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THE IMPACT OF PERSONALITY TYPE AND JOB DESCRIPTION ON THE OFFICE ENVIRONMENT NEEDS OF CLERICAL WORKERS AND MANAGERS

A Thesis

Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

Gratia Ann Downs

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DEDICATION

This thesis is lovingly dedicated to my parents, MargAnna and Grady W. Downs, and to my fiance, John Thomas Strother.

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ABSTRACT

The percentage of office workers in the U. S. workforce has grown to record proportions, and with it a substantial increase in office space. At the same time, however, the productivity of office workers has declined.

Studies have shown, however, that productivity can be increased substantially when the office environment meets the needs of workers. This research proposed that these needs might be determined by two factors: personality type and job description.

Ninety-one clerical and managerial office workers were given Myers-Briggs Testing Indicators to determine personality type. These subjects then created scale models from scale-model office furniture of what they considered to be the workspace having optimum function, comfort, and efficency for them in their current jobs.

Environmental needs for facets such as percent enclosure, lineal feet of worksurface, and orientation of the entrance to the primary worksurface were measured from the scale models. Data was then analyzed to determine if environmental needs were determined by personality type or job description.

The results showed minimal relationships between environmental needs and personality type. However, some

significant relationships were found between these needs and job description. It was also concluded that need for environmental facets is determined more by the total combination of facets together rather than individually.

PREFACE

This Master's thesis grew out of an interest in the needs of people who work in offices, and in quality office design that meets those needs. Office workers are the ones who really know what they need environmentally. They are the real users of office design. They are individuals with diverse abilities, personalities, and means of communicating.

Designers are the people who are able, hopefully, to accurately identify needs, acknowledge diversity, and transform offices into spaces that allow freedom to get work done effectively in conjunction with quality of work-life.

Interaction between user and designer is vital to acheive this outcome. However, office design projects must, of necessity, be done within stringent time constraints. Often there is little time or opportunity to involve each individual who will be working in the office daily in the design process. This thesis has attempted to address this problem in two ways. First, users were involved in the design of the space through the scale-model method. This method allows users to perceive space accurately, and behave as they would if they were moving around among life-sized furniture. Second, an attempt was

made to identify environmental needs specific to personality and job description.

Via scale-model user-participation, environmental needs could be observed in the presence of each other rather than in isolation. Therefore, the characteristics of the whole working unit could be observed, and a general set of functional programming considerations made available to designers. Second, the categorizations of personality type and job description are much less time consuming to identify than are interviews with users. If environmental needs are influenced by these factors, designers can use these factors as a basis for functional programming as well.

The intent, therefore, was not to drop the diverse group of office workers into stereotypical groups, rather, it aimed to enhance the designer's understanding of what causes these individuals to have different environmental needs. These outcomes and methods give the designer a means of identifying user needs and incorporating them into design, while still acheiving the practical necessity of designing within a time frame.

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CHAPTER I

INTRODUCTION

A statement of justification introduces this research, followed by a conceptual framework statement, statement of purpose, definition of specific terms, hypothesis tested, and assumptions and limitations.

Justification

A transition in the U.S. from an industrial-based society to an information-based society first became apparent in 1957, when white-collar workers outnumbered blue-collar workers (Naisbitt, 1982). In 1986, three out of five Americans were working with information rather than producing goods (Smith, E. R., personal communication in lecture, Feb. 1987). As a result, a need has arisen to accomodate the growing information sector of the workforce. In response to that need, office space in the U. S. has increased to more than nine billion square feet.

With increased space have come increased operating expenses. The cost of facilities is a substantial part of office operating costs: a 1:13 ratio for newly

constructed buildings and a 1:5 ratio for leased buildings.

Another substantial cost to organizations is low productivity in the information sector. Since 1970, the productivity rate of a single industrial worker has been equal to that of 20 information-handling office workers (Brill et al., 1984). From 1974 to 1984, "the U. S. has had the lowest rate of productivity growth of any modern industrial nation . . . about 1.5% per year" (Brill et al., 1984, p. 20). This low growth rate is equivalent to a loss of "$100 billion in real G.N.P. in the last decade" (Brill et al., 1984, p. 20). Wineman concludes :

> These data suggest that if an investment in building and equipment could be made that would favorably influence organizational effectiveness [productivity], and therefore reduce personnel costs [absenteeism, turnover, and retraining], total life-cycle costs could be substantially reduced. (1986, p. xiii)

Recent research has shown that office design can reduce these personnel costs, and subsequently improve productivity by meeting the environmental needs of office workers. Thus, what the specific environmental needs of office workers are, and what determines these needs, must be identified.

Productivity in the workplace is a function of two types of environmental needs: the mechanical support

needed to do the job functionally, and the psychological support needed to achieve at that job (Figure I-1). For a work environment to improve productivity, both the job description/functional needs of the worker and the personality type/psychological needs of the worker need to be considered (Wineman, 1986; Sundstrom, 1986; Becker, 1981; Williams et al., 1986). These needs are interdependent; a different personality type or job description requires a different work environment to have optimum organizational effectiveness (productivity) (Figure I-2).

Conceptual Framework

The majority of current organizational theories propose that job satisfaction and performance are

1. related to productivity and organizational effectiveness.

2. improved by meeting employees' work environment needs.

The Buffalo Organization for Social and Technological Innovation (BOSTI) found that work environment needs differed according to job description, whereas, the Facility Management Institute of Herman Miller (FMI) proposed that these needs varied according to both workstyle and organizational culture.

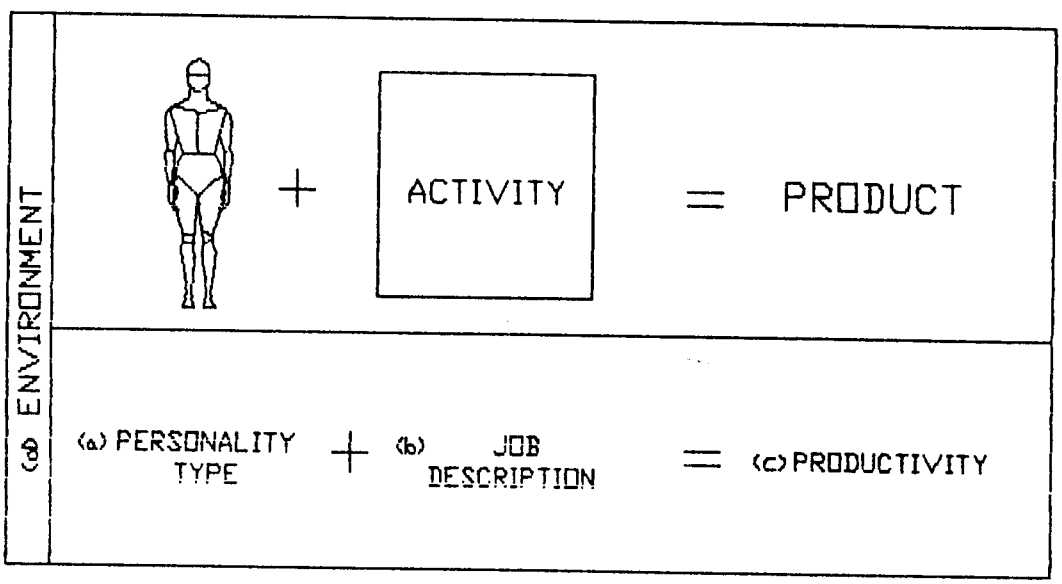


Figure I-1. Model of the relationship between the work environment, (a) personality type, (b) job description, and (c) productivity.

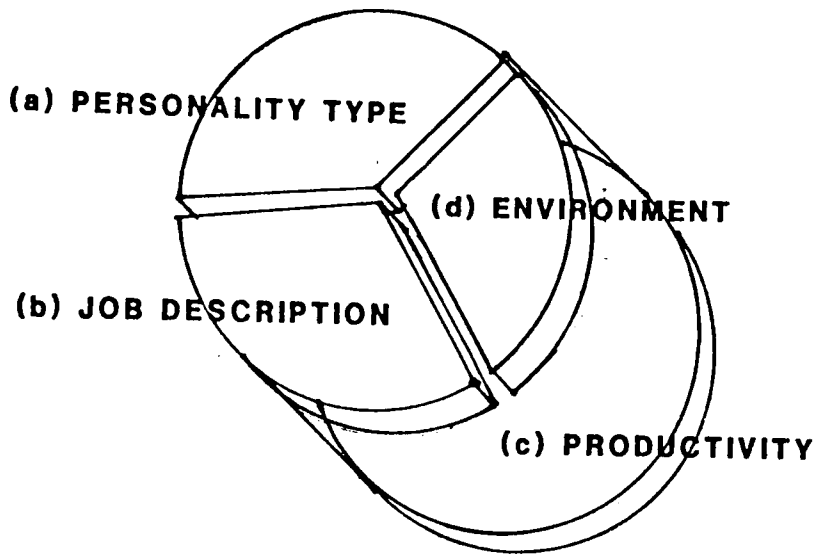


Figure I-2. Interdependent nature of (a) personality type, (b) job description, and (d) the work environment as the elements of (c) organizational effectiveness.

Synthesizing these approaches may indicate that a combination of job description, workstyle, and organizational theories determine or affect the environmental needs of employees. This study was structured to identify the relative importance each of these influences has in shaping the individuals' office environment to improve job satisfaction, performance, and productivity.

Statement of Purpose

The purpose of this research was to determine the impact of personality type and job description on the environmental needs of office workers. The resulting practical objective was to develop information for application to the design of workstations which meet functional and psychological needs, and which therefore positively influence productivity and organizational effectiveness in corporate office environments.

Definition of Terms

Terminology used for the purpose of this research includes the following definitions. (See Figure I-3 for a diagram of the relationships between elements.)

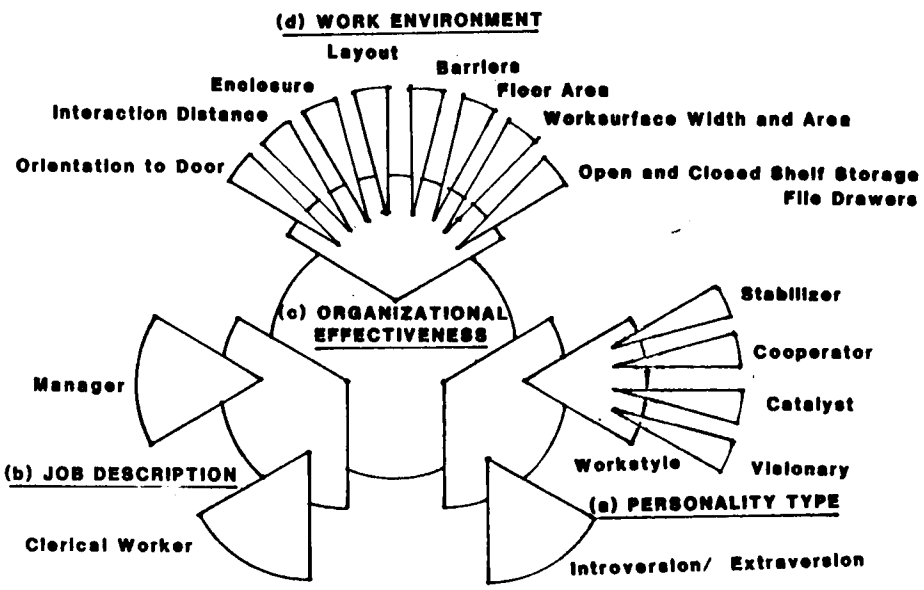


Figure I-3. Facets of personality type, job description, and the work environment as multiple elements of organizational effectiveness.

Personality type consists of two cognitive factors: introversion/extraversion and workstyle. These are the psychological processes which take place as a person does information-related work (Williams et al., 1985). Introversion and extraversion are the tendencies a person has to perceive either the inner world of ideas (introversion), or the outer world of things (extraversion) (Myers and McCaulley, 1985).

Workstyle is the way a person perceives, communicates, and evaluates information. Based on workstyles, there are four different types of workers: stabilizers, cooperators, catalysts, and visionaries (Williams et al., 1985). (These will be further defined in the review of literature.)

Job description is actually a measure of the tasks a person is required to do on the job, and is related in this study to two levels of the organization, clerical and managerial.

Environmental needs are the amount and type of environmental facets needed by office workers for optimum function, comfort, and efficiency. Environmental facets observed in this study are enclosure, layout preference, floor area, work surface width and area, open and closed shelf storage, file drawers, interaction distance,

orientation to door, and barriers. These facets will be defined individually in Chapter IV.

Corporate office environments are those specifically related to the running of a corporation and may or may not be where the corporation's main product originates.

Hypotheses

The following null hypotheses were tested in this research:

1. Enclosure needs do not differ significantly among
   (a) introversion/extraversion.
   (b) workstyle.
   (c) job description.
2. Floor area needs do not differ significantly among
   (a) introversion/extraversion.
   (b) workstyle.
   (c) job description.
   (d) company.
3. Work surface width needs do not differ significantly among
   (a) introversion/extraversion.
   (b) workstyle.
   (c) job description.
   (d) company.
4. Work surface area needs do not differ significantly among
   (a) introversion/extraversion.
   (b) workstyle.
   (c) job description.
   (d) company.

5. Open-shelf storage needs do not differ significantly among

(a) introversion/extraversion.
(b) workstyle.
(c) job description.
(d) company.

6. Closed-shelf storage needs do not differ significantly among

(a) introversion/extraversion.
(b) workstyle.
(c) job description.
(d) company.

7. The number of file drawers needed does not differ significantly among

(a) introversion/extraversion.
(b) workstyle.
(c) job description.
(d) company.

8. Interaction distance does not differ significantly among

(a) introversion/extraversion.
(b) workstyle.
(c) job description.
(d) company.

9. Orientation to door does not differ significantly among

(a) introversion/extraversion.
(b) workstyle.
(c) job description.
(d) company.

10. The presence of barriers in the workspace does not differ significantly among

(a) introversion/extraversion.
(b) workstyle.
(c) job description.
(d) company.

11. Interaction distance, orientation to door, and barriers are not related to each other.

12. Layout preference does not differ significantly among

(a) workstyle.
(b) job description.

13. When enclosure is measured as a series of steps, it does not differ significantly among

(a) workstyle.
(b) job description.

14. When enclosure, measured as a series of steps, and orientation to door are observed together, they do not differ significantly among

(a) workstyle.
(b) job description.

Assumptions

The following assumptions are made in this research:

1. Specific environmental factors are perceived in the context of other environmental factors, and the use of the scale-model method of spatial/behavioral

research accounts for this context so that each factor can be measured independently of the others.

2. The scale model method of spatial/behavioral research combined with instructions to the subjects to create what they feel is the most comfortable, functional, and efficient workspace for them, provides an accurate measure of that individual's actual workspace needs and preferences.

3. Meeting workers' needs for environmental facets which influence job satisfaction and job performance and which eliminate absenteeism and turnover will result in increases in organizational effectiveness (productivity) and a cost savings to the organization.

Limitations

The following limitations were inherent in this research:

1. The sample was limited geographically to metropolitan areas in east and middle Tennessee.

2. Model studies were done on location at each company represented in the sample. Therefore, there was wide variation in the visual and auditory privacy among companies of the test setting.

3. The job description of "manager" included managers of both information and people.

4. Subjects were chosen by a contact person within their company by acquaintance, job description, and willingness to participate. The researcher had no control over which employees were asked to participate.

5. There was no direct consideration of the social/communication facet of the work environment.

6. Other environmental facets, such as density of workers per space and lighting, known to influence productivity were not covered in this study.

CHAPTER II

REVIEW OF LITERATURE

Literature reviewed in this section deals specifically with the relationship found in theory and research relating productivity, the work environment, and design. This chapter is divided into three sections. First, the "Work Environment Research" section discusses office design studies, with particular reference to environmental needs findings according to job description and personality type, and productivity results from meeting those needs. Second, the Work Environment Design Considerations" section establishes job description, personality type, and organizational style as the criteria for design. Theories and research which explain the use of these criteria for organizational effectiveness oriented design are covered. Last, the "Work Environment Design Methods" section discusses user involvement in the design process for identification of job description and workstyle-related needs.

Work Environment Research

The purposes and outcomes of the theories reviewed in this section are summarized in Figure II-1. Three research studies are included: Hawthorne, BOSTI, and the Facility Management Institute. The BOSTI studies are parallel to the job description and work environment factors observed in this research. The Facility Management Institute studies are parallel to the workstyle and organizational factors observed in this research.

The Hawthorne Studies

Few research projects have measured the specific effects of factors in the work environment--such as amount of floor area or degree of enclosure--on worker productivity, job satisfaction, and job performance. The Hawthorne experiments, conducted from 1924 to 1932 in the Hawthorne plant of the Western Electric Company, were among the earliest attempts to measure the effects of the work environment on productivity. Environmental factors, such as lighting levels and density of workers per space, were manipulated. The organization showed interest in the workers' overall well being and environmental concerns by interviewing the workers (Westbrook, 1987).

STUDY	PURPOSE	OUTCOME
HAWTHORNE	(1) Measure effects of changes in environmental facets on productivity. (2) Identify worker attitudes about working conditions.	Due to the "Hawthorne Effect," increased productivity resulted from workers being observed and consulted. None of the productivity changes could be attributed to environmental facets.
BOSTI	(1) Measure effects of changes in environmental facets on the job satisfaction and job performance of clerical, professional/technical, and managerial office workers.	Specific environmental facets are related to both job satisfaction and job performance.
	(2) Measure the organization's financial cost for increased absenteeism and turnover, and savings for increased job satisfaction and job performance, caused by changes in environmental facets.	Each year, declines in environmental facets can cost the organization, and improvements in environmental facets can save the organization, more than 10% of each office worker's annual salary.
FMI	(1) Measure the effects of offices designed to match the cognitive style of their occupants on job satisfaction and job performance.	Workers having an office matched to their cognitive style had higher ratings on job satisfaction--but not job performance, than workers whose office was not matched to their cognitive style.
	(2) Propose office designs and needs for each cognitive style.	Profiles of office needs were developed for each cognitive style, based on cognitive dissonance and personality-type research. From these profiles, office designs for each cognitive style were developed.

Figure II-1. Summary of research on work environment design.

