day and decreased interview length, is consistent with a major theme in the literature. Changes in technology are frequently associated with improvements in productivity or product quality, often at the expense of the well being of workers performing the job. Why might this be

the case? Organizational decision makers invest in technology on the expectation of improved productivity. Productivity and work life quality, which have tended to be treated as though they were independent, actually compete (Turner 1984, Turner and Karasek 1984). The benefits of productivity improvements usually accrue to management while the costs of reduced work life quality are paid by workers. In this country (as contrasted with many in Europe), decisions concerning trade-offs between efficiency and worker well being are controlled by management. Thus, to the extent that trade-offs are needed, it is reasonable, although short sighted, to expect that they will be made on the basis of efficiency as the primary criteria.

Often, major application system design decisions are made by technical specialists without a full appreciation of the consequences of their decisions for workers. One reason for this is the technical specialist's preference for deterministic problems and a dislike for the ambiguity and uncertainty involved in dealing with people. Another may be the lack of exposure to principles of work design. Consequently, job design issues tend to be neglected. The job is often the result of the design of the machine portion of the system (Bjorn-Anderson and Jappe, 1978). Finally, technical specialists do work for management.

As the limits of direct compensation are reached for many labor categories, improving the quality of working life may become increasingly more important as a means of indirect compensation. The challenge then is to understand the ways that work environments are influenced by the characteristics of application systems, and to take advantage of the opportunity presented by a new system to improve both

productivity and work life quality.

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