

FOUNDATIONS FOR UNDERSTANDING THE USER ENVIRONMENT: A STUDY OF MOTIVATION, TASK DIFFERENCES, AND TECHNOLOGY

Gayle J Yaverbaum, Temple University
Oya Culpan, Pennsylvania State University at Harrisburg

ABSTRACT

The growth in the use of computers poses numerous problems for organizations. This paper summarizes the results from a survey administered to managers and clerical employees who work in the technological environment. We find that motivational differences exist and prescribe that they must be taken into consideration when employing technology.

Introduction

The proliferation of end user computing (EUC) is expected to continue, creating an enormous burden on organizations to comprehend the many issues related to user satisfaction. However, research has been contradictory and, therefore, not particularly helpful to organizations in addressing these problems. Furthermore, there are no clear guidelines as to how to best implement systems to raise user motivation and satisfaction, and, consequently, increase the effective use of computer systems.

There are some reports of work becoming more fulfilling as a result of computerization, and other reports of work becoming less fulfilling. In light of this type of research, it is not surprising that it is virtually impossible to delineate the variables affecting computer users. User participation in system requirements, user cognitive style, background characteristics, and education are a few of the variables which have been studied, resulting in little concrete evidence applicable to solution of the complex problems associated with user satisfaction.

Research emanating from the 1970s found new information systems resulting in dissatisfied

users (Guthrie, 1972). Later research, however, found an increase in job satisfaction after a new system is installed (Cheney and Dickson, 1982). Others also have reported conflicting results, but the truth is probably summarized in the declaration by Attewell and Rule(1984) that there are too many variables at work to reach a single conclusion about the effects of automation in the work place. They suggest that one must determine various cause/effect relations within specific contexts, implying a need for continued research.

In the present study, we address cause/effect relations within the work environment from the perspective of the managerial worker and the clerical worker. Answers to the following questions are sought: 1. Do clerical workers and managers react differently to the integration of computers in their task environment? 2. Does prolonged use of computers effect employee motivation? 3. Does the contrasting nature of decision structure lead to differences amongst employees utilizing computer technology?

The paper begins with a general background discussion and then presents the research design.

The final part is devoted to the results of the study along with implications affecting the end user environment.

Research Background

Research pertaining to information system users has employed various approaches. System usage has been related to user characteristics (Ginzberg, 1981; King and Rodrigues, 1978; Robey, 1979) and organizational variables (Cheney and Dickson, 1982; Ein-Dor and Segev, 1978; Monsour and Watson, 1980). Unfortunately, we have not resolved the enigmas identified with the successful use of information systems.

A number of researchers have approached the problem by studying job content as it relates to information system use. Several have reported differences tied to employee classification. Two extreme positions, "deskilling" and "upgrading," are described by Attewell and Rule (1984) as representative of the wide range of perceptions about the impact of information technology on job content. "Deskilling" refers to the stripping of jobs of their conceptual content (Braverman, 1974). "Upgrading" is said to occur when the new technology is responsible for taking the drudgery out of work (Attewell and Rule, 1984).

Genn and Feldberg(1977, 1979, 1980) report that various clerical and professional jobs lose conceptual content after automation occurs. Gregory and Nussbaum(1982) conclude that clerical workers complain about computer-generated work degradation. Pfeffer(1981) concurs with this observation.

On the other hand, Bell(1983) argues that information technology upgrades the jobs of white collar workers. Guiliano(1982) and Mumford and Banks(1967) agree, maintaining that automation occurs primarily in jobs which are already very routinized and, in fact, helps to relieve these jobs of their boredom.

In a study of the insurance industry, Attewell-(1983) finds that both upgrading and degrading occur within the same occupation. He reports a growth in higher-level white-collar occupations and a corresponding decrease in lower-level positions and concludes that upgrading occurred.

Managers have been studied by Gardnen,

Renden, Ruth and Ross(1985), who find that three-quarters of all chief executive officers (CEO) have computers in their offices but only 20 per cent actually use them. They support the findings of Howard and Smith(1986) that many managers have adjusted to technology, but that there is still evidence of computer anxiety amongst even this group of employees. One might perceive this anxiety itself as a cause of a workers perception of deskilling. Weinberg and English(1983) have investigated computer anxiety amongst college students and managers and find nearly one-third suffering from anxiety.

