Title: The Impact of High Technology Equipment in White Collar Professionals

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Abstract: The scope of this paper is limited to an analysis of the impact of high technology equipment on white collar workers. This includes job design, impact on communication and decision making processes, changes in managerial and employee roles and the impact on productivity and organizational structure. A set of guidelines to aid managers in the process of introducing new high technology equipment into the work place is presented based on the conclusions from the data analysis coupled with our review of the current literature.

The Impact of High Technology Equipment on White Collar Professionals

Doumani, A., Genovese K., Onubari, A., Phillips, R

EMP-P9020

THE IMPACT OF HIGH TECHNOLOGY EQUIPMENT ON WHITE COLLAR PROFESSIONALS

1. Your use of hypotheses is intelligent and useful. Unfortunately, it appears you do not understand the statistical theory and application.
2. Numerous guidelines are available (e.g. Baird, pp. 94-5.) Why not use them?
3. appendices B & C seem to be "overkill."
4. Perhaps your hypotheses should have been one-tailed. They are two-" as phrased yet you reject the negative r's. No real te
5. In summary, an interesting project but could have been <u>much</u> better with a little more thought. For example, why didn't you mention testing H's in your progress reports so we could have discussed them? You merely said "the responses will be analyzed." also,

EMGT 560
Dr. Bruce F. Baird
Summer 1990

[redacted]

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Alex Doumani
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THE IMPACT OF HIGH TECHNOLOGY EQUIPMENT ON WHITE COLLAR PROFESSIONALS

Doumani, Genovese, Oubari & Phillips

INTRODUCTION

Concern over the impact of introducing high technology into the workplace has been growing in recent years and has spurred numerous studies. However, these studies have focused on the impact on blue collar workers because initially automation and robotic technologies had a direct impact on the jobs of workers who previously performed the tasks being automated. This impact has been discussed in the popular literature, professional journals, and government reports. However, only in the mid 1980s has concern over possible impact on managers and other white collar professionals become a widely recognized issue.

since?

The scope of this paper is limited to an analysis of the impact of high technology equipment on white collar workers. This includes job design, impact on communication and decision making processes, changes in managerial and employee roles and the impact on productivity and organizational structure.

We conducted an extensive literature search. A survey of the existing literature in the areas of implementation, organizational impacts and human considerations are is presented. To close the gap in the available research and to gain information more specific to white collar professionals, we conducted a questionnaire-based survey. The results of the questionnaire are analyzed and conclusions are drawn.

Finally, using the conclusions from our data analysis coupled with our review of current literature, we present a set of guidelines to aid managers in the process of introducing new high technology equipment into the workplace.

DEFINITIONS

For clarity it is appropriate that we define two terms used extensively throughout the paper. The term, "white collar professional", is used in many of the articles appearing in literature, without being specifically defined. White collar professionals include engineers, managers, accountant (5) and lawyers, to name a few. Hence, when we use the term "white collar professional" in this paper, we are simply referring to the very broad sense in which it is used in the literature.

didn't define

Another term worthy of further definition is "high technology". Noori and Radford define high technology as "any technology which affects the very structure and organization of the support system. That is, high technology changes the nature of tasks and their performance, interconnections and nature of physical, energy and information flows, the skills required, the roles played, the styles of management and coordination, even the organizational culture."[1] In this paper, we limit the definition of high technology equipment to micro-electronic based equipment being introduced into the workplace as a tool to aid the white collar professional in performing his or her job. Additionally, it represents technology unfamiliar to the employee, which will require a certain amount of training before it can be used effectively.

✓

LITERATURE REVIEW

Background

Micro-electronics entered the workplace in the mid-1970s, primarily through the development of word processors and professional workstations. From 1975 to 1985,

minicomputers, micro-computers and then personal computers entered American corporations. As a result, organizations set about connecting their office automation, data processing and communication function into coherent and integrated information systems.

By the end of 1985, 15 million display terminals were in use with an estimated 10-12 million of these in offices and customer service organizations. In 1990, between 60-70 million terminals are currently in use. The influx of computers has been heavy in the white-collar occupational sectors and is expected to rise steadily and significantly the rest of the century.

Such sweeping technological change obviously has a powerful impact on workers, managers and organizations and it is important that serious attention be paid to it.