The result of the study came to be known as the infamous "Hawthorne Effect". Productivity increased as a result of workers being observed and consulted (Sommer, 1983). None of the productivity changes, however, were attributable to environmental factors:

> The general impression drawn from [the] Hawthorne studies has been that the physical environment had no effect. . . . The environment did make a difference, but its effect was a function of the ways in which individuals interpreted the changes. (Becker, 1981, pp. 15-16)

Still, the Hawthorne studies were a starting point for understanding the relationship between the environment and behavior.

BOSTI's Study

From 1975 until 1985 Brill et al., the Buffalo Organization of Social and Technological Innovation (BOSTI), and Westinghouse Furniture Systems conducted one of the largest and most comprehensive research projects ever done on the link between the work environment and productivity, job satisfaction, and job performance.

The purposes of the BOSTI study were to

1. Measure the effects of changes in environmental facets on job satisfaction, job performance, absenteeism, turnover, and other environmental facets (Figures II-2 and II-3).

MEASURE	DEFINITION
Job Performance	The effectiveness and quality of an individual's work output, measured by self and supervisory ratings.
Job Satisfaction	"An individual's satisfaction with his/her job, all things considered" (Sundstrom, 1986, p. 74). "The worker's evaluation of his / her job as a whole or of the general quality of life at work" (Sundstrom, 1986, p. 4).
Environmental Satisfaction	An individual's satisfaction with his/her work environment.

Figure II-2. Elements of organizational effectiveness defined.

MEASURE	DEFINITION
Communication (Ease of communication)	"How well the physical environment seems to support communication and interactions" (Brill et al., 1985, p. 53).
Satisfaction with Floor area	How satisfied a worker is with the square footage of his/her assigned work area.
Distractions	"Unintentional and accidental effects of being around others" (Brill et al., 1984, p. 198) which cause momentary inability to do tasks on the job.
Comfort	The degree of fit between the environment and a worker's task and physical size. (Brill et al., 1985, p. 56).
Status	The indication of a worker's position in the organizational heirarchy by the location and nature ofhis/her workspace (Brill et al., 1984, p. 261).

Figure II-3. Measures of environmental facets defined.

2. Measure differences in the environmental facets needs of clerical workers, professional technical workers, and managers.

3. Measure the dollar value of costs and savings to the organization due to changes in environmental facets.

A questionnaire was administered to a sample of over 10,000 office workers before and after either a move to a new location or a redesign of existing office facilities. Further research is continually being added to the results (Wineman, 1986; Brill et al., 1984 and 1985).

This study observed eighteen facets of the office environment and found some of them to be related to job satisfaction and job performance (Figure II-4). Improvements in these facets resulted in increases in job satisfaction and performance, and declines in absenteeism and turnover--providing a direct economic savings to the organization in personnel cost. Based on 1984 salary averages, these savings had amounted to $3,042 annually, or about 17% of the annual salary per clerical worker (Figure II-5); $4,650 annually, or about 15% of the annual salary per professional/technical worker; and $6,316 annually, or about 15% of the annual salary per manager.

The environmental facets considered by BOSTI which will be considered in this study are enclosure, privacy,

FACETS	BOTTOM-LINE MEASURES			
	ENV. SAT.	EASE COMM.	JOB SAT.	JOB PERF.
ENCLOSURE	■	■		■
LAYOUT	■	■		■
FURNITURE	■	■	■	
NOISE	■	■	■	
FLEXIBILITY	■	■	■	
PARTICIPATION	■		■	
COMFORT	■		■	
COMMUNICATION	■	(IS THE SAME)	■	
LIGHTING	■		■	PROBABLY
TEMP./AIR QUAL.	■		■	
FLOOR AREA		■	■	
PRIVACY	■	■		
STATUS	■	■		
PATHFINDING	■	■		
DISPLAY	■			
APPEARANCE	■			
OCCUPANCY		■		POSSIBLY
WINDOWS	POSSIBLY		POSSIBLY	

Figure II-4. Eighteen environmental facets observed by BOSTI and their relationship to job performance and satisfaction. (Brill et al., 1984, p. 58)

CLERICAL WORKERS

(AVG. SALARY: $17,400)

All Facets that Relate to Job Satisfaction, Taken Together	Annual Value	Net Present Value for Five Years
Noise	$ 102	$ 387
Temperature Fluctuation	70	264
Glare	70	267
Comfort[1]	—	—
Floor Area[2]	—	—
Relocation Frequency	122	463
Work Surface Width[3]	—	—
Storage (Personal)[4]	523	1,982
Ease of Communication	18	70
Participation[5]	—	—
TOTAL, JOB SATISFACTION:	$ 905	$ 3,429
All Facets that Relate to Job Performance, Taken Together	**Annual Value**	**Net Present Value for Five Years**
Enclosure	$ 1,237	$ 4,687
Layout	900	3,450
TOTAL, JOB PERFORMANCE:	$ 2,137	$ 8,094
All Facets that Relate to Job Performance, and Job Satisfaction Taken Together	**$ 3,042** (about 17% of annual salary)	**$ 11,526**

[1]COMFORT: Relates only to professional/technical workers
[2]FLOOR AREA: Only *decreases* in floor area relate to job satisfaction
[3]WORK SURFACE WIDTH: Only *decreases* in work surface width relate to job satisfaction
[4]STORAGE (PERSONAL): Relates only to clerical workers
[5]PARTICIPATION: No dollar value estimate can be developed for improvements in participation, given the numbers we have.

Figure II-5. Value of benefits from improvements in clerical workers' offices due to reduced absenteeism and turnover resulting from increased job satisfaction and performance. (Brill et al., 1984, p. 63)

layout, floor area, worksurface width, and number of file drawers. These facets, their definitions, and what they are related to are summarized in Figure II-6. The other environmental facets and aspects of organizational effectiveness they are related to are defined in figures II-2 and II-3 on page 19. In the following sections, each of these environmental facets are defined and are examined according to

1. What office workers have.

2. What office workers need, including actual worker preferences, and BOSTI's recommendations based on the relationship found between facets and the elements of organizational effectiveness shown in Figure II-6.

Enclosure. Enclosure refers to the "nature and configuration of the physical barriers that separate an employee's work space from other areas in the office" (Brill et al., 1984, p.89). Enclosure was measured according to both the height and the number of sides around a work space. Wall height was measured with four options:

1. "Minimum enclosure" was no barrier at all.

2. "Low" panels were panels a seated person could not see over.

3. "High" panels were panels a standing person could not see over.

ENVIRONMENTAL FACETS	DEFINITION	ASPECTS OF ORGANIZATIONAL EFFECTIVENESS RELATED TO	ENVIRONMENTAL FACETS RELATED TO
ENCLOSURE	"Nature and configuration of the physical barriers that separate an employee's workspace from other areas in the office." (Brill et al., 1984, p.89)	Job performance	Privacy Communication Satisfaction with floor area
PRIVACY	"Personal control over interactions and / or communication with others" (Brill et al., 1985, p.50).	The prediction of Job performance & job satisfaction Environmental satisfaction	Communication Distractions Enclosure
LAYOUT	Furniture, equipment, walls, and panels "arranged according to ideas about design, task support, behavior, and status" making up a single workspace. (Brill et al., 1984, p.118)	Job performance	Comfort Status Ease of communication
FLOOR AREA	Square footage of "the space that an assigned workspace for an individual worker contains" (Brill et al., 1985, p.37).	Job satisfaction	Communication
WORKSURFACE WIDTH	The combined dimensions of all worksurfaces in an individual workspace measured end to end.	Job satisfaction	
FILE DRAWERS	The number of individual file drawers located in an individual workspace.	Environmental satisfaction	

Figure II-6. Environmental facets observed by BOSTI.

4. "Walls" were barriers going from the floor to the ceiling. Four walls and a door were "maximum enclosure." (See Figures II-7 and II-8.)

Degrees of enclosure as measured by BOSTI are defined in Figure II-8.

What Office Workers Have.

1. BOSTI found enclosure in new and remodeled offices to be highly related to job type:

> Of the third who have little enclosure [two sides or fewer] 53% are clerical, 31% professional/technical, and 15% managers. Of the two-thirds with moderate enclosure [three sides or more], 50% are managers, 31% professional/technical workers, and 19% clerical workers. (Brill et al., 1984, p.97)

2. Of two combined sample groups, degrees of enclosure (Figure II-8) were distributed to percentages of the population as follows. (High enclosure was also counted in very-high enclosure, causing a total percentage of greater than 100).

Little enclosure	43%
Moderate	34%
High	16%
Very high	10%

3. Clerical workers had less enclosure than they needed. This was the general finding for BOSTI's sample:

> Most workers want more enclosure than they've got, and more privacy. Low enclosure gives workers little control over interruptions, visual exposure, and distractions of all kinds, and this [lack of control] interferes with their work. (Brill et al., 1984, p.92)

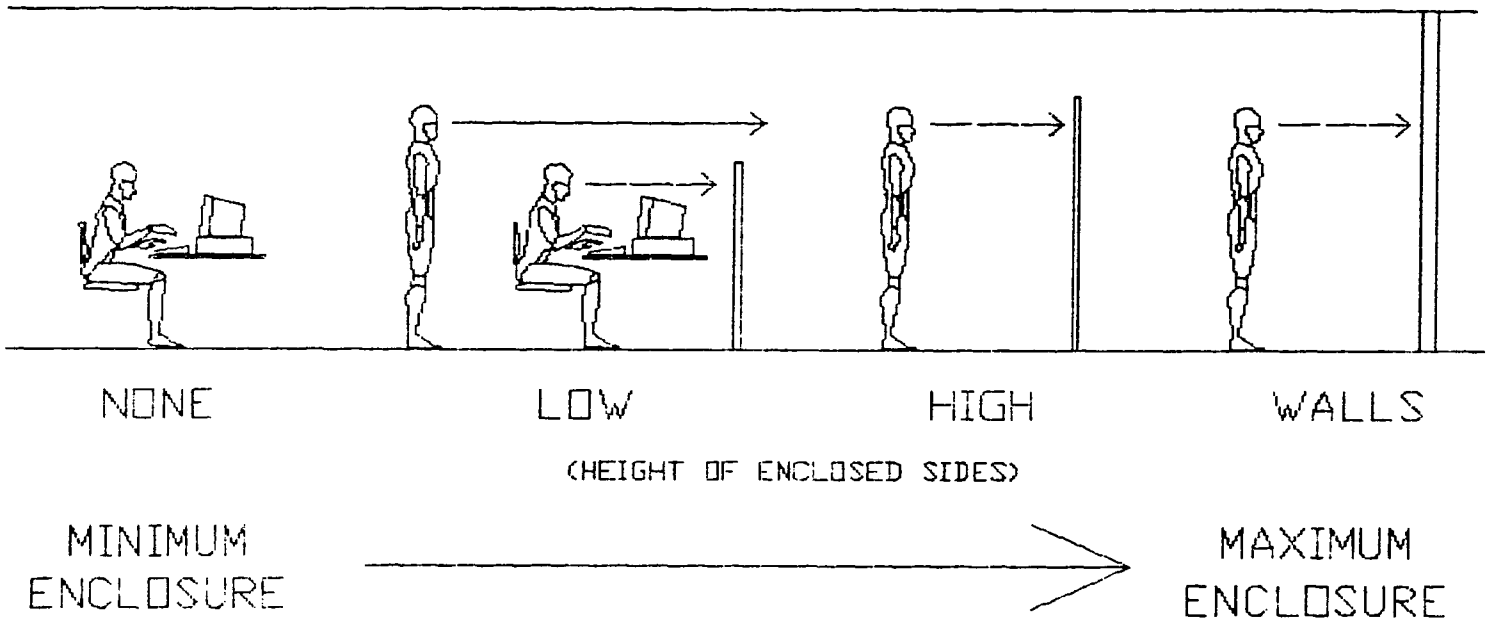


Figure II-7. Diagram of enclosure terms used by BOSTI.

DEGREE OF ENCLOSURE	DEFINITION
LITTLE	No sides, two sides or fewer, or three or fewer low sides.
MODERATE	Three sides or more, or four low sides.
HIGH	Three or four high sides or walls, but no door.
VERY HIGH	Four walls and a door.

Figure II-8. Degrees of enclosure measured by BOSTI.

What Office Workers Need.

1. Office workers feel more strongly about the number of sides and their height rather than the overall percentage of enclosure. Figure II-9 shows the degree of improvement in job satisfaction and performance from increasing enclosure at different steps. From this figure, it is possible to see that "adding a fourth side 'works' [to improve satisfaction] far more for low panels and little for high panels" (Brill et al., 1984, p. 96).

2. BOSTI proposed different enclosure requirements for clerical workers and managers (Figure II-10).

Privacy. Privacy (highly related to enclosure) is the ability a worker has to control interaction and communication with others in the workplace. Fifty-four percent of the clerical workers in BOSTI's sample felt privacy was an important factor in both getting the job done and feeling better about their jobs (Brill et al., 1985).

Privacy includes four independent measures: visual accessibility ("access"), visual exposure, visual distractions and interruptions, and speech privacy.

There are four different combinations of visual access and visual exposure which have different results in the work situation (Figure II-11). Visual access is the

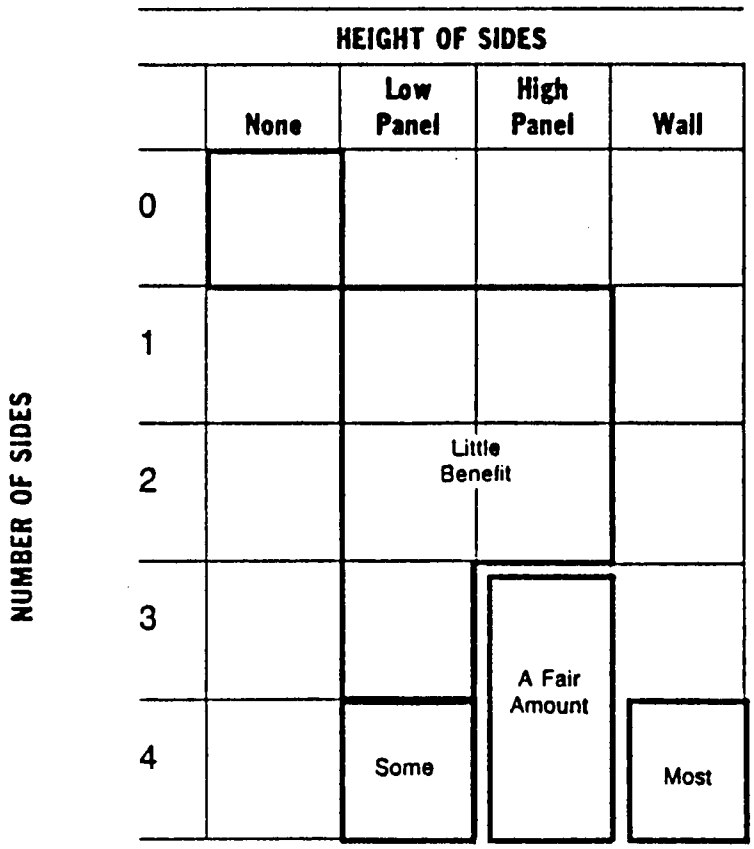


Figure II-9. Meaningful steps in enclosure. (Brill et al., 1984, p. 95)

JOB DESCRIPTION	RECOMMENDED ENCLOSURE
Executives	Very high.
Middle & First Level Managers	High, with an option for a door.
Clerical	Moderate.
Clerical--Keyboarding	Moderate to high.
Clerical--Financial	High, with an option for a door.

* No recommendations were made for low enclosure for any job descriptions. For receptionists, a job description that seemingly requires low enclosure, moderate enclosure with visual access to visitors was recommended.

Figure II-10. BOSTI enclosure recommendations by job descriptions.

Access	Exposure	Nature of Resulting Situation
High	High	You are fully "in public," like being on an urban sidewalk. When in public settings, we acknowledge our high exposure and do not make one another feel "on display." In offices, we *are* on display, making a high access-high exposure situation potentially stressful and disruptive.
High	Low	This is the ideal privacy situation. You can act freely because you can't be monitored (low exposure) and are able to anticipate when you might be monitored (high access). This is what office workers most favor.
Low	Low	This can result from being physically isolated, or behind a well-positioned door, or in an out-of-the-way niche. If you can control access to your location, you can regulate privacy and social contact. This situation will be tolerable, otherwise, only to those who enjoy isolation.
Low	High	The least desirable situation. You are vulnerable while others are protected.

*Access- your ability to see others.

*Exposure- the ability for others to see you.

Figure II-11. Degrees of visual access and visual exposure. (Brill et al., 1984, p. 199)

ability of the worker to see others. Visual exposure is the ability of others to see the worker.

Distractions and interruptions are "the unintentional and accidental effects of being with or near others" and result from "seeing others while you are working " and from the presence of others near your workspace (Brill et al., 1984, p. 198).

Speech privacy is the ability to control who receives sensitive and confidential information (Brill et al., 1984, p. 198).

What Office Workers Have. In terms of overall privacy:

1. None of the clerical workers in the sample had as much privacy as they wanted. After a move, even managers felt they did not have enough privacy. (BOSTI supposed this feeling was due to the number of managers moving from fully enclosed offices to panel enclosed offices.) According to BOSTI, having less privacy than one wants is related to decreases in environmental satisfaction, which "has the potential to undermine performance and/or satisfaction causing economic costs to the organization" (Brill et al., 1985, p. 51).

2. The fully enclosed office with four walls to the ceiling and a door provides the most privacy. However, of those having this type office "50% seldom or never close

their doors . . . and only 25% do it frequently or constantly" (Brill et al., 1984, p. 103). BOSTI suggested a reason for this statistic may be that open door policies are rewarded by organizations, and that a closed door is perceived as excluding oneself from the team or as an indicator of the degree of seriousness of a conversation.

Separated into the four aspects of privacy:

1. Control over access and speech privacy was almost nonexistant for clerical workers. Managers had low to moderate control over access.

2. Converse to control over access, managers had less visual exposure than clerical workers.

3. The level of distractions for all job types was moderate, with slightly more distractions for clerical workers than for managers.

What Office Workers Need.

1. Privacy is increased by increasing the degree of enclosure and by the arrangement of the barriers enclosing workspaces to provide high visual access and low visual exposure.

2. Increased enclosure increased the sense that the workspace provided decreased visual exposure and reduced distractions and interruptions.

3. "Having an office with four walls to the ceiling and a door was a precondition for obtaining control over

accessibility, speech privacy, and having enough workspace privacy" (Brill et al., 1985, p.52).