Basic decision theory gives rise to explanations of task differences. March and Simon(1958) suggest that the process of decision-making should be viewed on a continuum, where easy-to-predict, routine decisions are at one end, and uncertain situations at the other end. Programmed decisions are those at the lower end of this continuum, and non-programmed decisions are at the other end.

Keene and Scott Morton(1978) equate "structured" with programmed decisions and "non-structured" with non programmed decisions. They add the dimension of "semi-structured" to describe a situation somewhere in between. Structured decisions do not usually involve a manager; they are decisions that are well-understood and can be completely automated. Semi-structured decisions are those in which managerial judgment alone is not adequate, and the manager's input plus the system's information together provide the most effective decision.

Moran(1981) adds another dimension to the research on problem-solving. He views the novice computer user as engaged in a problem-solving activity in the use of the computer itself, and sees learning as a crucial element for the new user. The expert, who is already skilled with computers, is merely using a routine cognitive skill, according to Moran.

The literature reviewed to this point reveals a need for further investigation of the variables that affect success in end user computing. Recognizing the confusion that exists about these effects, this study focuses on job content and decision structure and explores differences between two typical employee classifications - the clerical worker and the manager.

Diagnosing the Work System

An exploratory study was designed to contrast motivation and satisfaction of clerical and management-level employees in computer user environments. We adopt a portion of Rockart and Flannery's (1983) very broad categorization of EUC and define our population as follows: 1. Nonprogramming end user utilizing pre-developed menu-driven software; 2. Command level end-user who generates reports with simple query languages; 3. End-user programmers utilizing commands and very high level languages.

The source of data for our study was a survey administered to 70 end-users from 15 organizations of varying size, and included 29 managers and 41 clerical employees. The organizations were volunteers from 300 solicited businesses in South Central Pennsylvania.

This survey instrument, developed by Hackman and Oldham(1975), is called the Job Diagnostic Survey (JDS) and measures the personal reactions or feelings of a person performing a job, along with his/her desire to obtain growth satisfaction from the job. The instrument allows one to integrate the myriad variables which are at work and to analyze jobs, people, and the organizational environment. A set of norms developed by Hackman, Oldham, and Stepina (1979) aids the interpretation of results.

The theory of work design presented by Hackman and Oldham(1980) has the following features: 1. Good performance is the result of a self-perpetuating cycle of positive work motivation powered by self-generated rewards for good work; 2. Motivation can be enhanced by increasing the levels of responsibility, meaningfulness, and feedback that are built into jobs; 3. Successful design acknowledges the potency of both individual and systematic properties in affecting the way people work in organizations.

The theory, shown in Figure 1, and the JDS provide the basis for calculation of 19 variables and a summary score that reflects the motivational potential of a job. A Motivating Potential Score (MPS) is calculated as follows:

$$A = [\text{Skill Variety} + \text{Task Identity} + \text{Task Significance}] / 3$$

$$\text{MPS} = A \times \text{Autonomy} \times \text{Feedback}$$

The five core dimensions used in the formula are defined as follows:

- * Skill Variety: The degree to which a job requires the use of a number of different skills and talents of the employee.
- * Task Identity: The degree to which the job requires completion of a "whole" and identifiable piece of work, that is, doing a job from beginning to end, with a visible outcome.
- * Task Significance: The degree to which the job has a substantial impact on the lives or work of other people-whether in the immediate organization or in the external environment.
- * Autonomy: The degree to which the job provides substantial freedom, independence, and discretion to the employee in scheduling the work and in determining the procedures to be used in carrying it out.
- * Feedback from the job itself: The degree to which work activities result in the employee obtaining direct and clear information about the effectiveness of his or her performance.

Each participant completed a JDS and supplied background information which included amount of computer use and computer course background. The survey results and the background information provided data for comparison to the already established norms for managers and clerical workers. The statistical analysis system, SAS, generated the remaining statistics. Means were computed using the Procedure MEANS, and levels of significance were recorded utilizing the Student T scores that were outputs of the program. The mean JDS scale scores generated were contrasted with the norms established by Hackman, Oldham, and Stepina [13] referred to above.

General Results

Table 1 presents means for the end-users and also for the established norms. Managers generally sense their jobs to be higher in motivating potential than do clerical workers. The same trend is observed in the sample with managers perceiving their jobs to be higher in motivation than do the workers in the clerical sample.