Implementing High Technology

Introducing high technology equipment into an organization presents a different set of challenges than does routine project management. Unfortunately, managers are well equipped by education and experience to handle the technical issues, but are lacking the ability to manage the organizational aspects of the introduction.

Successful implementation requires a detailed project plan. A firm must explicitly consider where it is now, and then outline a detailed step-by-step plan for getting to where it wants to be. The plan should include, at a minimum: an overview of the effort, statement of objectives, general approach, resource requirements, personnel requirements and an evaluation procedure.[2]

Organizational Considerations

Technology forecasts made during the late 1970s and early 1980s predicted that the implementation of high technology equipment would result in extensive job losses,

increased centralization of organizations, a trend toward job simplification and resistance to technologies on the part of the workforce. However, job losses have not occurred on the scale that was predicted. Natural wastage, unrealistic expected savings and the increase of indirect jobs are thought to be the major reason. Minimalist approaches to utilization and short rather than long term considerations have also contributed. In some cases new technologies have been associated with increased centralization, while in others increased decentralization. Job design has undergone similar changes: de-skilling has occurred in some instances, while in others increased employee discretion has resulted. Finally, organized resistance to the new technologies did not come about.[3]

Current approaches to organizational systems were developed before any significant introduction of high technology equipment into the workplace, and show little regard for human needs. The flexibility of high technology equipment potentially offers unique opportunities to rethink conventional approaches.[4] Managers must consider the available opportunities to change systems when implementing technology. Important considerations for managers include the usability of technological systems, a long term attitude towards both organizational and individual impacts , management of organizational changes resulting from the technological systems, and changes in the business environment. Usability includes human factors and training aspects, while attitudes about organizational and individual impacts relate to the job design and the participative approach to organizational change.[5]

There are two basic models in which information technology can be implemented at the organizational level. The first, follows a single task Taylorist model. In this approach, existing processes remain intact and use computers simply to speed them up. However, speeding up those processes cannot address their fundamental performance deficiencies. They are geared toward efficiency and control, yet usually have a negative effect on worker productivity and innovation.[6] According to the Gartner Group's research, "productivity in 1987 was exactly the same level it was in 1967. This is after all

of the huge investments in PCs and integrated office systems".[7]

It should come as no surprise that our business processes and structures are outmoded and obsolete. They have not kept pace with the changes in technology, demographics and business objectives. For the most part, they have organized work as a sequence of separate tasks and employed complex mechanisms to track its progress. This type of process structure is fragmented and lacks the integration necessary to maintain quality and service. Using this type of structure, people tend to substitute the narrow goals of their particular department for the larger goals of the process as a whole.[8]

In contrast, an integrated approach can be used in which employers equip workers with general purpose computerized tools and design jobs so that they consist of many different tasks. This often requires re-engineering of jobs and work processes through "discontinuous thinking - of recognizing and breaking away from the outdated rules and fundamental assumptions that underlie operations."[9] Harris et al. went even further, suggesting that "The greatest benefit of office automation lies not just in doing existing work faster. It comes form shaking down the organization to eliminate whole chunks of redundant work."[10] Real productivity gains can only be made in this manner.

Some experts claim that reporting structures tend to become flattened in this type of automated organization, partly because communication is easier. Theorists see this as a positive development because it enables companies to gradually reassign unnecessary levels of middle managers who added little value to the work process. "Perhaps more importantly, integrated automation can affect employees at different levels within an organization differently - and can even sever long standing routes to advancement."[11]

Both models have deficiencies. Under the first, companies risk creating a disgruntled group of low-skilled, workers far removed from the decision-making process. Under the second approach, a flattening of the organization structure can cause confusion about who should be doing what, i.e., highly paid executives doing the work of lower paid specialists.

High level management attention is needed to reap the benefits of office technology. "In the final analysis, management must take responsibility for guiding the automation of the workplace", says consultant Bob Fabian of Toronto-based Gellman Hayward and Partners. Lack of management guidance results in the failure to utilize the technology to its full potential.[12]

isn't this obvious

Human Aspects

The introduction of high technology equipment into an existing white collar environment represents a major change and is often accompanied by the fears associated with change.