Layout. Layout refers to the arrangement of furniture, equipment, walls, and panels that make up an individual's workspace. BOSTI attempted to identify

1. Workers satisfaction with their workstations.

2. Suitability of different layouts.

3. How layout related to other features of the environment.

What Office Workers Have.

1. Forty-three percent of BOSTI's sample "felt that their layout was not suitable for their tasks" (Brill et al., 1984, p.120) This feeling was true for only 31% of the managers, as compared to 42% of the clerical workers.

2. After relocation to a new office, layout suitability improved for all job types, however, it was still inadequate for 30% of the clerical workers and 18% of the managers.

What Office Workers Need.

1. The furniture groupings providing the highest layout suitability were those having two work surfaces and one to five file drawers. The number of worksurfaces, does not help if not properly arranged (Brill et al., 1984, p. 142)

2. Managers' layout suitability increased greatly with the capability to interact with others across a work surface.

3. From responses of those in the overall sample satisfied with layout, BOSTI found the following layout conditions to be preferable:

a. Having a single entrance to a work station from in front is preferable.

b. Having other people seated directly in front is not preferable.

c. Having the right, left, or both sides of the work station open onto an aisle others use is not preferable.

d. Having some space, and then a barrier above standing eye height on all sides is preferable. (Brill et al., 1984, p.124)

4. The following recommendations were made with reference to location of entry into the workspace:

> Wherever possible, the entry shall be located in front of a person seated at a primary work surface. The second most desirable location is to the side and located within the seated person's cone of vision. The least desirable location is to the rear of a seated person. (Brill et al., 1985, p. 107)

Floor Area. Floor area is "the space that an assigned workspace for an individual worker contains" (Brill et al., 1985, p. 37) measured in square footage.

What Office Workers Have.

1. On average, the amount of floor space that all job types actually have is more than what workers consider to be "enough" and, is more than what workers consider to be "satisfactory" for all but clerical workers Brill et al., 1985, p. 38). See Figure II-12.

2. A direct relationship was found between organizational level and floor area, with a ratio of approximately 3:2:1 by job description. Average amounts of floor area are shown in Figure II-12.

3. After a move, floor area was reduced by a 3:2:1 ratio according to job description also. Floor area was reduced for

a. 30% of the managers.

b. 60% of the professional/technical workers.

c. 80% of the clerical workers.

What Office Workers Need.

1. Square footages considered to be enough floor area by BOSTI's sample are shown in Figure II-12.

2. No significant differences were found between automated equipment users and non-users in amount of floor area considered adequate (Brill et al., 1984, p. 115).

Job Type	Average Floor Area (sq. ft.)		
	(Average) Actual	"Satisfactory"	"Enough"
Manager	115	115	74
Professional/technical	82	74	59
Clerical	43	78	40

Figure II-12. Actual, "Enough", and "Satisfactory" floor areas. (Brill et al., 1984, p. 115)

Work Surface Width. Work surface width, measured in lineal feet, is the dimension of all work surfaces in an individual workspace measured end to end.

What Office Workers Have. After relocation to a new office, worksurface width and depth was inadequate for half of the clerical workers, and adequate for three-quarters of the managers.

What Office Workers Need.

1. BOSTI did not indicate actual work surface width needed by office workers. They did, however, recommend two or more work surfaces for all job types, characteristic of layouts with high suitability to task.

2. Also, no significant differences were found between automated equipment users and non-users in the amount of work surface width considered adequate (Brill et al., 1984, p. 146).

File Drawers. BOSTI observed the number of single file drawers located in individuals' workspaces.

What Office Workers Have.

1. Managers had on average more file drawers than clerical workers, with the effects of clerical workers known as "keepers of the files" removed. The frequency with which different numbers of file drawers were had by people of different job descriptions is in Figure II-13.

Number of File Drawers	Managers	Professional/ Technical	Clerical
0	3%	5%	8%
1-2	22%	53%	46%
3-5	5%	25%	21%
6-8	13%	9%	4%
9-11	4%	4%	9%
12+	4%	4%	13%

Figure II-13. Number of file drawers by job type, after a move to a new or redesigned office. (Brill et al., 1984, p. 148)

2. The large percentage of clerical personnel with more than nine file drawers was attributed to certain of them being designated "keeper of the files" for an entire division or department (Figure II-13).

3. BOSTI noted a trend "toward significantly fewer file drawers in the workspace for all job types, but . . . especially for . . . clerical workers" (Brill et al., 1984, p. 141).

4. There were no differences in the average number of file drawers of equipment users and non-users.

What Office Workers Need. No recommendations were made on the number of file drawers needed.

The Facility Management Institute Study

One of the most recent studies on productivity in the work environment was conducted in 1985 by Herman Miller's Facility Management Institute (FMI). This study, based on Carl Jung's theory of cognitive styles and Isabel Briggs Myers' research on cognitive styles, attempted to

1. Measure the effects of offices designed to match the cognitive style of their occupants and the organizational style of the company on job satisfaction and job performance.

2. Propose office designs and needs for each cognitive style.

Cognitive style is the way an individual perceives and evaluates information (Williams et al., 1985, pp. 25-26). According to Jung, personality type is based on cognitive style. Jung proposed two aspects to cognitive style: Sensing (S)/Intuition (N), and Thinking (T)/Feeling (F) (Figure II-14). Sensing and Intuition are the faculties an individual uses to perceive. Thinking and Feeling are the faculties an individual uses to evaluate. More specific definitions of these are in Figure II-15. Isabel Briggs-Myers expanded Jung's theory to include two other aspects of personality type (Figure II-16): Introversion (I)/Extraversion (E), and Judging (J)/Perceiving (P). Introversion and Extraversion are the viewpoints from which a person perceives; the inner world of ideas (introversion) or the outer world of things (extraversion). Judging and Perceiving are the viewpoints from which a person evaluates.

Sample and procedure. In the FMI study, a sample of 222 office employees from 12 companies and six organizational levels (from clerical to executive) was administered the Myers-Briggs Testing Indicator (MBTI) (Form F), which measures both sensing/intuition, thinking/feeling and introversion/extraversion, judging/perceiving, to measure work style the way a person

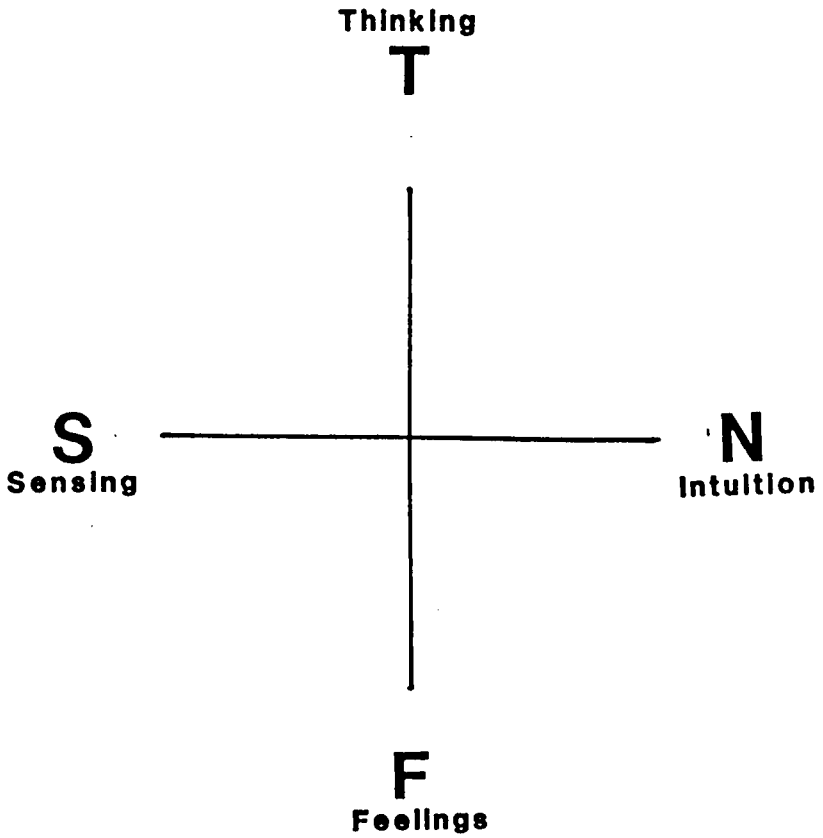


Figure II-14. Jung's cognitive styles axis. (Williams et al., 1985, p. 26)

SENSING

An S probably means that you would rather work with known facts than look for new possibilities and relationships. S's dislike new problems unless there are standard ways to solve them; like an established way of doing things; enjoy using skills already learned more than learning new ones; seldom make errors of fact; tend to be good at precise work; are patient with routine details.

INTUITION

An N probably means that you would rather look for possibilities and relationships than work with known facts. N's like solving new problems; dislike doing the same thing repeatedly; enjoy learning a new skill more than using it; work in bursts of energy powered by enthusiasm, with slack periods in between; reach a conclusion quickly; are impatient with routine details.

THINKING

A T probably means you base your judgments more on impersonal analysis and logic than on personal values. T's do not show emotion readily and are often uncomfortable dealing with peoples feelings; may hurt people's feelings without knowing it; like analysis and putting things into logical order; tend to decide impersonally, sometimes paying in sufficient attention to peoples wishes; are able to reprimand people or fire them when necessary.

FEELING

An F probably means you base your judgments more on personal values than on impersonal analysis and logic. F's tend to be very aware of other people and their feelings; enjoy pleasing people, even in unimportant things; dislike telling people unpleasant things; tend to be sympathetic; like harmony.

Figure II-15. Cognitive styles aspects defined. (Briggs, Katharine C., and Isabel Briggs Myers, 1983., p. 3)

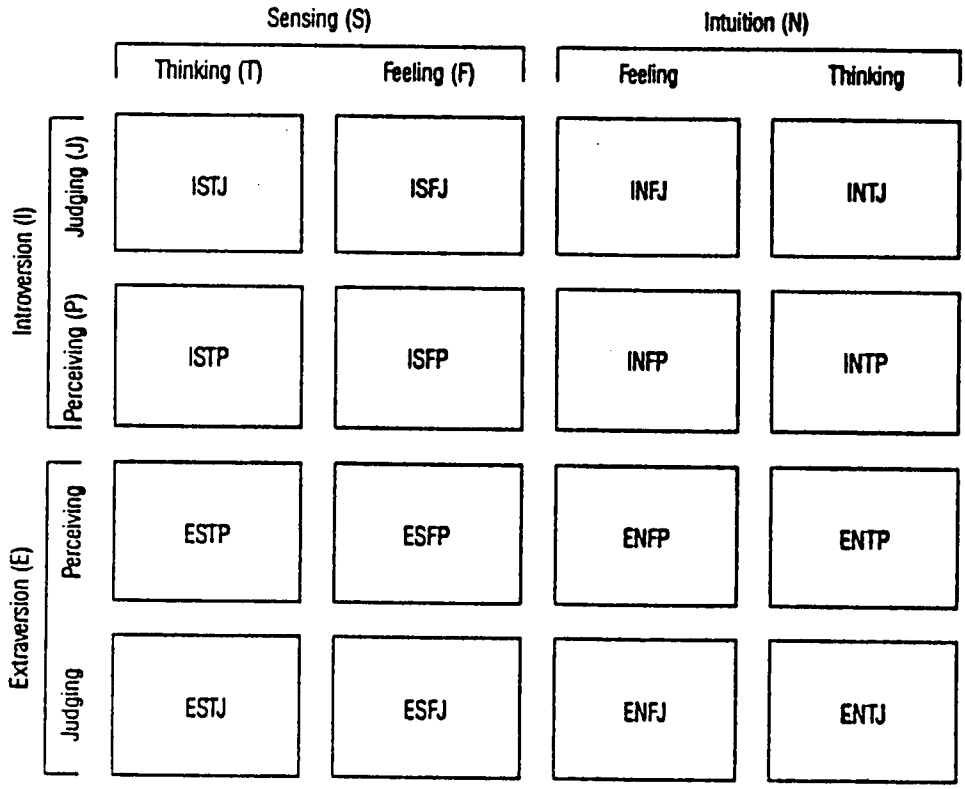


Figure II-16. Myers' expansion of Jung's cognitive styles axis. (Williams et al., 1985, p. 42)

perceives, communicates, and evaluates information. Work style is a combination of sensing /intuition and thinking/feeling (Myers and McCaulley, 1985; Williams et al., 1985).

FMI also measured the work process and the workplace with a modified version of the MBTI. The work process--also called organizational style--identified the management theories used in the organization with a questionnaire based on the Myers-Briggs Type Indicator. The workplace was identified with questions about the attributes of subjects' workspaces using nomenclature keyed to personality characteristics as determined by the MBTI (Williams et al., 1985, pp. 44-45).

Work style, work process, and workplace responses were separated into four different types, each resulting from a specific quadrant of the cognitive styles axis: Stabilizer (ST for sensing/thinking), Cooperator (SF for sensing/feeling), Catalyst (NF for intuition/feeling), and Visionary (NT for intuition/thinking) (Figure II-17). In addition, other names were assigned to each work process to equate them with organizational theories in common use (Figure II-18). In the following paragraphs, the four types--stabilizer, cooperator, catalyst, and visionary--are analysed, with an emphasis on the FMI study's recommendations.

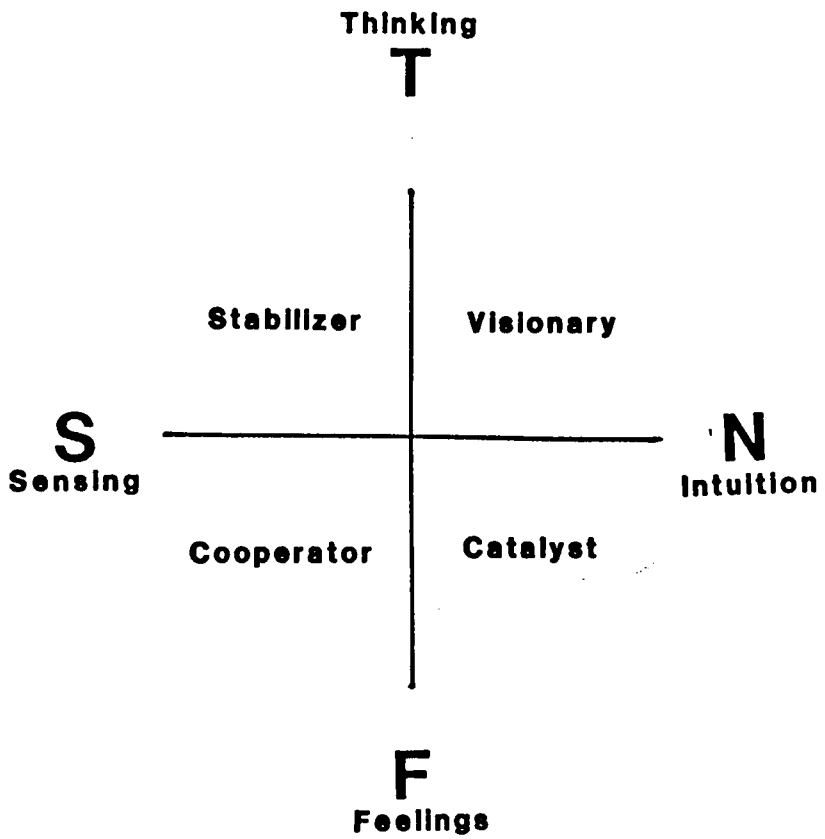


Figure II-17. Workstyles defined by FMI, as located on the cognitive styles axis. (Williams et al., 1985, p. 26)

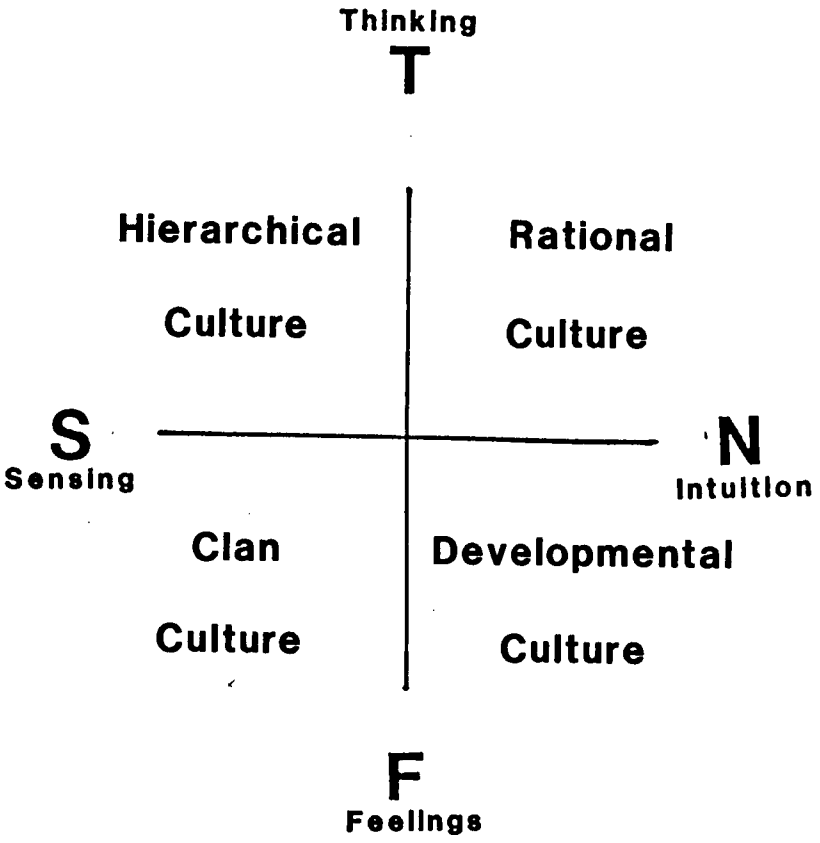


Figure II-18. Organizational styles defined by FMI and parallel to workstyles, as located on the cognitive styles axis. (Williams et al., 1985, p. 34)

Stabilizers base their perception, communication, and evaluation on sensing and thinking. Someone who is a stabilizer

> collects hard data, produced by scientific procedures or experience . . . [and] needs all information pertaining to the next step toward a final goal. These facts are then arranged and acted on from a completely logical point of view aimed at creating stability and order. (Williams et al., 1985, p. 29)

The organizational style that FMI identified as having stabilizer characteristics is the heirarchical culture. An example of an heirarchical culture is a military organization. An organization having this culture will be "'permeated with assumptions of stability'" (Williams et al., 1985, p. 36). This culture is a bureaucracy, held together with "procedures, rules, and regulations to maintain the organization logically and systematically" (Williams et al., 1985, p. 36). "Stabilizers will establish orderly ways to develop routines", resulting in this culture, to meet their primary need for security and order (Williams et al., 1985, p. 36). FMI defined the stabilizer "workplace" as one "geared toward action":

> Stabilizers need to display current and frequently consulted information. Desk and table tops are actually used for working (not for piling up paper) and to hold electronic devices handy for analyzing and displaying relevant data. Stabilizers need little personalization in their offices and believe, 'There is a place for everything, and everything should be in its place.' (Williams et al., 1985, p. 31)

FMI recommended for stabilizers a fully enclosed office with four walls to the ceiling and a door (Figure II-19). Storage space is closed to connote security, "a quality necessary for the stabilizer to contribute at his or her peak" (Williams et al., 1985, p. 71). The office is compact, neat, and private with a sense of permanence characteristic of bureaucratic organizations (Williams et al., 1985).