However, while management employees from the sample had scores which were only 7 percent above the reported norms, the MPS scores for clerical workers were 15 percent higher than

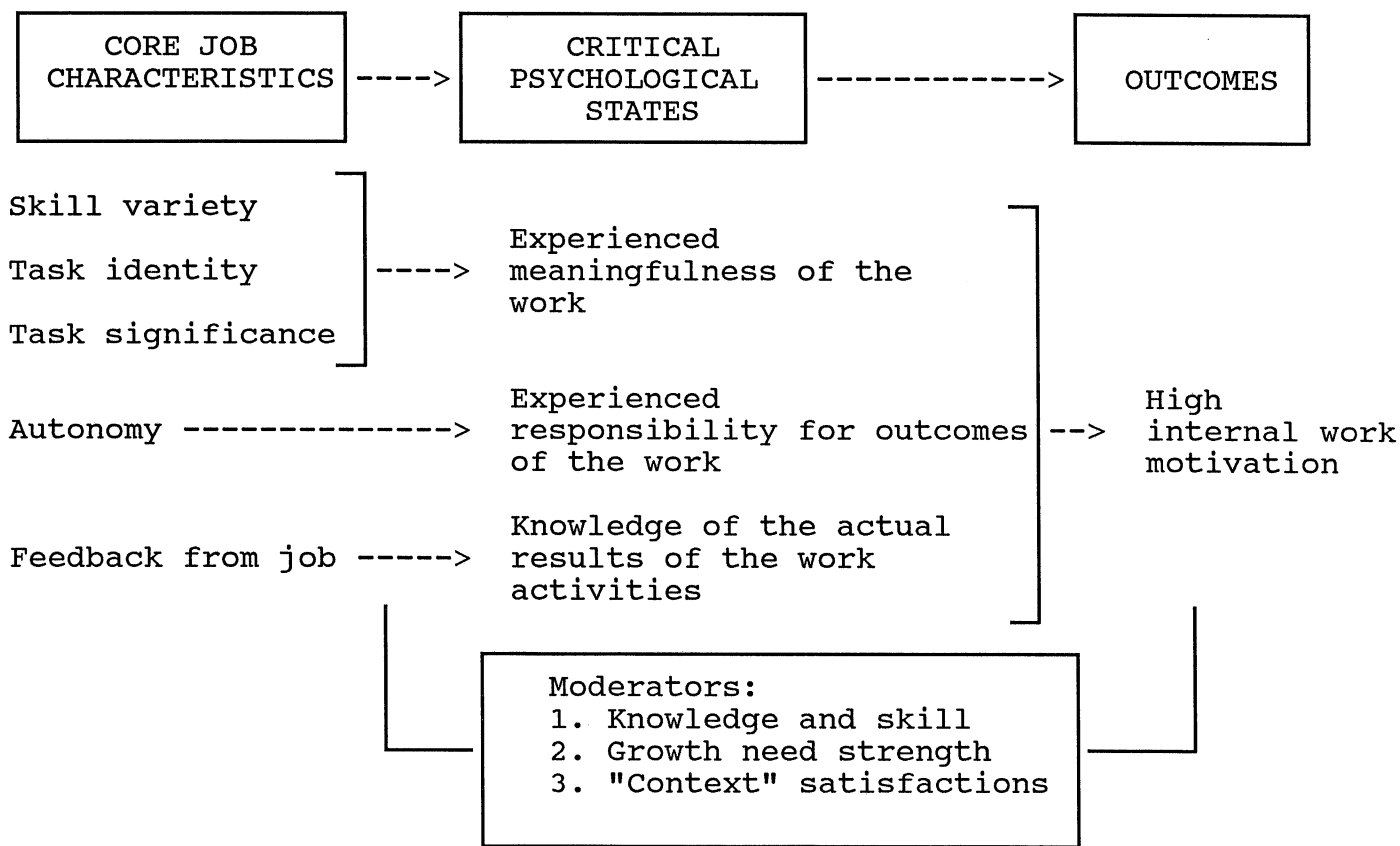
those reported in the norms. These results indicate that technology upgraded the clerical positions but had little effect upon the average manager.

The MPS reflects the overall potential of a job to foster internal work motivation. The job with a high MPS creates a condition such that, if an employee performs well, he/she is likely to be satisfied as a direct consequence of that performance, and if he/she performs poorly, unhappy feelings will ensue. We conjecture that an

end-user will make use of the information system only if he/she perceives satisfaction from a task.