Workers must deal with the uncertainty of learning a new system as well as being evaluated on their new skills and ability to make the transition. Some worry that they may be laid off or their jobs may be downgraded. More specifically, older workers may be intimidated by new technology and are afraid of not being able to learn and use it effectively.

In addition, people often fear the new technology itself. Research done in 1982 showed that at least thirty percent of the business community dealing daily with high technology equipment experiences some form of anxiety.[13] Users can experience anxiety due to feelings of control loss and lack of experience with input devices such as a keyboard or mouse. This anxiety may be based on prior experience but others may be anxieties associated with deeply entrenched attitudes or personality traits. Fear of the hardware may be eradicated by allowing the new user to become familiar with the system through hands-on training.

Another issue associated with introducing new technology is the fear of being moved to lower paying jobs or being laid off.[14] However, another source cites case studies which show that professional are not laid off with the introduction of high technology equipments.[15] This source found that the demand for professionals to

operate advanced equipment increases and therefore creates jobs for those who would otherwise be shifted to new jobs or laid off.

When top management shows support of new technology through presentations of corporate priorities and sessions in which employees' questions are answered, employees see the new technology as being important.[16] They develop a better understanding of how the new introduction fits into the future plans for their organization and how they as individuals can help in those plans.[17] See Baird, pp. 92-95.

Training Considerations

High technology systems must be "Phased in" and "grown" within an organization rather than merely purchased. Firms phasing in high-tech equipment must often choose only a select handful of employees to obtain initial training. As this system grows within the organization the number of people to be trained increases.[18]

A study of skill requirements for high technology equipment shows that the introduction of such equipment causes a shift toward higher skill level, as well as change in the knowledge base and thinking process required. [19] This implies that professionals, who would otherwise have been displaced, can be shifted to new jobs through additional training. Results of a study of GE's training program indicated that it was more cost effective to retrain blue collar and white collar personnel than to layoff and hire already trained personnel.[20] Competition for trained personnel is strong enough that some companies avoid vendor training courses which would allow their employees contact with employees from other companies. They fear that they will be paying for training of their own workers only to have them "stolen" away by other companies. [21]

When introducing a new technology, training of managers and their specific needs should also be considered. Upper and middle managers need training which includes the cost/benefits and feasibility of introducing high technology equipment, so

that they are aware that the returns may not be swift and the investment should be considered as long term. in addition, middle and lower level managers will need to be educated in the way that high-tech equipments fits into the organization and the resources that must be acquired. Another study showed that the inclusion of supervisors in training can be particularly beneficial since they have a major influence on workers' acceptance of automation.[22]

It stands to reason that the more training a manger receives the greater will be the manager's understanding of the potential benefits of high-tech equipment within the organization.

Literature Summary

In summary, accepted guidelines for implementation of high technology equipment are:

- Plan for automation in the following order: decide on your business objectives and figure out what tasks must be performed to fulfill them. Only then can you determine what tools you'll need to perform the tasks effectively.
- Include reps from all levels and groups right from the beginning of the planning process.
- Educate all levels of users about the implications of the new technology for their jobs long before the equipment arrives.
- Involve your users in a formal analysis and redesign of job content and work flow before you implement the system.
- Train your employees thoroughly on the new tools, but not too long before the equipment actually arrives.
- Set performance targets for new technology users and their managers, but make sure targets are modest during the transition phase.

- Redesigning jobs and the distribution of work through the office should be a continuous process. Do it before, during and after you bring in the new equipment.
- Welcome complaints from the employees about the new work system -however vague or seemingly irrational.
- Make sure the jobs in a work group are balanced and that all are equally or nearly equally desirable.
- Make sure that jobs are "whole", that each employee can readily see the significance of what he or she is doing and can get some sense of satisfaction in completing the work.[23]

THE SURVEY

After doing a considerable amount of research into current literature, we realized that we would not be able to develop a questionnaire which addresses all the different issues involved with the introduction of technology into the white collar workplace. Therefore, we decided to focus on three main areas: the equipment selection process, training, and employee reaction. The questions were grouped together in this order. In addition, the questionnaire includes a section on demographics to allow us to look at the correlation between the responses and the personal aspects. A copy of the questionnaire is included in Appendix A.