Cooperators base their perception, communication, and evaluation on sensing and feeling. Cooperators examine facts and experiences "in light of . . . personal values or the values of others affected by these facts" (Williams et al., 1985, p. 37).

The organizational style that FMI identified as having cooperator characteristics is the clan culture. An example of a "clan culture" organization is a family business. An organization having this culture will be "permeated with assumptions about human affiliation" (Williams et al., 1985, p. 37). This culture attempts to form a sense of family and is similar to Ouchi's "Theory Z" organization--otherwize known as Japanese-style management. In the "clan culture":

> 'Compliance flows from trust, tradition, and long-term commitment to membership in the system. . . . the individual's primary need is for attatchment, affiliation, or membership. Leaders . . . [are] participative and supportive, showing consideration in facilitating interaction. . . .

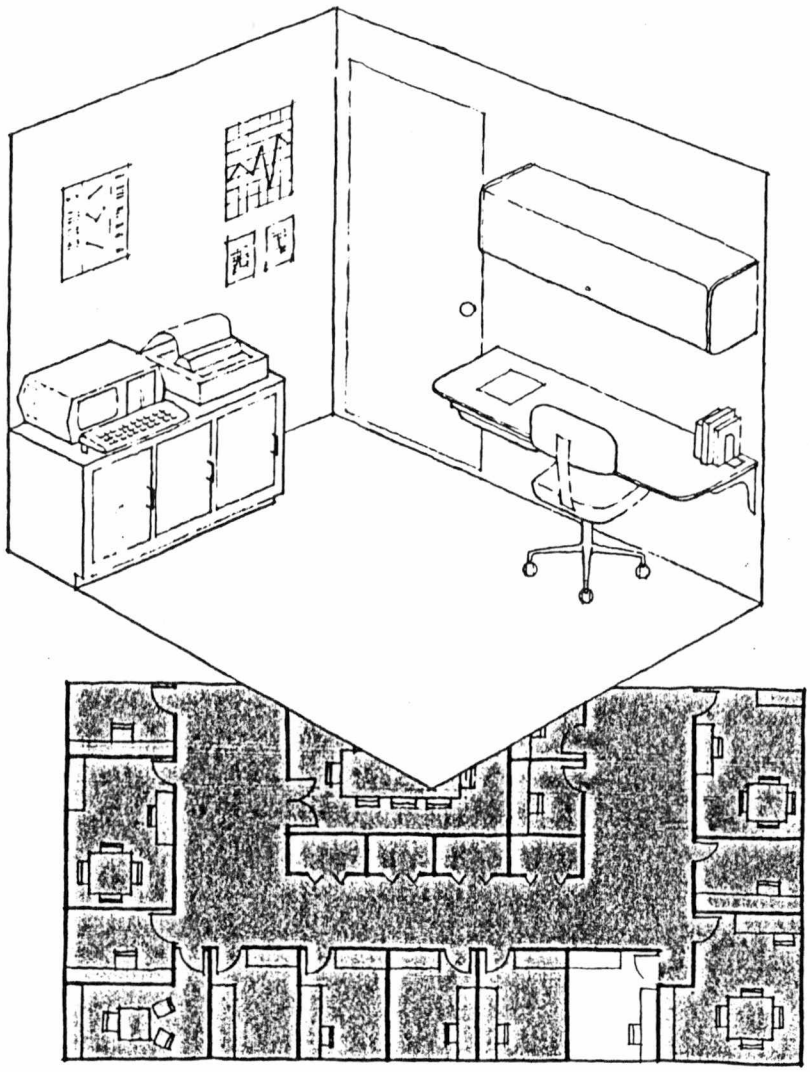


Figure II-19. Stabilizer office proposed by FMI. (Williams et al., 1985, p. 71)

> decisions are made participatively [and] supported by all members of the system. . . . Emphasis [is] on the development of human resources.' (Williams et al., 1985, pp. 37 and 39)

FMI defined the cooperator "workplace" as one which "provide[s] for easy contact with other people, either face to face or over the phone," because "the cooperator works best through meeting with others" (Williams et al., 1985, p. 31). Consequently, FMI recommended for cooperators an office with low walls and moderate enclosure (Figure II-20) to "emphasize the receipt and transmission of information, rather than storing information or desk work" (Williams et al., 1985, p. 31). According to FMI, they need less privacy than other work styles, and are usually either "out cooperating with other people somewhere else, or they are working with people in their own offices" (Williams et al., 1985, p. 31). FMI recommends for cooperators an

> open, neat, large area, [with] a few specially chosen items from home. . . . A high level of personal interaction can be negotiated here. The neatness demonstrates the cooperator's way of ordering facts to understand the world, as evidenced by the IN and OUT boxes, the computer, and the opportunity for easy access to other people (Williams et al., 1985, p. 70).

Catalysts base their perception, communication, and evaluation on intuition and on feeling. Catalysts make decisions "based on the implications for the people concerned, including themselves," and "tie . . . [their

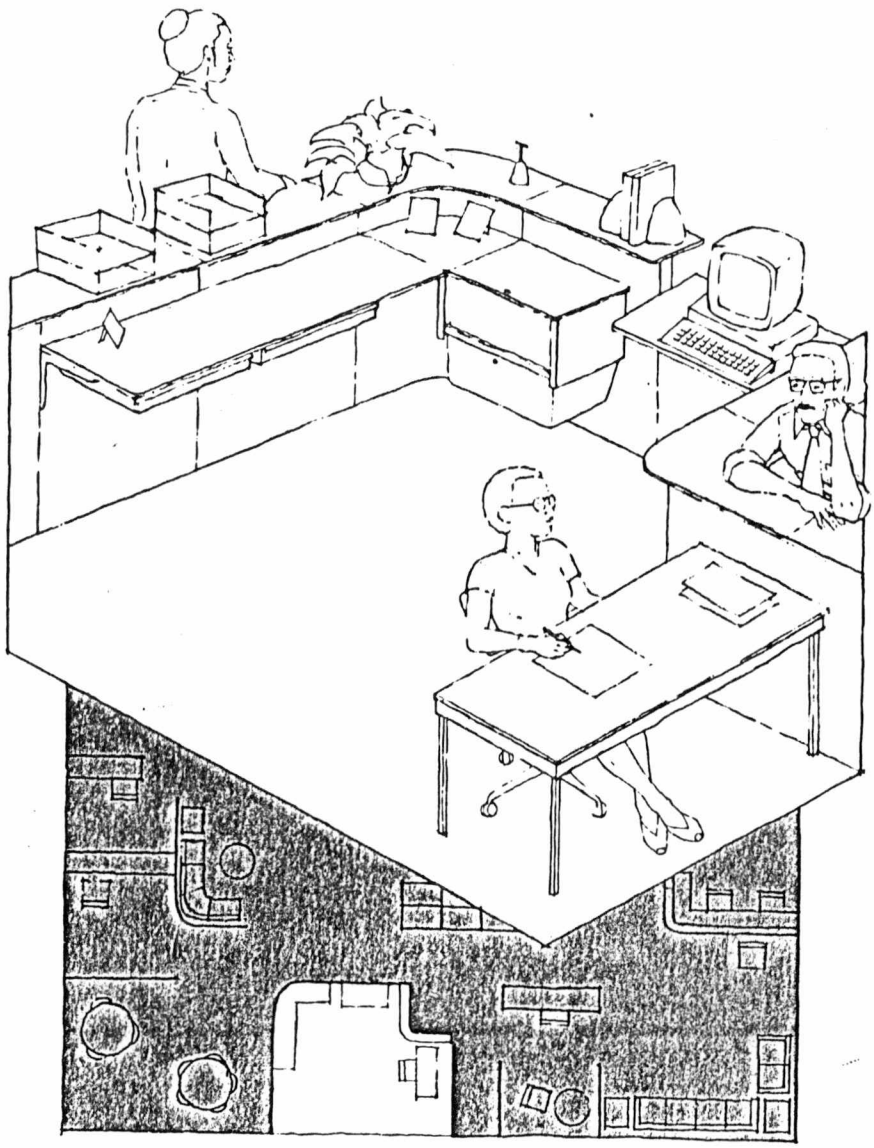


Figure II-20. Cooperator office proposed by FMI. (Williams et al., 1985, p. 70)

decisions] into the personal values of all concerned" (Williams et al., 1985, p. 29).

The organizational style that FMI identified as having catalyst characteristics is the developmental culture. An example of a development culture is an advertising agency or graphic design firm. An organization having this culture will be "permeated with assumptions of change" (Williams et al., 1985, p. 36). This culture is related to the adhocracy, organic, or matrix organizational theories:

> 'In this dynamic view, it is believed that the individual's primary need is for growth, stimulation, and variety. Leaders . . . [are] inventive and risk-taking, paying particular attention to envisioning new possiblities and acquiring additional resources, visibility, legitimacy, and external support. . . . Compromise is important.' (Williams et al., 1985, pp. 36-37)

FMI defined the catalyst's workplace as one "reflect[ing] a more personal approach to information", where the decision making process is helped by an office environment consisting of personal items and mementos, combined with work objects. To the catalyst, these are reference materials not just for current use but also for future projects. (Williams et al., 1985, pp. 30-31)

FMI recommended for catalysts an office with a relatively high degree of privacy to allow seclusion necessary for working on tasks demanding complete concentration (Figure II-21). "Everything in the office has some personal meaning and is rarely discarded. [Note the box on

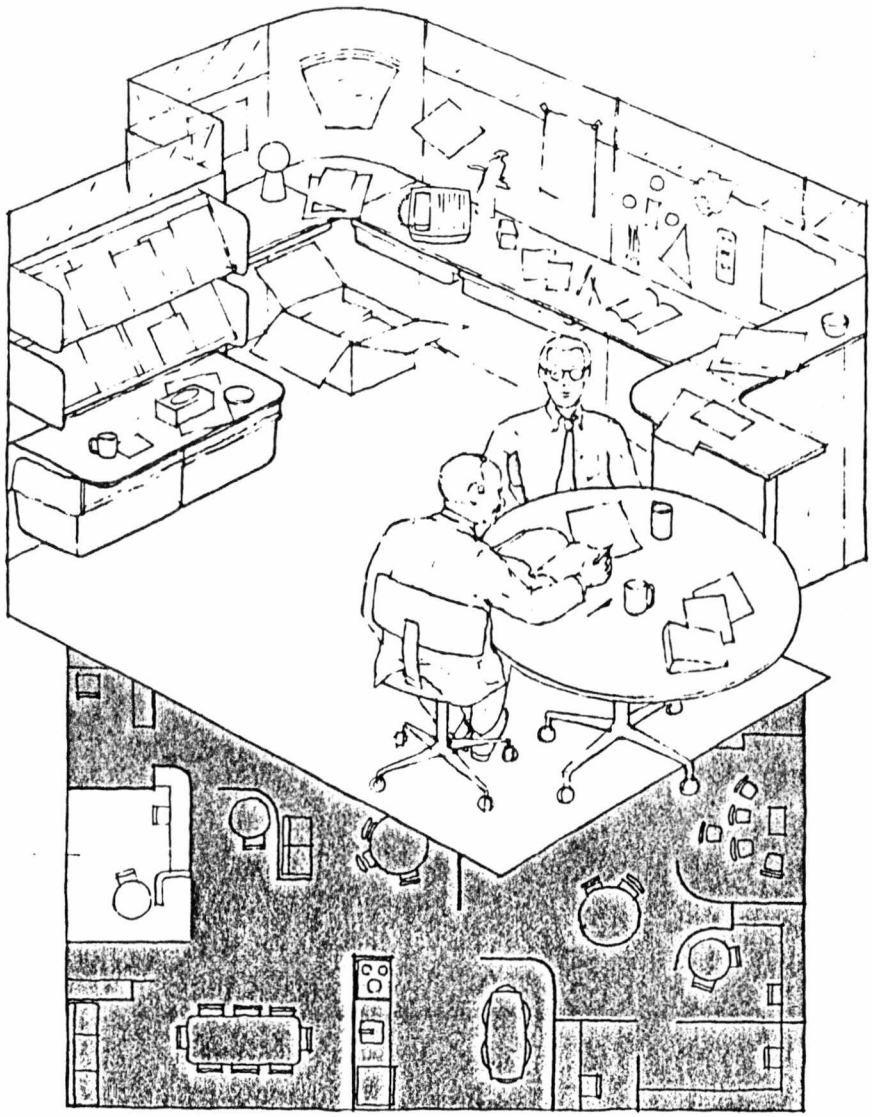


Figure II-21. Catalyst office proposed by FMI. (Williams et al., 1985, p. 72)

the floor.] A table makes it easy for the catalyst to work with other people, something he or she is usually adept at doing" (Williams et al., 1985, p. 72).

Visionaries base their perception, communication, and evaluation on intuition and thinking. Visionaries tend to concentrate on theoretical ideas, subordinate human considerations, and think futuristically. To do this they want to accumulate all information available on a subject. Decisions are made impersonally based on this information. (Williams et al., 1985, p. 29)

The organizational style that FMI identified as having visionary characteristics is the rational culture. An organization having this culture will be "permeated with assumptions about achievement," such as a research and development firm. Ouchi's "Theory A" or "market form" is the organizational theory corresponding the the rational culture. In this type organization

> 'Individual objectives are clarified and rewards are predicated on accomplishment. Compliance thus flows from formal contracting such as the MBO process. . . . [and assumes] the individual's primary need is to demonstrate competence and experience the successful achievement of predetermined ends. Leaders . . . [are] directive and goal-oriented, constantly providing structure and encouraging productivity. . . . [Emphasis] is placed on planning, productivity, and efficiency.' (Williams et al., 1985, p. 37)

FMI defined the visionary workplace as one with

> a good deal of historical and reference material. The attitude is, 'You never know when I might need

> this information to help me make a decision; I'd better keep it close by.' Shelves and storage are piled with material the visionary consults privately while considering a course of action. Visionaries want to work without interruption and without space constraints. (Williams et al., 1985, p. 29)

For the visionary, FMI proposed an office with a relatively high degree of enclosure (Figure II-22) and plenty of storage space for books:

> The visionary must be aware of all relevant information, past and present. All reference data must be at hand to develop the big picture, the goal of most of a visionary's work and a process likely to absorb him or her. . . .[He/She] view other people as vital to the execution of long-range plans but seldom needed in the formulation of the plans, [thus, the absence of a "guest chair"--most visionary interaction would be in a meeting or presentation format]. (Williams et al., 1985, p. 73)

Summary of FMI Findings. Work styles, work processes, and workplaces were distributed among the sample in different ways (Figure II-23). Stabilizers were the largest group of work styles (personality type on figure II-23), with 45%. visionaries followed with 27%, cooperators with 19%, and catalysts were the smallest group with 9%. An almost even number of work processes (organizational styles) were found among stabilizers (29%), visionaries (28%), and cooperators (27%), with substantially fewer catalyst work processes (15%). An even number of work-

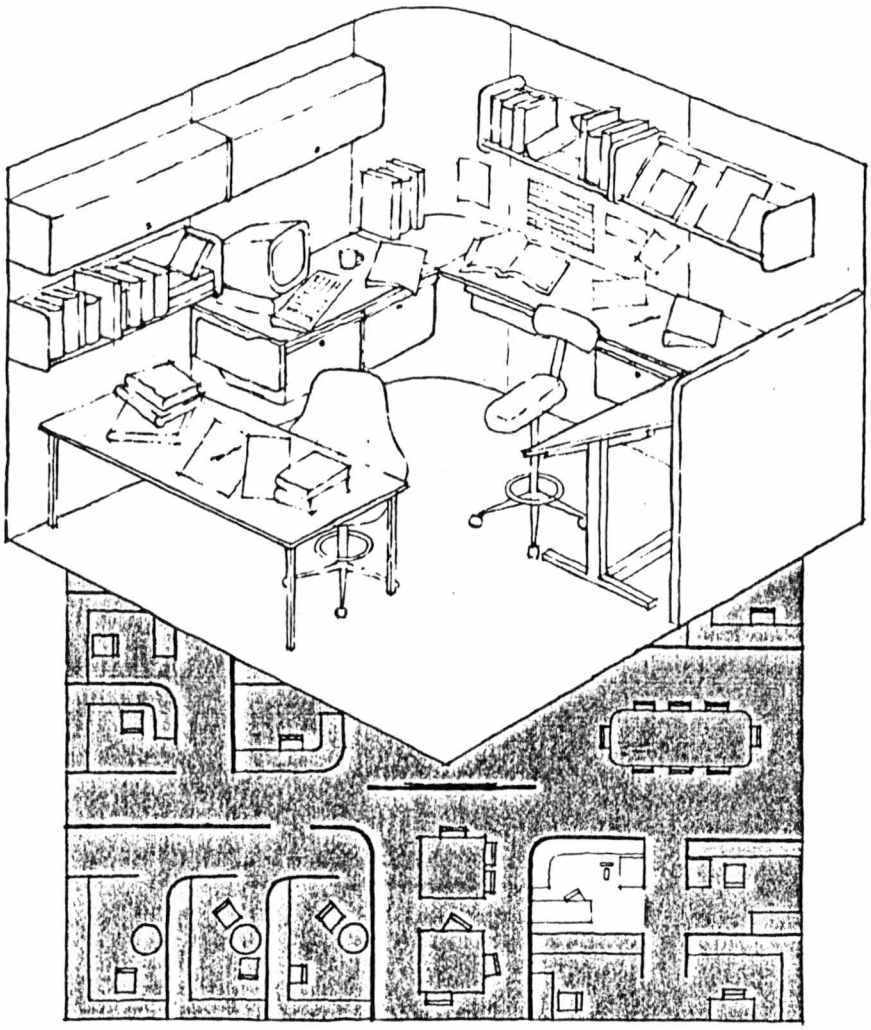


Figure II-22. Visionary office proposed by FMI. (Williams et al., 1985, p. 73)