Because a low score in one characteristic can still result in a high MPS, it is useful to examine individual characteristics which entered into the calculation. Autonomy and feedback from the job are the primary reasons for the higher-than-average MPS or the clerical worker in this study, with the other core dimensions being very close to the norm. "Autonomy" indicates that

FIGURE 1
Moderators of the Relationship Between the Job Characteristics and Internal Motivation



Richard J. Hackman and Greg R. Oldham, Work Redesign, Addison-Wesley Publishing Company, 1980, p. 83.

the job provides considerable freedom in scheduling of work and determining procedures to be carried out, while "feedback from the job" evidences that the employee is receiving direct and clear information about the effectiveness of his or her performance.

The relatively lower MPS mean score for the managers is directly related to "task significance." This indicates that the manager does not have as positive a feeling about the effect of his/her job on others with the advent of automation as he/she had prior to automation.

The JDS provides auxiliary measures to aid in the diagnosis of jobs. The theory proposes that positive personal and work outcomes are obtained when three psychological attributes are present. These include 1) experienced meaningfulness of work, 2) experienced responsibility for

the outcomes of work, and 3) knowledge of the results of work activities. Additionally, measures for effective outcomes and several context satisfactions are calculated.

The clerical workers indicate they experience increased meaningfulness of work in the automated environment, while the managers' mean for this variable is substantially lower than the norm. Context-related variables remain constant for the clerical employee, but pay is flagged as a possible source of dissatisfaction for the manager. The managers' need for growth score is notably higher than the norm. This, in combination with the decrease in "experienced meaningfulness" of work and "task significance," signifies that "degrading" may be taking place in the manager's environment as a result of automation.

Partitioned Results

TABLE 1
JDS MEAN SCORES AND NORMS
FOR CLERICAL AND MANAGERIAL EMPLOYEES

	Norm For Clerical	Average Clerical	Norm For Managers	Average For Managers
Skill Variety	4.0	4.2	5.6	6.0
Task Identity	4.7	4.5	4.7	4.9
Task Significance	5.3	5.5	5.8	5.5
Autonomy	4.5	5.0	5.4	5.7
Feedback From Job	4.6	5.0	5.2	5.2
Feedback From Others	4.0	4.2	4.5	4.7
Dealing With Others	5.2	5.3	6.4	6.5
Experienced Meaningfulness	4.9	5.0	5.5	5.2
Experienced Responsibility	5.3	5.6	5.7	5.6
Knowledge of Results	4.9	5.0	5.0	5.0
MPS	105.9	123.3	155.9	167.5
General Satisfaction	4.5	4.5	4.9	4.9
Internal Motivation	5.4	5.6	5.8	5.7
Job Security	4.8	4.7	5.2	5.2
Pay Satisfaction	4.0	4.2	4.6	3.9
Social Satisfaction	5.2	5.2	5.7	5.5
Supervisory Satisfaction	4.9	5.2	5.2	5.3
Growth Satisfaction	4.6	4.7	5.3	5.6
Growth Need Strength	5.0	5.3	5.3	5.7

The data appertaining to computer usage was partitioned into two groups - those who reported that they regularly utilize a computer in their work, and those who reported use of the computer on an irregular basis. Thirty-four in the clerical category and 19 at the managerial level claimed regular use of the computer.

Table 2 reveals that the clerical employee who regularly uses a computer perceives his/her job to be lower in motivating potential than those whose computer use is irregular. The scores of the clerical workers, who regularly used a computer for their work, hovered around the averages for the clerical group norm. This can be explained by the fact that most of the clerical workers in the sample were regular computer users.

Nevertheless, the clerical personnel who do

not make regular use of a computer score much higher than their counterparts who regularly use a computer. A primary variable affecting the MPS is "task significance." The group as a whole identifies more with the task assigned and exceed the scores of those who use the computer on a regular basis in their attitude toward co-workers and superiors. They also perceive more feedback from others and from the job. While this group is small, T statistics indicate the means are significant, and the fact that one can relate these averages to established norms makes them even more meaningful.