The purpose of the questionnaire was to use it as a tool to try and bridge the gap that we found in the research, particularly towards white collar workers. Each member of the team gave out questionnaires to people we knew. As a result, it is important to recognize that this study was not a random test of white collar workers. However, because each member of this team works at different companies in different industries, we did test a good cross section of professionals. From the results of the questionnaire we completed a content and statistical analysis, and hypothesis testing.

	1	2	3	4	5
1	4	13	11	2	1
2	17	6	3	4	0
3	0	0	3	11	17
4	15	4	6	6	0
5	0	3	10	15	3
6	1	3	2	18	7
7	5	8	6	10	2
8	21	5	N/A	N/A	N/A
9	27	3	0	0	0
10	9	22	N/A	N/A	N/A
11	13	7	3	2	0
12	2	10	16	3	0
13	1	7	13	9	1
14	0	3	9	17	2
15	1	6	8	11	4
16	0	3	9	16	3
17	2	8	11	8	2
18	1	1	3	11	14
19	1	1	6	11	12
20	0	3	8	14	6
21	0	3	13	14	1
22	0	3	10	12	6
23	1	4	10	12	4
24	1	1	2	9	18
25	0	1	20	7	2
26	0	2	1	12	16
27	0	2	4	11	14
28	2	9	11	6	3
29	0	8	14	6	3
30	6	13	2	7	3
31	0	3	15	8	4
32	0	0	6	20	5
33	2	2	21	4	2
34	6	9	7	6	2
35	0	1	5	16	9
36	2	0	2	18	9
37	0	2	4	11	13
38	19	7	5	0	0
39	0	3	16	8	4
40					
41	0	2	24	4	1
42	1	14	8	8	0
43	9	8	4	6	4
44	5	2	6	11	7

Table 1. Questionnaire Response Summary

Analysis

We received 31 answered questionnaires back from the people we gave them to. This number is smaller than we anticipated, but still represents a good sample size. The responses to each of the questions are summarized in Table 1. In addition, we have included a tabulation of the responses of all respondents, as well as frequency histograms for each question. These can be found in Appendices B and C, respectively.

Content Analysis

Two approaches are taken in analyzing the data collected from the questionnaires. The first approach, the subject of this section, involves analyzing the contents of responses to specific, significant questions. The next section addresses relationships among questions as well as related groups of questions.

The questions in the questionnaire were developed in a manner such that the response categories are weighted equally. Thus, any question whose responses are heavily weighted towards one end of the scale indicate the possibility of a significant phenomenon worthy of further analysis. This section subjectively analyzes such questions and attempts to justify these anomalies wherever possible.

To simplify the analysis process, the results of the survey were re-tabulated in a slightly different manner (see Table 2). In this tabulation, row 'n' represents the responses to question 'n' in terms of the percentage of respondents selecting a particular response category. Columns 1 through 5 indicate the five response categories. Questions which do not support all five response categories indicate unsupported categories with an N/A in the appropriate cell.

	1	2	3	4	5
1	13%	42%	35%	6%	3%
2	55%	19%	10%	13%	0%
3	0%	0%	10%	35%	55%
4	48%	13%	19%	19%	0%
5	0%	10%	32%	48%	10%
6	3%	10%	6%	58%	23%
7	16%	26%	19%	32%	6%
8	78%	16%	N/A	N/A	N/A
9	87%	10%	0%	0%	0%
10	29%	71%	N/A	N/A	N/A
11	42%	23%	10%	6%	0%
12	6%	32%	52%	10%	0%
13	3%	23%	42%	29%	3%
14	0%	10%	29%	55%	6%
15	3%	19%	26%	35%	13%
16	0%	10%	29%	52%	10%
17	6%	26%	35%	26%	6%
18	3%	3%	10%	35%	45%
19	3%	3%	19%	35%	39%
20	0%	10%	26%	45%	19%
21	0%	10%	42%	45%	3%
22	0%	10%	32%	39%	19%
23	3%	13%	32%	39%	13%
24	3%	3%	6%	29%	58%
25	0%	3%	65%	23%	6%
26	0%	6%	3%	39%	52%
27	0%	6%	13%	35%	45%
28	6%	29%	35%	19%	10%
29	0%	26%	45%	19%	10%
30	19%	42%	6%	23%	10%
31	0%	10%	48%	26%	13%
32	0%	0%	19%	65%	16%
33	6%	6%	68%	13%	6%
34	19%	29%	23%	19%	6%
35	0%	3%	16%	52%	29%
36	6%	0%	6%	58%	29%
37	0%	6%	13%	35%	42%
38	61%	23%	16%	0%	0%
39	0%	10%	52%	26%	13%