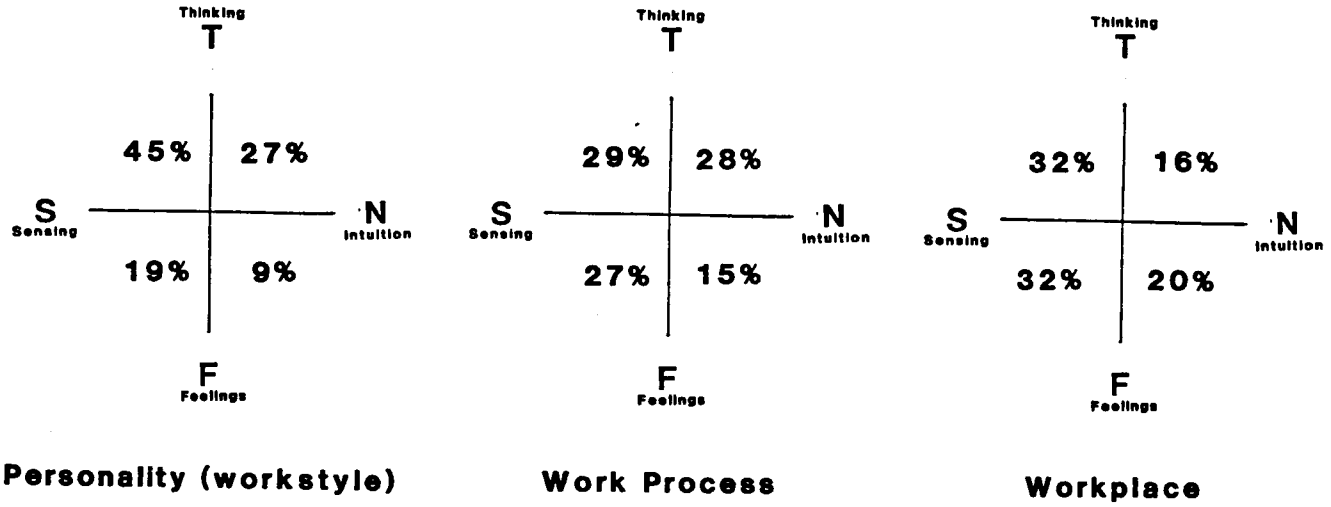


Figure II-23. Distribution of workstyles, organizational styles, and workplaces in FMI's sample. (Williams et al., 1985, p. 46)

places were stabilizer and cooperator (32% each), with 20% catalyst workplaces and 16% visionary workplaces.

Scores of the three measures were combined to determine the degree of fit between the work styles of subjects, the work processes they are required to use, and their workplaces. The perfect matches and mismatches are shown in Figure II-24. Perfect matches are when all three measures--work style, work process, and workplace--are all the same type. Worst mismatches are when none of the three measures are the same type (e.g. work style is stabilizer, work process is catalyst, and workplace is visionary, etc.) "Only seven per cent of the total sample work in offices that coincide with their work and their personalities" (Williams et al., 1985, p. 51).

In terms of factors relevant to productivity--job satisfaction and job performance, FMI found:

> The group of perfect matches had higher scores than the mismatched group on job satisfaction, company satisfaction, and satisfaction with present workplace. The quality of fit among people, their work, and their workplace is, then, a measureable construct definitely related to factors affecting individual and, ultimately, corporate productivity. (Williams et al., 1985, p. 49)

As a result of these findings, FMI concluded that:

> Offices must begin to negotiate with their users . . . [and] align not only with the work they support but also with the people who use them. (Williams et al., 1985, p. 51)

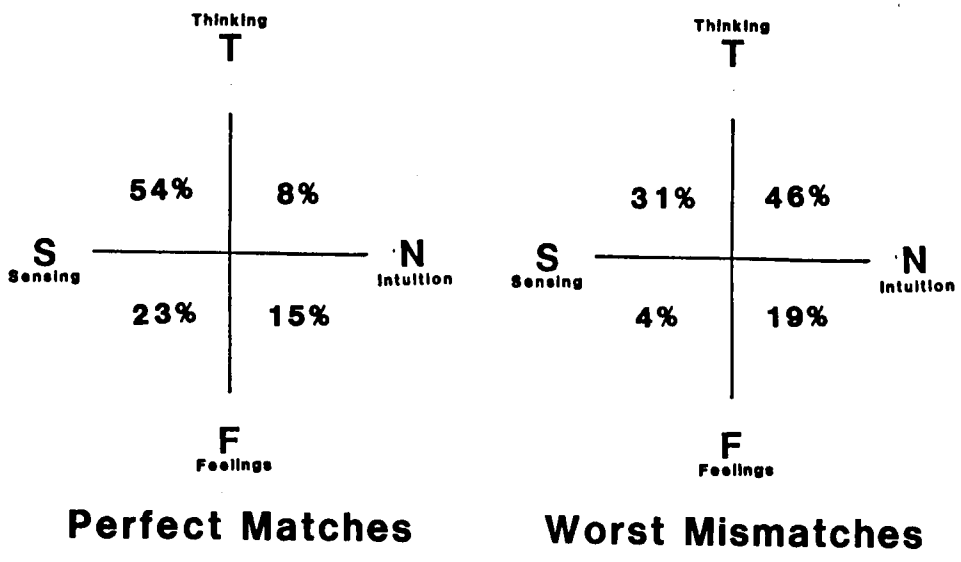


Figure II-24. Perfect matches and worst mismatches found in FMI's sample. (Williams et al., 1985, p. 50)

Work Environment Design Considerations

Personality type, job description, organizational style, and work-environment design are interdependent components of organizational effectiveness. (See Figure II-25.) A change in one of these elements requires a change in the others in order to maintain optimum balance. Specific failures will occur if all components are not considerations for work environment design (Figure II-26). The relationships between these elements must be considered when designing the work environment because:

> People and their physical environment exert mutual influence and together form interdependent systems. . . . Relationships between people and physical settings differ, depending on whether the unit of analysis is the individual, the interpersonal relationship, or the entire organization. (Sundstrom, 1986, p. 1)

People and their interactions with the work environment have a definite influence on what happens in organizations:

> individuals rearrange file cabinets . . . and conduct meetings in cramped offices or corridors rather than in designated conference rooms. . . . [It] is a process of organizing that occurs continuously in all organizations. It is engaged in by all participants, whether or not they are accorded formal recognition and responsibility for such . . . decisions. (Becker, 1981, p. 36)

The environment becomes a setting for social/organizational activity, and contributes a psychological/personality element to this activity. Individuals in work environments manipulate the space to

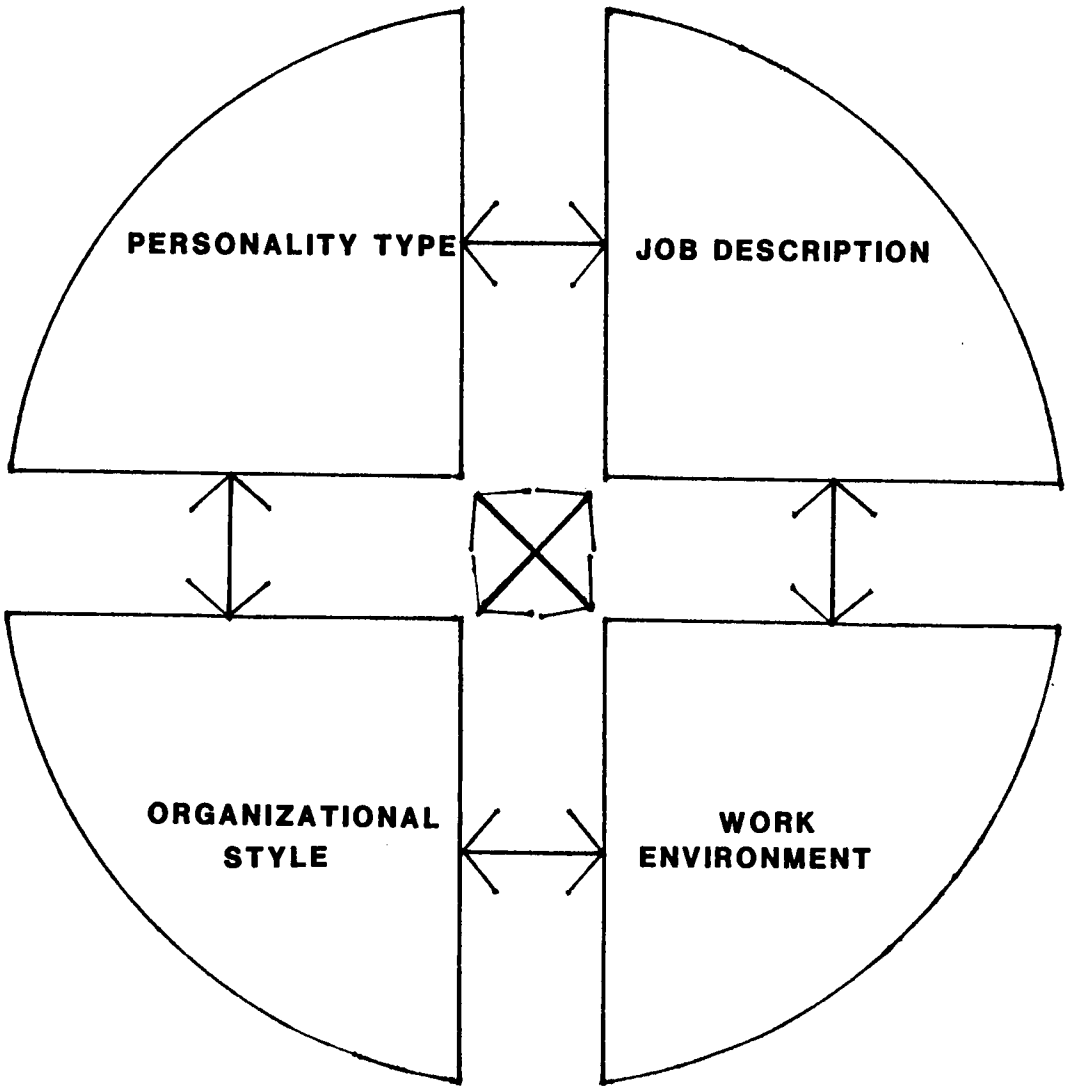


Figure II-25. Interdependent nature of the components of organizational effectiveness, including organizational style--if one changes, the others must change to maintain the whole.

ELEMENT NOT OBSERVED:	RESULT:
ORGANIZATION (WORK PROCESS)	* The work environment will not support the location of people within their organizational structure for optimum functioning of the organizational theory in use.
PERSONALITY (WORK STYLE)	* The work environment will not support personality/cognitive requirements of workers for optimum functioning of their best personality characteristics.
JOB (JOB DESCRIPTION)	* The work environment will not meet the requirements for functional job support or for optimum performance of job requirements.

Figure II-26. Work environment failures due to lack of consideration of specific organizational effectiveness components.

form it into the social/psychological context they most desire. This preferred context is based on a framework of their workstyle, job description, and the organizational style in which they work. (Becker, 1981; Sundstrom, 1986.)

Thus, behavioral design has to understand all of these elements and how they influence each other in order to equip the designer for organizing work environments to prevent failures. These three elements--workstyle, organizational style, and job description--will be reviewed individually.

Organizational and Job Considerations for Work Environment Design

Because of the closeness of organizational and job considerations, they are both covered in one section. Job descriptions are an integral part of the structure of an organization. The significance of their interdependence with the work environment and with each other is stated by Becker:

> No organization or institution can become outstanding or remain so over long periods of time unless there is a good fit between the environmental support structure, organizational structure, and a full range of user requirements. (1981, p. 4)

Research has shown that office design can actually improve productivity (Brill et al., 1984; Williams et al., 1985). Productivity is "the measure of the quantity of

work that is produced for each hour of labor activity" (Fredrickson, 1984, p. 2). It only considers output in terms of quantity of work, and does not consider quality or incurred costs in production. These costs are absenteeism, turnover, and retraining.

Absenteeism is the frequency and duration with which workers are absent from their expected work schedule (Becker, 1981). Turnover is the voluntary resignation of employees from the organization and their subsequent replacement by another person (Becker, 1981). Retraining is the process of teaching a new worker to complete tasks required for the job. The retraining period lasts from the time the new worker begins until reaching full productivity. These costs can be considerable. BOSTI identified average absenteeism and turnover rates per month and the costs of each of these incidences (in 1984 dollars) (Figure II-27).

Productivity alone, therefore, is not an adequate measure of the goal of an organization to produce as much as possible with the highest quality at the least cost. A better measure is "organizational effectiveness," which is a direct measure of the productivity of an organization, considering organizational costs incurred in production (Becker, 1981). There is a general agreement among the literature that overall "organizational effectiveness"--

AVERAGE ABSENTEEISM AND TURNOVER RATES PER MONTH, AND COSTS PER INCIDENT

Job Type	Absenteeism		Turnover	
	Average # Absences/Mo.*	Cost/Day	Average Rate*	Cost/ Turnover**
Managers	.65	$160	.018	$3,700
Prof./Tech.	.65	$131	.018	$2,000
Clerical	.65	$ 77	.018	$1,000

*From Cascio, 1982
**From personnel department of one of the world's largest companies

Figure II-27. Average absenteeism and turnover rates per month, and costs per incident. (Brill et al., 1984, p. 349)

rather than the limited measure of productivity--should be the outcome sought from the total work environment. (Becker, 1981; Brill et al., 1984 and 1985; Wineman, 1986).

The elements that make up organizational effectiveness are job performance, job satisfaction, and the absence of dissatisfaction (Herzberg, 1984; Becker, 1981; Brill et. al., 1984). Dissatisfaction results in absenteeism and turnover. Job performance is a measure of output quantity and quality. It is measured by what both the workers and their supervisor feel is the quantity and quality of the workers' performance. Job satisfaction is "An individual's satisfaction with their job, all things considered" (Sundstrom, 1986, p. 74) and "the worker's evaluation of his or her job as a whole or of the general quality of life at work" (Sundstrom , 1986, p. 4).

Can the work environment improve overall organizational effectiveness? Studies by Frederick Herzberg identify the work environment (called "work conditions") as contributing to dissatisfaction if it doesn't adequately provide necessary functional requirements for people to do their jobs (Figure II-28). However, if the work environment is meeting basic functional needs, and is also tied to a "motivator"--something that produces satisfaction--such as recognition

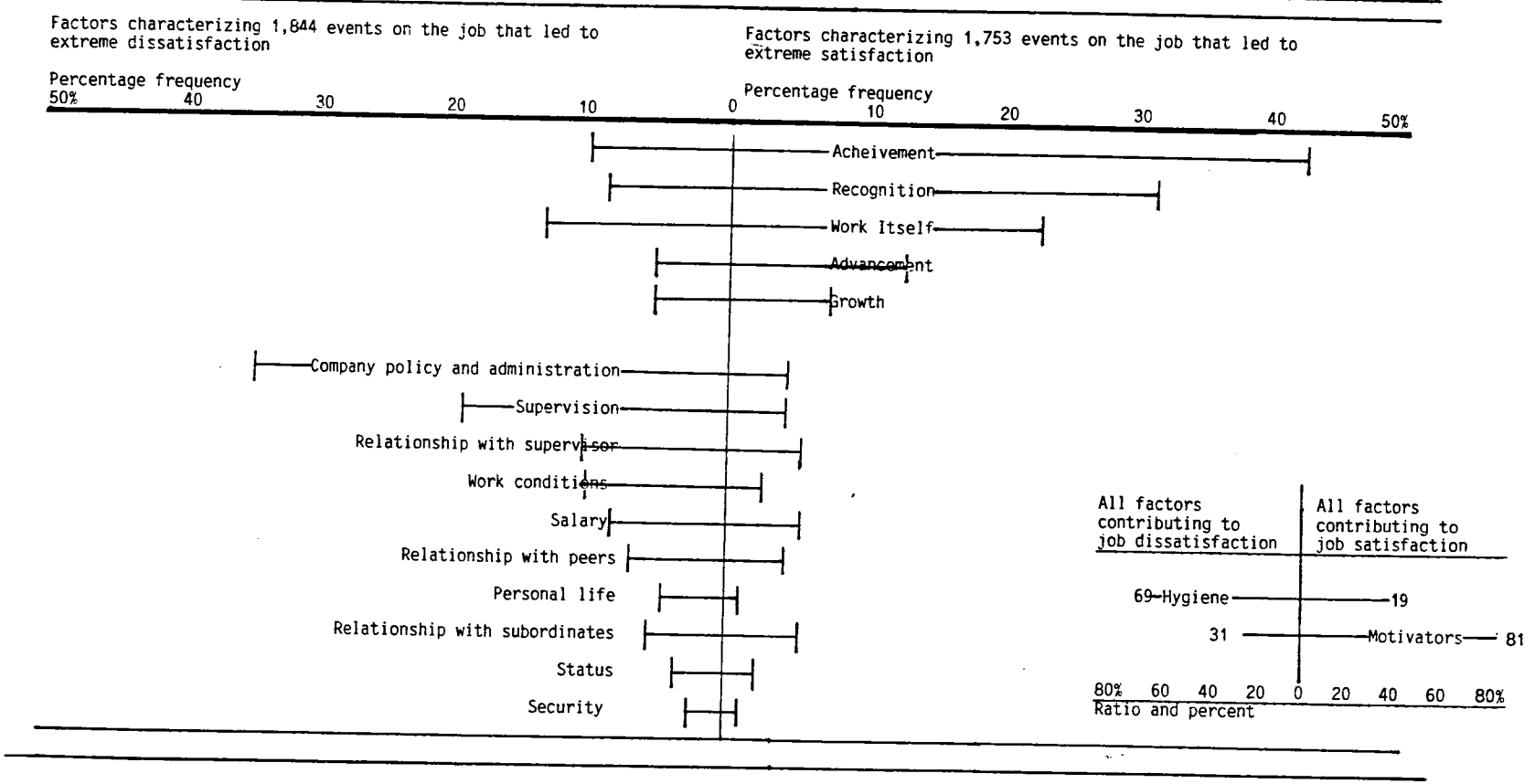


Figure II-28. Herzberg's job dissatisfaction/-satisfaction scale. (Herzberg, 1984, p. 168)

or acheivement, it can produce job satisfaction, and as a result improve job performance (Herzberg, 1984)

Recent studies have also shown that the work environment does contribute to the absence of dissatisfaction if the work environment is adequate for supporting the job description, but is able to improve overall organizational effectiveness by contributing to job satisfaction and job performance as well. (Brill et al., 1984; Williams et al., 1985; and Wineman, 1986).