Managerial results are the opposite of clerical results. Regular computer users perceive their jobs to have more potential for motivation than do irregular users. "Task significance" accounts for much of the difference between the regular and non-regular user, with a high average for the

TABLE 2
JDS MEAN SCORES BY DEGREE OF COMPUTER USE

	Non-regular Clerical	Regular User Clerical	Non-Regular User Manager	Regular User Manager
Skill Variety	4.2	4.2	6.2	5.9
Task Identity	5.0	4.4	4.9	4.9
Task Significance	5.8	5.4	4.8	5.8
Autonomy	5.2	5.0	5.4	5.8
Feedback From Job	5.0	5.0	5.1	5.3
Feedback From Others	4.7	4.1	5.1	4.5
Dealing With Others	6.3	5.1	6.4	6.6
Experienced Meaningfulness	4.9	5.0	4.7	5.4
Experienced Responsibility	5.4	5.6	5.3	5.7
Knowledge of Results	5.5	4.9	5.0	4.9
MPS	133.5	123.3	152.4	174.0
General Satisfaction	4.7	4.5	4.9	4.9
Internal Motivation	5.6	5.6	5.3	5.8
Job Security	5.9	4.4	5.7	4.9
Compensation Satisfaction	5.1	4.0	4.4	3.7
Satisfaction Coworkers	5.9	5.1	5.9	5.3
Supervisory Satisfaction	6.3	5.0	5.8	5.0
Growth Satisfaction	4.7	4.7	5.5	5.5
Growth Need Strength	5.4	5.3	5.8	5.7

regular user. "Experienced meaningfulness" from the job, autonomy, and feedback from the job are also high for the regular computer user. The problem areas that do exist here are in the area of job security, pay, and satisfaction with coworkers and supervisors.

Conclusions and Implications

The questions posed in the introduction can all be answered affirmatively. Clerical workers and managers do react differently to the integration of computers in their task environment and the prolonged use of computers appears to effect employee motivation. Additionally, we believe that the contrasting nature of decision structure can be linked to differences amongst employees utilizing computer technology.

Table 3 compares the user categories, partitioned by regular and occasional users with key variables including with decision type, motivating potential, and task significance. Decision type is distinguished from the viewpoint of the structured and semi-structured categories of Keen and Scott Morton [15]. They theorize that structured decisions are those that do not involve the

manager and that managerial judgement is necessary for semi-structured decision-making.

Our results disclose high motivational potential scores for both occasional clerical users and regular managerial users. The same scores for the regular clerical category and the occasional managerial user are much lower. A similar observation is true for "task significance," the most powerful mitigating variable in the results.

For the clerical worker, learning to use a computer, is the primary task oriented goal. Therefore, learning activity is high for an occasional clerical user and the regular user has already achieved the aforementioned goal.

On the other hand, a manager seeks to improve his/her problem solving skills with the computer being a support tool. Learning to use the resource is only indirectly related to basic task objectives. Therefore, actual goal oriented learning is high for those who have overcome the initial apprehension associated with the new user.

There are several explanations for the facts

TABLE 3
THE NATURE OF DECISION-MAKING AND DISPARITIES
IN MOTIVATING POTENTIAL

	REGULAR USER	OCCASIONAL USER
USER CATEGORY	Clerical	Clerical
DECISION TYPE	Structured	Structured
MOTIVATING POTENTIAL	Low	High
TASK SIGNIFICANCE	Low	High
LEARNING	Low	High
USER CATEGORY	Manager	Manager
DECISION TYPE	Semi-Structured	Semi-Structured
MOTIVATING POTENTIAL	High	Low
TASK SIGNIFICANCE	High	Low
LEARNING	High	Low

presented in the table. Managers, who often experience computer anxiety when first faced with computers, overcome the problem with regular computer use. The nature of their tasks involve semi-structured decision-making, in which learning fosters motivating potential. Once the anxiety problems are conquered, there are rewards from utilizing the information system to aid the decision making process.

The clerical worker, on the other hand, uses a computer for more routine, structured types of task. Regular use in this case leads to boredom, while irregular users experience the rewards gained from learning. This observation is based upon the theory of Moran [17] described above.

In summary, this study observes differences in

motivating potential that are related to task. It adds to the body of emerging research on the computer user by examining some basic cause/effect relationships and linking the personal effects of technology to an employee's problem-solving work activities.

To realize the full potential of high technology, organizations must treat various segments differently. For example, social programs and task variety are appropriate for the regular clerical user while unique training programs would benefit managerial novices.

Further investigation will be required to examine the actual solutions suggested. Due to the exploratory nature of this study, further generalizations are inappropriate.

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