Table 2. Questionnaire Responses in Percentage Format

The response categories for question 3, "how much did you want the equipment", ranged from "not at all" to "absolutely wanted". The responses, however, were heavily skewed. 90 percent of the respondents wanted the new equipment to be available (55 percent "absolutely wanted" and 35 percent "somewhat wanted"). The remaining 10 percent were indifferent. Not a single respondent felt that he or she did not want the new equipment to be introduced in the workplace. This overwhelming desire for the new equipment is particularly significant in light of the general belief that employees feel that the new high technology equipment being introduced is of no use to them. This anomaly may be explained as an attitudinal difference towards the value of high technology equipment between white collar workers and blue collar workers, since the vast majority of the research conducted to date focuses on blue collar workers. We propose that white collar professionals are less threatened by the new equipment and are subsequently more objective in measuring the potential value of the equipment to them.

Questions 8 and 9 both deal with the employer's attitude towards training. Question 8 inquires as to whether the training was conducted on company time or the employee's personal time. 78 percent of the respondents indicated that the training was conducted on company time. Similarly, 87 percent of the responses to question 9, "who paid for the training", selected the company. It is clear that the vast majority of the employers in our sample believe in the importance of training when introducing new high technology equipment, and they encourage their employees to participate in the training by not only paying for it, but also providing it on company time. For some time now, research as well as popular literature [24] has emphasized the importance of providing training and encouraging the employees to participate in it. It is refreshing to note the high percentage of companies that are now taking this advice to heart.

In response to question 26, "how has the equipment affected the quality of your work", 39 percent felt that it slightly increased quality and 52 percent felt that it significantly increased quality. In contrast, only 6 percent indicated that quality had

slightly decreased as a result of introducing the new equipment. We believe that in a white collar environment, the most significant impact of high technology equipment is improving the gathering and flow of information. This is supported by the response to question 24, where 87 percent of the respondents felt that the new equipment has improved the flow of information. This improvement in the flow of information helps explain the overwhelming positive impact on quality, since according to many experts on quality, including Dr. Deming, better access to information is one of the major contributors to improved quality.

Question 32 addresses the impact of introducing new high technology equipment on the technical personnel requirements in the workplace. 81 percent of the respondents indicated that the equipment increased the need for technical personnel, while there was no indication at all that the need was decreased (19 percent indicated no impact). This result is corroborated by a study reported in Forbes, which concluded that "more technicians and specialists than ever [are] on the payroll."[25] Given the large variety and complexity of high technology equipment being introduced in the workplace, as reported by our respondents, it should be no surprise that additional technical specialists are required to handle the maintenance and smooth operation of the equipment. This is especially true for white collar professionals, where the new equipment is not the main focus of the job being performed, but simply a peripheral tool. Thus, the core professionals generally lack the inclination and the time to devote to learning all the technical details of the new equipment.

The impact on productivity is addressed by questions 35 and 36. Two aspects of productivity are measured: the change in employee output (question 35) and the change in overall effectiveness in performing the job (question 36). While 81 percent indicated an increase in their output, only 3 percent indicated a slight decrease. Similarly, 87 percent indicated an increase in effectiveness compared to 6 percent reporting a decrease. This data is in disagreement with the Gartner group study, which concluded that "white

redundant

collar productivity in 1987 was exactly at the same level it was in 1967. This is after all of the huge investments in PCs and integrated office systems."[26] One cause of this discrepancy may be the fact that the Gartner research focused solely on office automation, which is only a small portion of the broader high technology equipment focus of this study. A more significant cause may be the difference in the scope of productivity. Our research measures the direct impact of the equipment on the professionals' personal productivity. An increase in this measure does not necessarily result in a clear improvement in overall organizational productivity. More recent studies suggest that in order to increase organizational productivity, the overall organizational system must be restructured to take full advantage of the pockets of improvement in personal productivity. [27]

Difficult to measure

Correlation Analysis

In this section, a number of hypotheses regarding the relationships among various aspects of introducing a new high technology product are analyzed. All of the hypotheses selected are based on prior research in two areas: The impact of high technology equipment on blue collar workers and the impact of high technology equipment on overall organizational dynamics (refer to literature review section). Our goal is to identify any deviations resulting specifically from the focus on white collar professionals only.