BOSTI defines the work environment as a tool for organizing work flow, supporting individuals at their tasks, and improving efficiency and effectiveness (Brill et al., 1984, p. 27-29). Becker defines the work environment as a component of overall organizational effectiveness, providing "direct support" to do the job task, but also acting as a "catalyst" to the psychological aspects of work (Figure II-29). Direct support means "the organization gets fewer hours of work per employee, per dollar spent" (Becker, 1981, p. 10), by providing everything needed for the workers to perform the tasks making up their job description. As a catalyst, the physical environment "sets in motion a series of linked events or behavioral reactions" (Becker, 1981, p. 10), by providing for the psychological-growth needs of the worker. The result of proper functioning of the direct-support environment is job

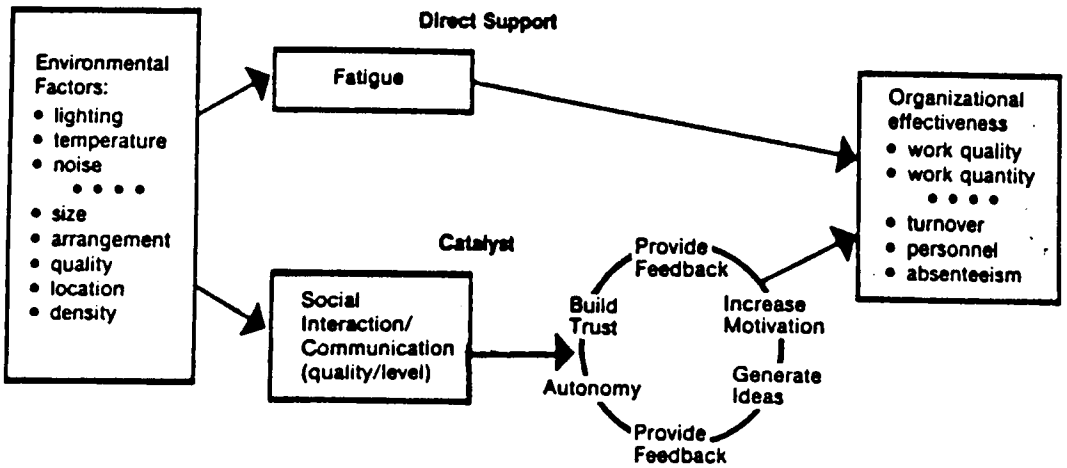


Figure II-29. Becker's model of the work environment as both direct support and catalyst to organizational effectiveness. (1981)

performance--optimum quantity and quality of work. The result of proper functioning of a catalyst environment is the absence of dissatisfaction--reduced absenteeism, turnover, and personnel costs.

> Within this model, the environment becomes a tangible, and under-utilized resource the organization can use in ways the [sic] support its own interest by tapping that of its employees. (Becker, 1981, p. 88)

Ideally, the work environment functions as both direct support and catalyst to improve overall organizational effectiveness.

To show the impact of the work environment on performance, satisfaction, and organizational effectiveness Wineman expanded a model by Lawler and Porter (Wineman, 1986). Organizational theorists Lawler and Porter did not discuss the specific relationship between the work environment and organizational effectiveness. Instead, they were concerned with what actually causes job performance and job satisfaction. In a survey of 148 middle and lower-level managers, these theorists measured job performance and job satisfaction and found that "significant relationships did appear between the two (Lawler and Porter, 1984, p. 386). They theorized that job performance results from expecting to receive certain rewards for performance ("perceived equitable rewards"), and that receipt of these rewards results in job

satisfaction. These rewards are based on meeting basic human needs as outlined by Maslow's heirarchy of needs: security, socialization, esteem, autonomy, and self--actualization (Lawler and Porter, 1984, p. 384). The lower-order needs (security, socialization) are met with extrinsic rewards, such as salary and insurance benefits; and higher order needs (esteem, autonomy, and self--actualization) are met with intrinsic rewards, such as recognition and achievement.

Wineman's expansion of this model (Figure II-30) shows three effects the work environment (called "characteristics of the organizational setting") can have

1. Dissatisfaction, absenteeism, and turnover result if the work environment does not provide what is needed for performance of the job description.

2. Performance results if the work environment provides what is needed for accomplishment of the job description.

3. Satisfaction results if the work environment meets lower-order needs (security, social) with extrinsic rewards, and meets higher-order needs (esteem, autonomy, self-actualization) with intrinsic rewards. The higher the need level that is met, the greater the job satisfaction that results. (Lawler and Porter, 1984)

For the work environment to provide direct support and extrinsic rewards, it must enable the workers to perform

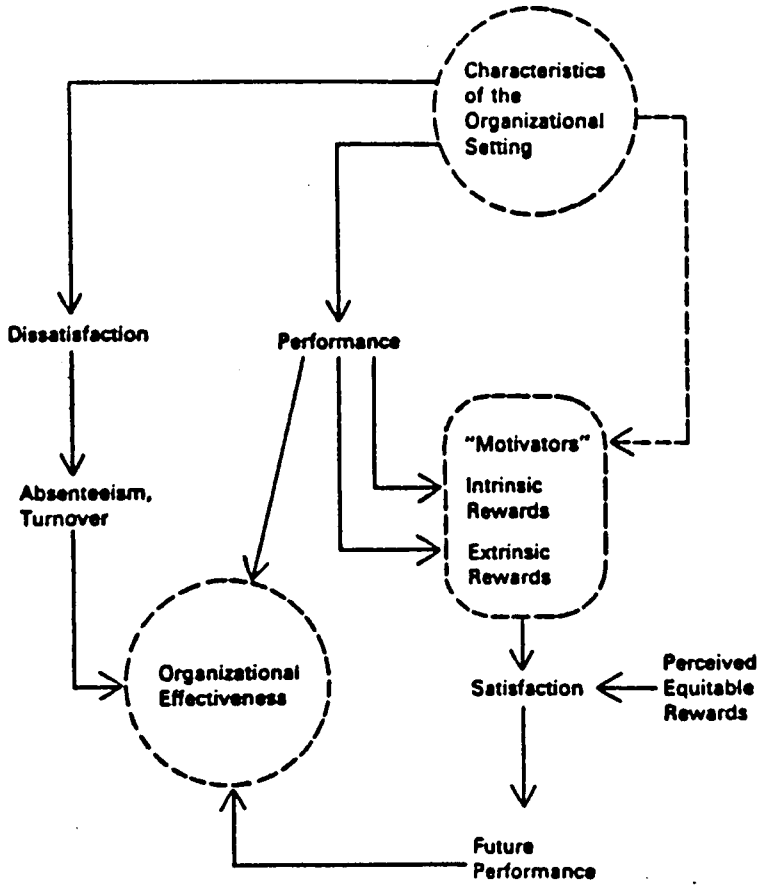


Figure II-30. Wineman's expansion of Lawler and Porter's model showing the work environment (called "Characteristics of the Organizational Setting") as a producer of dissatisfaction, performance, and satisfaction, which result in organizational effectiveness. (Wineman, 1986)

their job so that they will receive pay and a place in the organization. To meet these requirements it must be an environment with everything needed for a worker to perform the job to optimum ability, not inhibiting performance in any way, so that as a result of performance, the organization will meet workers' lower-order needs.

For the work environment to act as a catalyst and provide intrinsic rewards, it must enable the workers to perform their jobs so that they feel a sense of achievement. Therefore, the work environment must provide for psychological growth toward the higher-order need of self-actualization. Psychological growth toward these needs is affected by the fit between the cognitive/ personality type of the worker (discussed in the next section) and the work environment.

Personality-Type Considerations for Work Environment Design

Personality type, as already defined in Chapter I, is derived from cognition--the way a person perceives things. The way people subsequently react and adjust to the work environment is based on their cognitive style. Becker states the complexity of cognition of environments:

> Physical settings--simple or complex--evoke complex human responses in the form of feelings, attitudes, values, expectancies, and desires; and it is in this sense, as well as by their known physical properties, that their relationships to human experience and behavior must be understood.

> This is a phenomenological approach to the environment, one in which the object of study is not the environment as it is, but as it is experienced. (1981, p. 18)

DeLong proposed that environment and behavior are interdependent in that they complement each other and have a transactional relationship, in which each makes a contribution to the understanding and experience of the other (Synthesis and Synergy, p. 25; Context, Structures, and Relationships, p. 187). Also, DeLong proposed that the relationship between the two is observable and constant:

> One of the most fundamental concerns in organism-environment relationships is how, given the intrinsic variability in both the environmental circumstances and the emitted behavior organisms can maintain a sense of constancy and stability. What is perceived to be stable and constant is not the environment nor the behavior . . . but rather the relationship between the two. (DeLong, Context, Structures, and Relationships, pp. 208-209).

According to cognitive styles theory, people with different workstyles will perceive the context of environment, the emitted behavior, and the relationship between the two differently (Williams et al., 1985; Myers and McCaulley, 1985). Thus, in order to design an environment that fits people, designers must take into consideration the cognitive differences in the way people experience that environment. In other words, the perceptual values an individual places on aspects of the environment are the requirements for design.

Work Environment Design Methods

How does the designer incorporate requirements of job, organization, and personality of workers into the design of a work environment to improve organizational effectiveness? Becker states:

> Even when designers are concerned with the programmatic implications of a design, or want a more behaviorally based rationale for design decisions, neither their own training, nor their staffs, nor that of staff in departments like organizational development or management is of much help. (1981, p. 4)

A method is needed to incorporate all of these considerations into design requirements.

User participation in the design process can help to determine the environmental impact of cognitive style. Sommer emphasized the importance of user participation in office design (1983). Shoskes states, "Whatever a designer can do to involve people in the evolution of the new space adds to the value of the space" (1976, p. 17). Baetz adds:

> The participation of those who will be most involved in using the space is necessary to ensure that the strategies and tactics . . . are translated into designs that are appropriate for those people who must work in these environments. (1985, p. 119)

Becker identified five degrees of user participation in environmental design. The users can:

1. Create forms and objects themselves.
2. Select and arrange forms that are provided.

3. Choose between alternate plans that are complete in themselves.

4. Provide information to a designer who draws a plan.

5. Have no consultation or choice. (Sommer , 1983, p. 116)

Different formats of these have been tried, such as the questionnaire and the interview (Tweedy, 1986; Brill et al., 1984; Shoskes, 1976). With the interview format, only the information that the individual is able to state about his or her perception of the environment is transferred. However, design researchers agree that although people generally do not realize that their behavior is affected by the physical environment surrounding them, it is affected nonetheless (Sommer, 1969; Proshansky et al., 1970; Hall, 1966). "To learn what individuals attend to, we need to focus as much on their behavior, what they actually do" (Becker, 1981, p. 19).

Cognitive information can be transferred to design by the users creating forms themselves with scale models (at a scale of 1"=1'-0") (DeLong, 1976). In this way, information about the cognitive values individuals place on the elements of their environment can be observed by the designer and incorporated into design.

According to DeLong (1976), a self-designed scale model is a way of allowing the user to create forms with

accurate spatial perception (at 1"=1'-0"). In a study replicating Sommer's study (1969, pp. 66-67) on spatial zones, at 1"=1'-0" scale, DeLong found that

> given instructions concerning the activity to be performed and information concerning the overall spatial context, results obtained in a minimal, scale model environment are identical to those obtained by observing real, full-size settings. (1976, p. 181)

Requirements for the successful use of scale models in determining users' spatial needs are

1. The subject has instructions regarding the activity to be performed (job description), and the overall spatial context (organizational environment).

2. The subject is instructed to feel rather than think or rationalize about the space (DeLong, 1977).

> The use of scale model environments permits the . . . [designer] involved in environment-behavior research a unique tool which drastically increases the speed with which relationships can be identified, as well as permitting the examination of a much wider variety of overriding contextual factors. Finally, an ideal medium and mode of environmental representation for the designer and user. (DeLong, 1976, p. 182)

In this way, the designer can identify forms in the environment which are perceived as important by the user. By allowing the user to design his or her ideal workspace (self-designed scale model), and combining that design with accurate descriptions of the job to be performed, the forms used are reflective of the values the individual places on certain aspects of the workplace, the organizational

environment typically surrounding the workplace, and the job description to be carried out in the workplace.

CHAPTER III

METHODS AND PROCEDURES

Selection and Development of Instruments

Various testing instruments were used to measure the personality type, job description, organizational style, and work environment needs of subjects.

Personality Type

Personality type factors introversion/extraversion and workstyle were measured with the Abbreviated Version Myers-Briggs Type Indicator (AV-MBTI, Appendix B). The MBTI was used to maintain parallel methods with the Facility Management Institute study, in which the Form F version was used. The Abbreviated version was used intead for this study after a pretest comparison revealed it was almost as accurate as Form F and required one-fourth of the time to take.

The AV-MBTI is a 50-item forced-choice questionnaire. Each item gave subjects an option between two personality characteristics from a pair. The subject was to select the characteristic that described their behavior most of the time. The personality characteristic pairs observed for

this study were sensing/intuition and thinking/feeling--combined to measure workstyle; and introversion/extraversion.

A scoring mechanism built into the test was used to indicate the strength of subjects' preferences for certain characteristics, and the accuracy of the test at determining preference. A consistently chosen characteristic was indicated by a higher score, and thus a stronger preference for that characteristic. When both characteristics from a pair were chosen with almost equal frequency, the accuracy of the test was questionable, and preference was determined by asking the subject to choose the most accurate characteristic from descriptions included with the test scoring form.

Different workstyles were indicated by preferences for the following characteristics:

stabilizer - sensing and thinking

cooperator - sensing and feeling

visionary - intuition and thinking

catalyst - intuition and feeling.

The introversion/extraversion pair, unlike workstyle, was not used in conjuction with any other pairs to determine this aspect of personality type.

Job Description

The Activity Information Sheet (AIS, Appendix B) was used to identify job description. It was developed using the job-analysis/task inventory method (Markowitz, 1987; Prein et al., 1987; McCormick and Ilgen, 1985), which is useful for determining what job activites are done and how often. This method consists of forming a list of activities typical to certain jobs. An ordinal scale is used for subjects to indicate how often they do each activity.

The method has several advantages:

* It is capable of differentiating activities done frequently from those done less frequently or not all.
* Items are taken from the most up-to-date job descriptions, selected from recent research evidence.
* As many or as few items as necessary can be included.
* It is simple for subjects to understand.
* It is quick and easy to complete.

The disadvantages of this method are that it

* Does not encompass activities not on the list or have space to fill these in.
* May sometimes be an inaccurate predictor if a subject does activities not consistent with his/her job description or does not have a well defined job

description. (Markowitz, 1987; Prein et al., 1987; McCormick and Ilgen, 1985)

Job activities listed on the AIS were identified as typical of clerical workers, managers, or both in studies by Tepper (1983, p. 24), Enzel et al., (1980, p. 302), Bergerud and Gonzalez (1984, p. 308), and the Buffalo Organization for Social and Technological Innovation (Brill et al., 1985). Eleven of the activities were managerial, eleven clerical, and six activities pertinent to both jobs, making a list of 28 items.

Subjects were asked to check the activities they actually do on the job, and to indicate on an ordinal scale (Kidder, 1981) the relative time spent at each activity. A range from one to five was used, with one being rarely and five being frequently. Any subject having a higher number of clerical activities than managerial activities, ranked from three to five on the scale, was counted as a clerical worker. Any subject having a higher number of managerial activities was counted as a manager.

Only in a few cases was the AIS an inaccurate predictor. It was determined that in these cases managers had checked job activities that were non-pertinent to their actual job description. Such activities were

1. not supposed to be a part of their job (misallocating work time).

2. required of them due to inadequate support staff to cover these activities.

The AIS accurately predicted job description for all clerical workers in the sample. Therefore, the AIS was found to be a valid indicator of job description.

In addition to identifying job description, the AIS was used during the scale-model study to help subjects recall activities they typically engaged in on the job, and accomodate these activities in the scale-model.

Organizational Style

Westbrook's (1987) Motivational Principles in Use form (MPU, Appendix B) was used to determine the organizational style of companies used in the sample and to consider any effect this style might have on environmental factors. It is a check list of the most common organizational theories taught in business schools. Each theory is consistent with a particular organizational style or work process (Figure III-1). As stated previously, these organizational styles are consistent with workstyles. (See Appendix C for a summary of the principles of each theory.)

The MPU was verified as an accurate predictor of theories, when administered to managers in different types of organizations by a group of graduate-level industrial engineering students. For the current study, however, the

ORGANIZATIONAL THEORY	ST	SF	NF	NT
Herzberg		X	X	
Maslow			X	
McGregor's "X"	X			
"Y"			X	
Managerial Grid			X	
Likert's System IV			X	
In Search of Excellence				X
McClelland's Acheivers				X
Porter & Lalwer's Satisfaction		X	X	
Likert's Supportive Relationships		X	X	X
Vroom's Valence				X
Argyris		X		
MBO				X
Quality Circles		X	X	
Hershey & Blanchard	X			
Tannenbaum & Schmidt	X	X	X	X
Ouchi's "Z"		X		
Drucker's Survival			X	

ST = Stabilizer/Heirarchical Work Process:
Structure oriented
Long-term perspective

SF = Cooperator/Clan Culture Work Process:
People oriented
Very long term perspective--lifetime

NF = Catalyst/Developmental Work Process:
Teamwork and Project oriented
Short-term perspective--length of project

NT = Visionary/Rational Work Process:
Acheivement oriented
Short, medium, and long-term goals
(1, 5, and 10 year goals usually set).

Figure III-1. Organizational theories on the Motivational Principles in Use sheet as they relate to the Facility Management Institute's "Work Processes".

subjects were so unfamiliar with the various theories by name that the majority of the checklists were returned blank. Thus, the instrument did not measure any "style" as originally intended. It did, however, measure the degree of familiarity the subjects had with current motivational theories.