The Correlation Analysis technique is applied to the sample data collected from the questionnaire to test these hypotheses. Since the questions were developed such that the five response categories are equally weighted, we have arbitrarily assigned these categories the values -2, -1, 0, 1 and 2, respectively, with a mean value of 0.

OK

There are numerous cases where one side of the relationship in the hypothesis is tied to more than one question in the questionnaire. In such instances, the values for the variable representing that side of the relationship are arrived at by averaging the

responses in each response category for all the significant questions.

The sample correlation coefficient, r, which is an estimate of the overall population coefficient is defined as [28]:

$$r = \frac{\sum_{i=1}^{n} (X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum_{i=1}^{n} (X_i - \bar{X})^2 \sum_{i=1}^{n} (Y_i - \bar{Y})^2}}$$

Given our 31 respondents, and a mean response value of 0:

$$r = \frac{\sum_{i=1}^{31} X_i Y_i}{\sqrt{\sum_{i=1}^{31} X_i^2 \sum_{i=1}^{31} Y_i^2}}$$

Hypothesis 1:

The level of involvement in the equipment selection process is correlated to the level of use of the equipment after implementation.

does not have to be + correlation / You merely say "... is correlated"

The level of involvement in selecting the equipment is arrived at by averaging the responses to questions 2 and 4. This is the X variable. The level of usage of the new equipment is arrived at from the response to question 37. This is the Y variable.

$$r = \frac{-27.5}{\sqrt{(64.5)(63)}}$$

$$r = \frac{-27.5}{63.75}$$

$$r = -0.43$$

NO!

It is clear that according to our collected data the hypothesis fails the test. In fact, it appears that the level of involvement in equipment selection is negatively associated with the amount of use of the equipment. This, of course, is highly unlikely. We suggest that the reason for these results is that the level of use of new high technology equipment by white collar professionals is somewhat constant (moderate to high use) regardless of the selection process. Our existing data neither proves nor disproves this new hypothesis. This may be the subject of further research.

yes

"Don't confuse me with the no.s! This is highly unlikely."

Can't ever prove anything with statistics.

Hypothesis 2:

The level of familiarity with the equipment prior to its introduction is correlated to the user's perception of its value after implementation.

The level of familiarity with the equipment prior to introduction is arrived at from the response to question 1. This is the X variable. The user's perception of value is deduced from responses regarding time savings, flow of information, quality of work, performance and effectiveness. These are questions 18, 24, 26 and 36, respectively. Their average is the Y variable.

$$r = \frac{-15.6}{\sqrt{(62.72)(34)}}$$

$$r = \frac{-15.6}{47.2}$$

$$r = -0.33$$

The collected data indicates that the level of familiarity with the equipment prior to its introduction into the workplace does not affect the perception of its value by white collar professionals.

careful about cause and effect

Hypothesis 3:

Difficulty in learning the new high technology equipment directly impacts the frequency of its use.

The level of difficulty in learning the equipment is arrived at by averaging the responses to questions 12, 13 and 14. These questions identify the level of frustration while learning, the user friendliness of the equipment and the reliability of the equipment, respectively. Their average is the X variable. The frequency of usage is arrived at from the responses to question 37. This is the Y variable.

$$r = \frac{5}{\sqrt{(4.67)(63)}}$$

$$r = \frac{5}{17.1}$$

$$r = 0.29$$

Given the high elasticity of the level of use of high technology equipment by white collar professionals (discussed earlier), a coefficient of 0.29 indicates a reasonably strong correlation with difficulty in learning the equipment.

You blew it here

.29 is "reasonably strong" but -.43 and -.33 are + ???

Hypothesis 4:

The level to which the new equipment alters the technical skill requirements is correlated to the loss of employees attributable to its introduction.

The responses to question 32 supply the measure for the impact on technical personnel requirements. This is the X variable. The frequency of loss of employees as a result of the introduction of the high technology equipment is provided by the responses to question 38. This is the Y variable.

$$r = \frac{-36}{\sqrt{(33)(79)}}$$

$$r = \frac{-36}{51.1}$$

$$r = -0.7$$

This negative correlation strongly suggests that , unlike the blue collar environment, high technology equipment which requires new technical skills does not result in the loss of white collar professionals. This result should be no surprise, given that white collar professionals are highly likely to be motivated by a technical challenge requiring the acquisition of new skills.

Hypothesis 5:

The degree to which the equipment is utilized is impacted by the age of the user

This hypothesis suggests that as professionals get older they are more likely to resist using new high technology equipment. The level of utilization of the equipment is arrived at from the responses to question 37. This is the X variable. The age group of

the respondent is provided in the section on demographics at the end of the questionnaire. Note that since, according to the hypothesis, the level of usage is expected to decrease with the age, what we are looking for here is a negative correlation coefficient.

$$r = \frac{-11}{\sqrt{(63)(26)}}$$

$$r = \frac{-11}{40}$$

$$r = -0.28$$

Though there is some negative correlation, we believe it is insufficient to emphatically conclude that employee age has a direct impact on resistance to using the new equipment. It merely warrants a warning to pay extra attention to the older employees when introducing the equipment.

If $r < 0$, doesn't this mean the older, the less resistance?

MANAGEMENT GUIDELINES

Much of what has been written about high technology equipment in the workplace, relative to white collar professionals, has been speculative. Most of the early forecasts on the revolutionary impact of computer based equipment is turning out to be somewhat exaggerated. There are, as yet, relatively few empirical studies upon which to build well-founded generalizations.

We believe that although many of the general guidelines available in the literature apply equally well to white collar professionals, some significant differences exist. Using the results of our survey, we have identified a number of such differences. Following is a set of guidelines specifically targeted at the manager of white collar

professionals who is about to embark upon introducing new high technology equipment into the workplace. These guidelines assume familiarity with the current literature on blue collar guidelines (refer to the Literature Review section), and only focus on areas specific to white collar workers:

- The belief that employees have a natural tendency to resist the introduction of new high technology equipment into the workplace does not apply well to white collar professionals. Instead, there appears to be a consistent desire for the incorporation of such equipment into the work environment. Do not concern yourself with this belief. Expect your employees to easily accept the new equipment and to be eager to learn how to apply it in improving their job performance.
- New high technology equipment, especially in white collar environments, consistently increases the need for specialized technical personnel to smoothly handle its daily operation. You must ensure the availability of such skilled technicians at the time of introducing the equipment.
- Given that the appropriate equipment is selected, a significant improvement in white collar professional productivity will almost automatically ensue. What remains a management issue is translating the personal improvements in productivity to a positive impact on the organization as a whole. You must pay special attention to the impact of the new equipment on the overall internal system. Redefine jobs and re-engineer process flows to ensure maximum benefit from introducing the new equipment.
- Existing literature suggests that involving the largest number of employees in the equipment selection process results in better acceptance and more use of the equipment. This does not appear to be the case for white collar professionals. You should only involve those employees who will contribute to a better selection of the equipment. DO not involve employees simply to gain their acceptance. This will

only slow down the selection process and will not ultimately result in any measurable change in the acceptance or use of the equipment.

what is the basis for this

- Unlike blue collar workers, the level of familiarity with the equipment prior to its introduction into the workplace has no effect on the white collar workers' perception of its value after implementation. Though there is clearly no harm in familiarizing white collar professionals with the new high technology equipment prior to its acquisition, do not go to extra effort or incur additional expenses for that purpose. More importantly, do not base the selection of the new equipment primarily on the employees' familiarity with it.
- Difficulty in learning the new equipment remains a significant factor in its acceptance, regardless of the level of users. Always ensure that adequate training by experts in made available and encouraged at the time of introduction. Also, take whatever steps are necessary to guarantee the reliability of the equipment, especially during the early training periods.
- The impact of the age of white collar professionals on the utilization of the new high technology equipment is not as pronounced as the literature indicates. Nonetheless, some correlation does exist. Pay extra attention to the older employees in the organization when introducing new high technology equipment. Ensure that they participate in the training and allow them extra time to familiarize themselves with the equipment. Avoid making their performance evaluation contingent on their use of the equipment, if at all possible.

ENDNOTES

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