There were almost no responses in the "familiar" category and only a very few responses in the "used in my organization" category. Therefore, the use of this instrument was terminated and is not included in the discussion of results. It is interesting to note that this low familiarity was not due to lack of visual exposure. One company had several charts displayed in employee work areas depicting one of the theories on the list. These employees stated that "it sounded familiar," but they "knew nothing about it." Some organizations in the sample had training programs in these theories, but they were generally required for upper-level and exectutive managers not included in this study.

Work Environment Needs

The scale model method of spatial behavior research was used to identify environmental needs of subjects. The researcher followed specific guidelines, based on DeLong's recommendations (1976, and 1977). These recommendations,

as well as the advantages and disadvantages of the study, were discussed in the review of literature section titled "Work Environment Design Methods" in Chapter II.

Specific guidelines for the researcher to use in conducting scale-model studies were established and validated in the pretest (Appendix B). Scale models were videotaped during the construction of the model, upon consent of the subject. These videotapes were used to verify both the quality of information from the model and the quality of interaction between researcher and subject.

Subjects were asked to construct a scale model of (1"= 1'0") the office they felt would be the "most functional, comfortable, and efficient" for them in the job they held at the time. This model could include furniture, walls, panels, and accessories (See Figure III-2 and Appendix D). Subjects were informed that no relationship was necessary between the office they were currently in or their current furniture and the scale model.

Activity Information Sheets were available to help subjects remember furniture and accessory items needed and activities typically done in the workspace. They were also free to contruct any of the surrounding area they felt necessary to convey to the researcher a clear understanding of their workspace. When an initial workstation was set up, the subjects were instructed to project themselves into the

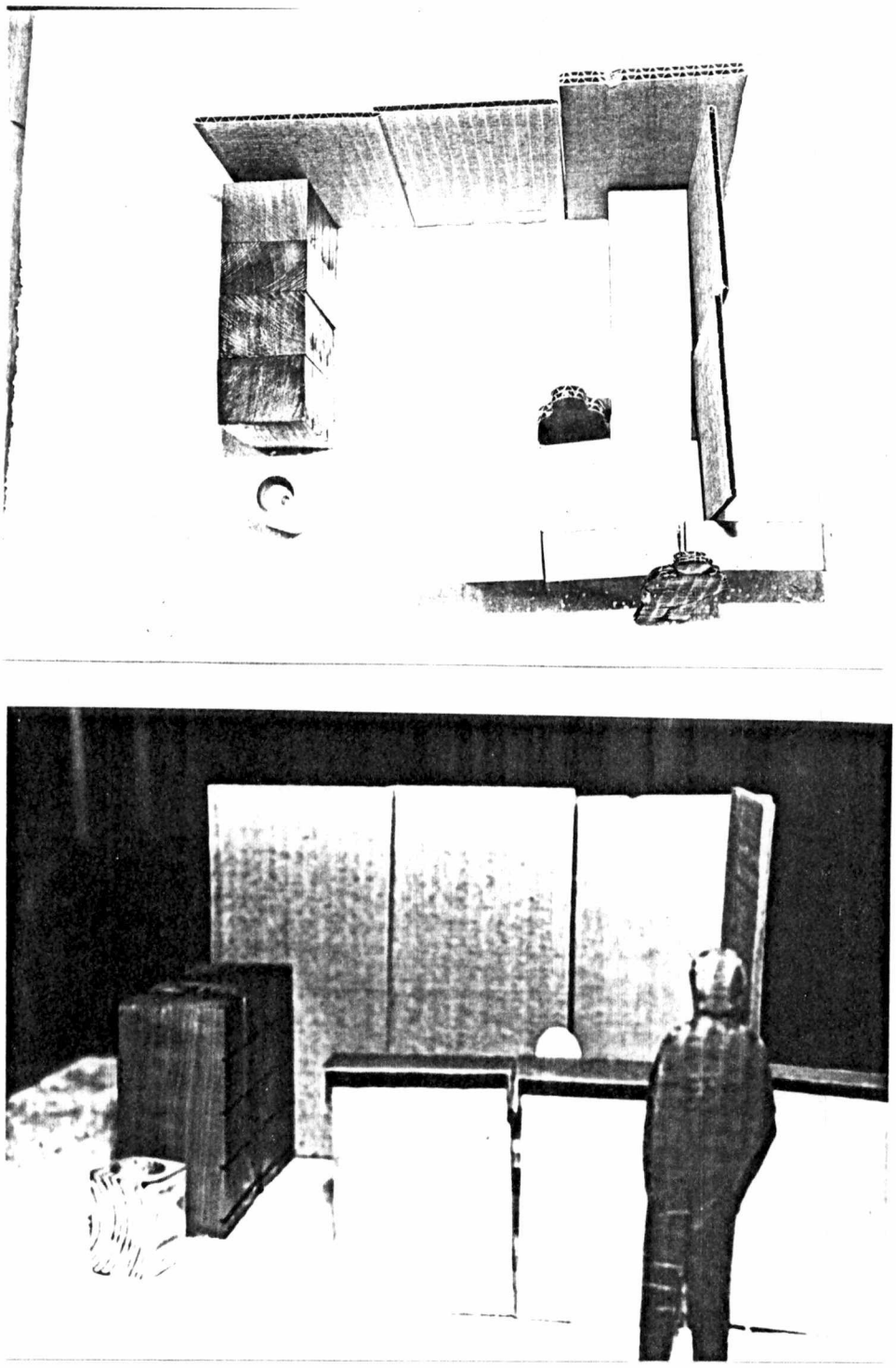


Figure III-2. A completed scale model, front and top view.

space and see how it felt to carry on typical work activities. They were encouraged to manipulate the model pieces so that the arrangement of pieces "felt comfortable to them," and so that everything (storage, workspace, floor area, etc.) "felt adequate, not too much or too little."

Comments made by the subjects during scale model construction were recorded by the researcher. These comments were used to clarify understanding of how the subjects used office space and what they felt they needed in the workspace. After construction, questions located on the "Guidelines for Scale Model Study" were asked of the subject (Appendix B).

Next, a floor plan was made of the scale model (Figure III-3). Comments made by the subject were transferred to this plan. From the floor plan, the following environmental facets were measured: enclosure, layout, floor area, worksurface width, open and closed storage, number of file drawers, interaction distance, orientation to the door and barriers. (These measurements will be defined individually as they are discussed in the "Hypothesis Testing" section of Chapter IV.)

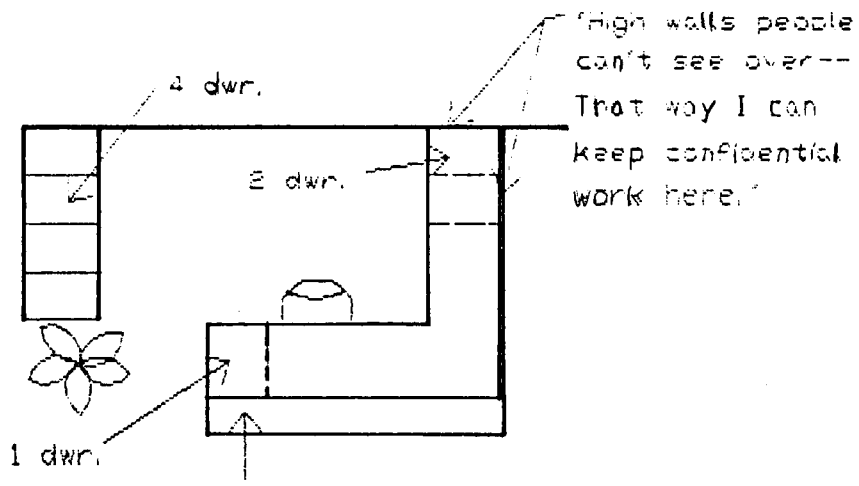


Figure III-3. Floor plan from scale model in Figure III-2.

Pretest

A pretest was conducted from July through September of 1987 to meet the following eight objectives, which focused on refining and improving the validity of data collection. The objectives were to determine

1. The validity of the Abbreviated Version of the Myers-Briggs Type Indicator for the final study.

2. The clarity and accuracy of environmental-needs information taken from the scale-model study.

3. The consistentcy of environmental facets measures taken from scale-models.

4. The relationship between workstyle and job description.

5. The relationship between workstyle and environmental facets measured from scale-models.

6. The relationship of specific attitudes office workers have about the work environment to workstyle and job description (as indicated by FMI).

7. Statistical tests useful for analyzing the data.

8. The approximate sample size needed for the final study.

Each of these objectives are discussed below.

To test these objectives, two samples were used. A sample of 17 university employees--herein referred to as

Sample A--and a second sample of seven students--herein referred to as Sample B--make a total sample size of 24. Objectives tested with the two samples and the number of subjects in each category are shown in Figure III-4.

Pretest Procedures and Results

Each objective, the procedure followed to test it, and results are discussed individually.

Objective 1. Form F of the Myers-Briggs Type Indicator (MBTI) was given to Samples A and B to determine workstyle. Nine subjects from both samples were also given the Abbreviated Version MBTI (Figure III-4). The Abbreviated Version was tested for use in the final study because that version requires a substantially lesser amount of time to complete (10 to 15 minutes) than does the longer Form F (45 minutes to one hour).

Three preferences measured by the Abbreviated MBTI were checked for agreement with the results of Form F. These preferences were sensing/intuition and thinking/feeling--both used to measure workstyle--and introversion/extraversion. There were no differences between the two tests in measurement of the introversion/extraversion or sensing/intuition preferences. However, the two versions did test differently in two out of nine cases for the

SAMPLE:	# of Subjects	Objectives tested	MBTI form	
			F	Abbrev.
Sample A: Clerical workers	7	1-8	7	3
Faculty	6	1-8	6	2
Administrators	4	1-8	4	0
Sample B: Students	7	1-3	7	4

Figure III-4. Pretest sample groups and objectives tested.

thinking/feeling preference. In both of these cases, the scoring mechanism built into the test revealed low enough scores to merit questioning the accuracy of either test at indicating this preference for these two subjects. Therefore, the built-in scoring mechanism worked with equal effectiveness for both versions of the test. The Abbreviated version was found to be an accurate predictor of type when low scores were questioned.

Objective 2. The clarity and accuracy of environmental needs information in the scale-model study was tested by using videotapes. Some of the scale-model studies of both Sample A and Sample B were videotaped as they were conducted by the researcher. Throughout the pretest, selected videotapes were analyzed by a panel of experts to identify procedures necessary for

1. Researcher consistency in conducting the scale-model between subjects.

2. Quality of information gained from the study about environmental needs of subjects.

Recommendations of the panel were incorporated into the "Guidelines for Scale-Model Construction" (Appendix B) used in the final study, therefore meeting objective 2.

Objective 3. A consistent method of measuring environmental facets from scale-models was determined by making a floor plan of each scale-model and experimenting with different ways of measuring each facet. These methods were observed by a panel of experts, whose recommendations were used to develop the most consistent, useful, and valid measures. These recommendations were based on what the designer needs to know about environmental needs to design offices that meet those needs. Methods decided upon will be discussed in the section titled "Hypothesis Testing" in Chapter IV.

Objective 4. The frequency of workstyles in each job description was used to determine if the two were related (Figure III-5). Similar to the findings of FMI (Williams et al., 1985) and Myers and McCaulley (1986), clerical personnel tended to be Cooperators, (SF) and administrators/managers tended to be Stabilizers (ST).

Objective 5. Environmental facets were measured from scale-models with the methods determined from testing objective 3. To determine if a relationship existed between workstyle and these facets, a statistical analysis (objective 7) was done. Findings indicated that workstyle was a statistically significant indicator of work-

JOB DESCRIPTION	WORKSTYLE				
	ST	SF	NF	NT	
1. Clerical	2	4	1	0	(n = 7)
2. Faculty	2	1	0	3	(n = 6)
3. Administrators	3	0	1	0	(n = 4)
N = 17	n = 7	n = 5	n = 2	n = 3	

ST = Stabilizer

SF = Cooperator

NF = Catalyst

NT = Visionary

Figure III-5. Frequency of workstyles by job description in the pretest sample.

space enclosure (Pr= .0015 at the .005 level). Workspace enclosure was measured as the amount of enclosure around the actual work area used by the subject, not including interaction and circulation spaces. Other measures tested (floor area, and work surface width), however, were not shown to be predicted by workstyle. Thus indicating that workstyle might also be a predictor of other environmental factors and should be considered in the final study.

Objective 6. Comments made by subjects about work-environment needs and preferences during their scale-model constructions were recorded, and the frequency of these comments compared to job description and workstyle. Due to the small sample size and high variation in overall attitudes of the sample, it was impossible to determine if attitudes were directly related to either job description or workstyle. Measurement of the relationship (as suggested by Williams et al., 1985) between attitude factors and environmental preferences would require much more extensive research. In addition, the meaning of the subjects' comments would need to be refined in a pilot study on prevalent environmental attitudes of office workers.

Objective 7. For data analysis, the two-way analysis of variance was selected, based on its ability to observe

the individual effects of both workstyle and job description factors on environmental measures, with the effects of the other factor removed.

Objective 8. To determine an approximate sample size for the final study, a block design was formulated, consisting of a matrix crossing workstyle (stabilizer, cooperator, catalyst, and visionary) and job description (clerical, mid-management, and executive). (See Figure III-6.) To have enough subjects to measure each environmental facet independently by workstyle and job description, a final sample size of approximately ten subjects in each of the twelve blocks was recommended.

Summary of Pretest Results

Five of the six pretest objectives were met. The exception was objective six, concerning environmental attitudes of office workers measured from comments made by subjects during the scale-model study. Because of the random nature of comments from the subjects, additional extensive research could be applied to this topic alone to determine if comments indeed reflect environmental-facets needs specific to job description and/or workstyle.

	Stabilizer	Cooperator	Catalyst	Visionary
Clerical	n = 10	n = 10	n = 10	n = 10
Faculty	n = 10	n = 10	n = 10	n = 10
Administrator	n = 10	n = 10	n = 10	n = 10

N = 120

Figure III-6. Matrix design and recommended sample size developed from Pretest.

Procedure

The procedure included identification of a sample, collection of data, and treatment of the data for the analysis.

Identification of Sample

The sample consisted of 91 office workers--36 clerical and 55 managers--from 13 different companies. The number of people in the sample from each company ranged from four to 20.

The companies in the Knoxville and Nashville areas were chosen by acquaintance and location. Those in the Knoxville area were also located through the Knoxville Chamber of Commerce listings of "Large Employers in the Greater Knoxville Area" (1988) and "Largest Manufacturing Industries in Knox County" (1988). The offices ranged from 25 to 225 employees. The majority of offices were located in manufacturing organizations due to the willingness of these companies to participate in the study.

The sample was chosen from each company by a contact person within the company. The contact people included administrative assistants, human relations managers, and personnel administrators. They were contacted by phone and then sent a letter and packet with information about the

research (Appendix A). After having time to look over the packet, they were called again to see if their company would be willing to participate in the study. Thirteen out of the 36 companies contacted were willing to participate (a 30% response rate).

Contact people from companies willing to participate were instructed to select a composite of clerical personnel and managers having general-clerical or managerial job descriptions. The ratio of clerical workers to managers varied among companies. The ratio the company chose to contribute to the study was the ratio used in the sample. The only restriction was that there had to be at least five people from each company. Originally, the category of "manager" was to be two separate categories: middle manager and executive. However, due to the executives' lack of time for participation in outside studies (expressed by all companies in the sample) the number of executive subjects was extremely low; and the two categories were collapsed into one. Therefore, the final study observed only two catagories: clerical and manager.

Of a total of 101 subjects asked to participate in the study, 92 agreed (a 91% response rate). Of this group, all but one of the subjects were included in the final study. This subject had a job description that was too specific to be categorized as either clerical or managerial.

Collection of Data

Data was collected from March to the middle of June 1988. The following materials were sent to the subjects:

1. Letters of Explanation
2. Motivational Principles in Use forms (MPU)
3. Activity Information Sheets (AIS)
4. Myers-Briggs Type Indicators (MBTI), and
5. Consent forms

(See Appendix B). Subjects were then called individually to set up an appointment for a scale-model study on the day of the researcher's visit to their company.

Scale-model studies were conducted one-on-one in each company. Facilities for conducting the study varied, although all of the companies met the requirements: a room with relative visual and acoustic privacy, away from the subjects' workspaces, and a large table for setting up the scale-model furniture. Figure III-7 shows the setup used for conducting the scale-model study.

At the time of the scale-model study, each subject returned to the researcher the consent form, AIS, MPU, and MBTI (Appendix B). The researcher hand scored the MBTI's while subjects were becoming familiar with the scale-model parts. Low preference scores on the MBTI were checked as to the accuracy of the preference indicated, by consulting with the subject after the scale model study--the same

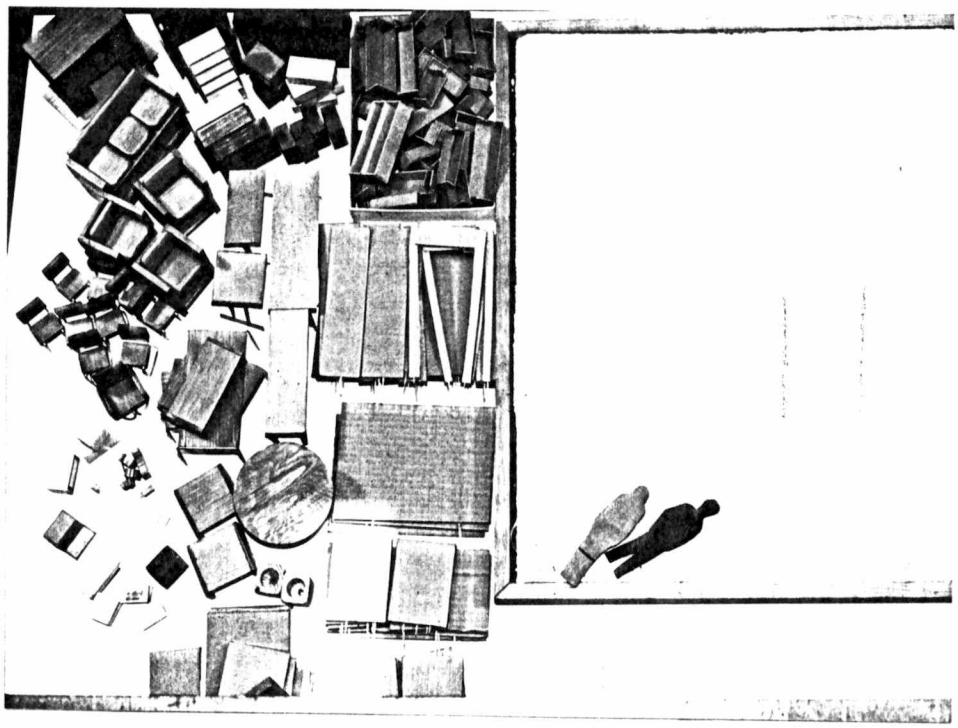


Figure III-7. Table set up for subject to conduct a scale model study.

procedure used and tested in the pretest. Scale-model studies were then conducted. In some cases, videotapes were made of the scale-model studies for review by a panel of experts to insure accurate procedure throughout the study.

Overall, the consent form, AIS, and MPU required about five minutes for each subject to complete; the MBTI required 10 to 15 minutes; and the scale-model study 20 to 60 minutes, depending on the subject. Therefore, a total of 35 minutes to one hour and 20 minutes was required of the participants.

Treatment of Data

The Treatment of data was done both statistically and graphically.

Statistical Analysis. The PROC GLM (General Linear Models Procedure) in SAS (Statistical Analysis System) computer program was used to conduct a statistical analysis. Methods used for analysis were the two-way analysis of variance with a type III sum of squares, frequency tables, Chi-Square statistics, and Least Squares means with Standard error calculations. A model of the variables analyzed and the procedures used are found in Figure III-8.

ENVIRONMENTAL FACET	METHOD OF ANALYSIS				
	2X2 ANOVA	LS means	Chi-Sq.	Freq.	Graphic
Floor Area	X	X			
Worksurface Width	X	X			
Worksurface Area	X	X			
Open-Shelf Storage	X	X			
Closed-Shelf Stor.	X	X			
File Drawers	X	X			
Layout			X	X	
Enclosure	X	X			X
Orientation			X	X	X
Barriers			X	X	X
Interaction Dist.	X	X			X

Figure III-8. Analysis methods used for environmental facets.

With the GLM program, it was possible to determine the individual effects of both discrete and continuous independent variables on continuous dependent variables. Discrete variables are non-numerical variables having a number of alternative options--such as either yes or no; or a, b, or c. Continuous variables are numerical variables which measure the quantity of something--such as 12.5 feet.

The advantage of the two-way analysis of variance (2x2 ANOVA) with a type III sum of squares, is that it is able to measure the effect of independent variables on dependent variables individually, with the effects of the other independent variables removed.

Frequency tables and Chi-Square statistics were used to identify the significance and nature of relationships among discrete variables.

"Least squares means" (LS means) were calculated to identify the probable amount of each environmental facet needed by subjects, according to the category of introversion/extraversion, workstyle, or job description that was determined to be the most accurate predictor of each environmental facet using the 2x2 ANOVA. Standard error was calculated on LS means to determine if the mean was reasonably accurate.

Graphic Analysis. To get a clear picture of relationships among certain environmental facets, a graphic analysis was conducted on enclosure, orientation to door, interaction distance, and barriers. Enclosure was analyzed as a series of steps (as recommended by BOSTI, Brill et al., 1984 and 1985) rather than as a percentage of total enclosure, which was measured statistically. (See Figure III-9 for the matrix used to measure the steps of enclosure.) In this analysis, orientation to door, work-style, and job description were also observed to determine any relationships that might exist among these and enclosure. A second graphic analysis was done to determine if relationships exist among enclosure, orientation to door, interaction distance, and barriers. These measures are further defined in the Chapter IV section "Hypothesis Testing."

		Sides			
		F	S	S	B
Wall Height	NONE				
	LOW				
	MED.				
	HIGH				

Figure III-9. Matrix used to measure steps of enclosure for graphic analysis.

CHAPTER IV

RESULTS AND DISCUSSION

This chapter covers the characteristics of the sample, hypothesis testing, and discussion of these findings. Characteristics of the sample are discussed in terms of the independent variables: introversion/extraversion, workstyle, and job description. Each hypothesis is discussed individually. The discussion section covers the findings, and whether or not they support the literature from previous studies.

Sample Characteristics

A total of 92 subjects were given the Activity Information Sheet (AIS), Westbrook's (1987) Motivational Principles in Use form (MPU), Myers-Briggs Type Indicator (MBTI), and a Scale-model study. One subject that had too specific a job description was eliminated, therefore, there were 91 subjects in the final sample and data analysis. For analysis, the sample was divided into groups according to job description, introversion/extraversion, and work-style. A discussion of each of these groups follows.

Job Description

Job description was determined by the Activity Information Sheet (AIS). Forty percent of the respondents were clerical workers (n=36), and 60 percent were managers (n=55). (See Figure IV-1).

Introversion/Extraversion

Respondents were given the Abbreviated Version of the Myers-Briggs Type Indicator (MBTI), shown in Appendix B, to determine introversion/extraversion and workstyle. There were considerably more extraverts (64) in the sample than introverts (27). A distribution of introversion and extraversion by job description is shown in Figure IV-1.

Workstyle

The distribution of workstyles in the sample was very close to the distribution of workstyles found by the Facility Management Institute (FMI, Williams et al., 1985), except for a larger percentage of cooperators not present in the FMI study (Figure IV-2). Cooperators in the sample tended to be clerical personnel, consistent with the findings of FMI and Myers and McCaulley (1985). Therefore, it follows that in a sample with such a large number of clerical workers, there would be a large percentage of cooperators. The distribution of workstyles according to

JOB DESCRIPTION	INTROVERSION/EXTRAVERSION	
	Introversion	Extraversion
Clerical n=36	11	25
Manager n=55	16	39
N=91	n=27	n=64

Figure IV-1. Distribution of clerical and manager introverts and extraverts.

JOB DESCRIPTION	WORKSTYLES			
	Stabilizer	Cooperator	Catalyst	Visionary
Clerical n=36	11	20	1	4
Manager n=55	23	11	9	12
N=91	n=34	n=31	n=10	n=16
	37%	34%	11%	18%
[FMI percents]	[45%]	[19%]	[9%]	[27%]

Figure IV-2. Distribution of clerical workers' and managers' workstyles.

all job descriptions was also parallel to findings of Myers and McCaulley (1985), indicating that workstyles found in this study were a relatively accurate representation of the general office population of managers and clerical workers.

Hypothesis Testing

Each hypothesis was related to specific work environment needs. Each variable is defined in this section prior to the stating of its' hypothesis. Some variables were defined and measured in terms of the individual's work-space, and some in terms of the individual's total work area. The individual's workspace is the part of his/her total work area that contains primary and secondary work-spaces, and any other workspaces in close proximity, but that does not contain circulation, conference, and lounge areas. The individual's total work area is the total amount of work area typically used (including circulation, conference, and lounge areas), but not including areas shared by others. (See Figure IV-3.) The way each factor was actually measured is shown on a floor plan in a figure, after each definition of the variables.

See Figure III-8 for a listing of methods of analysis used to test each hypothesis. F-values and Chi-Square values were considered significant at the .05 probability

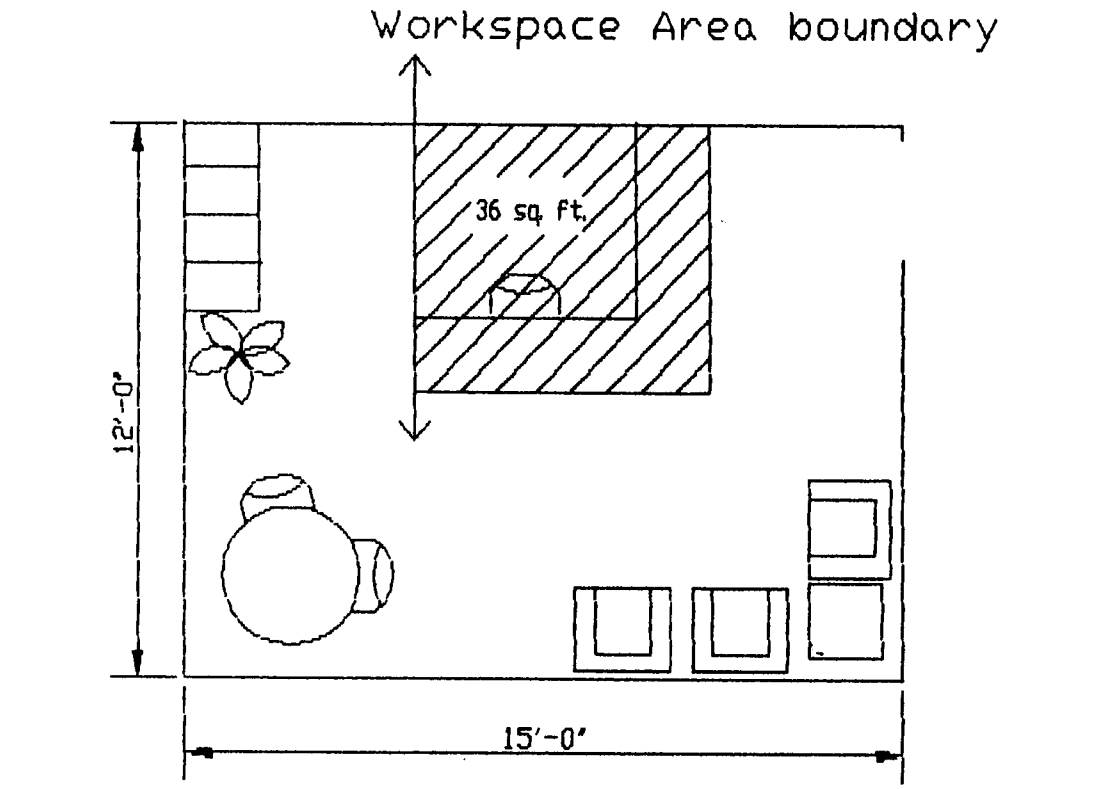


Figure IV-3. Individual workspace area as compared to total floor area.

level ($p < 0.05$), except where cell frequency was less than five for more than 30 percent of the cases. For the graphic analysis, significance was a subjective measure, considering the relationships among environmental facets.

Findings based on the data from these analyses are drawn relative to the null hypothesis stated in Chapter I. Figure IV-4 shows relationships identified as significant, somewhat significant, and not significant.

Hypothesis 1

Enclosure is the degree to which a person's individual workspace is separated from other people in their work area. It is measured as a percentage of the total possible enclosure around a person's individual work area, based on an assumed ceiling height of eight feet (Figures IV-3 and IV-5). The hypothesis stated that enclosure needs do not differ significantly among (a) introversion/extraversion, (b) workstyle, or (c) job description (Figure IV-4).

The statistical analysis confirmed (a) and (b), but rejected (c). Therefore, job description was a significant predictor of the percent enclosure needed by workers in the sample (Table 1).

Further analysis of LS means indicated that the average enclosure needed by clerical workers was 63% with a stan-

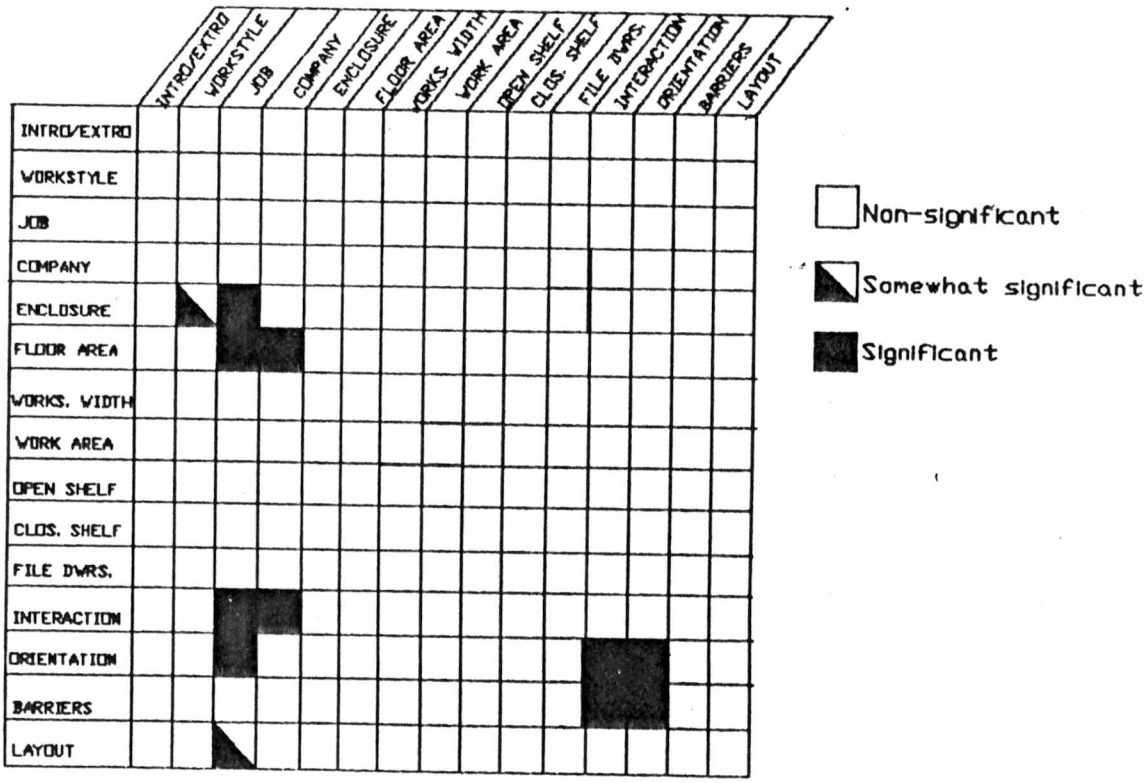
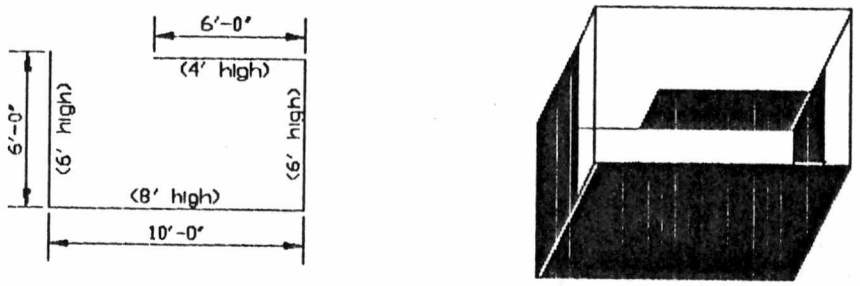


Figure IV-4. Significant, somewhat significant, and non-significant relationships observed.



Total possible enclosure = [2(6') + 2(10')] x 8' = 256 sq. ft.

Actual enclosure = 2(6')6' + (6'x4') + (10'x8') = 176 sq. ft.

PERCENT ENCLOSURE = 176 sq. ft./256 sq. ft. = 69%

Figure IV-5. Enclosure measured by percent.

Table 1. Analysis of Variance Summary

Measured by:	Environmental Facets	F-value	Pr > F
Introversion/ Extraversion	Enclosure	0.02	0.8901
	Floor Area	0.00	0.9590
	Worksurface Width	0.02	0.8809
	Worksurface Area	0.01	0.9301
	Open-Shelf Storage	0.25	0.6184
	Closed-Shelf Storage	0.03	0.8707
	No. of File Drawers	3.76	0.0564
	Interaction Distance	0.71	0.4031
Workstyle	Enclosure	0.92	0.4363
	Floor Area	0.97	0.4136
	Worksurface Width	0.14	0.9387
	Worksurface Area	0.22	0.8840
	Open-Shelf Storage	0.74	0.5336
	Closed-Shelf Storage	0.90	0.4472
	No. of File Drawers	0.49	0.6927
	Interaction Distance	0.74	0.5314
Company Affiliation	Enclosure	9.14	0.0033
	Floor Area	2.13	0.2180
	Worksurface Width	1.35	0.2062
	Worksurface Area	1.00	0.4615
	Open-Shelf Storage	1.77	0.0654
	Closed-Shelf Storage	0.87	0.5850
	No. of File Drawers	1.83	0.0543
	Interaction Distance	4.01	0.0001
Job Description	Enclosure	0.92	0.4363
	Floor Area	8.49	0.0047
	Worksurface Width	0.73	0.3944
	Worksurface Area	0.04	0.8514
	Open-Shelf Storage	1.11	0.2948
	Closed-Shelf Storage	0.56	0.4550
	No. of File Drawers	1.45	0.2320
	Interaction Distance	8.41	0.0049

dard error of 4%. The average enclosure needed by managers was 80% with a standard error of 4%. (See Table 2).

Hypothesis 2

Floor area is the amount of square footage in an individual's total work area (Figure IV-3). The hypothesis stated that floor area needs do not differ significantly among (a) introversion/extraversion, (b) workstyle, (c) job description, or (d) company (Figure IV-4).

The statistical analysis confirmed (a) and (b), but rejected (c) and (d). Therefore, job description and company affiliation were significant predictors of the amount of floor area needed by workers in the sample (Table 1).

Further analysis of LS means indicated that the floor area needed by clerical workers was 125 square feet with a standard error of 19 square feet. The floor area needed by managers was 195 square feet, with a standard error of 15 square feet. The average floor area needed by workers in different companies ranged from 89 square feet with a standard error of 35 square feet, to 300 square feet with a standard error of 39 square feet. (See Table 2).

A separate analysis of workspace area--as opposed to total floor area (Figure IV-3)--was conducted to determine if the difference in floor area needs of clerical workers

Table 2. Least Squares Means Summary.

Environmental Facet	Range*	Clerical	Managerial
	LS Mean (Std. Error)	LS Mean (Std. Error)	LS Mean (Std. Error)
Enclosure		63(4)%	80(4)%
Floor Area	89(35)sq.ft. - 300(39)sq.ft.	125(19)sq.ft.	195(15)sq.ft.
Worksurface Width	14.5(.95)ft. - 15.7(1.19)ft.		
Worksurface Area	34.5(3)sq.ft. - 36.1(2.4)sq.ft.		
Open-Shelf Storage	6.6(5.4)lin.ft. - 14.6(3.9)lin.ft.		
Closed-Shelf Storage	0.9(1.15)lin.ft. - 4.0(2.2)lin.ft.		
Number of File Drawers	8(2)drawers - 10(2) drawers		

*Range given is for the composite values of LS Means according to Introversion/Extraversion, Workstyle, and Job Description. Job Description (Clerical and Managerial) means are given only for those significantly determined by these values.

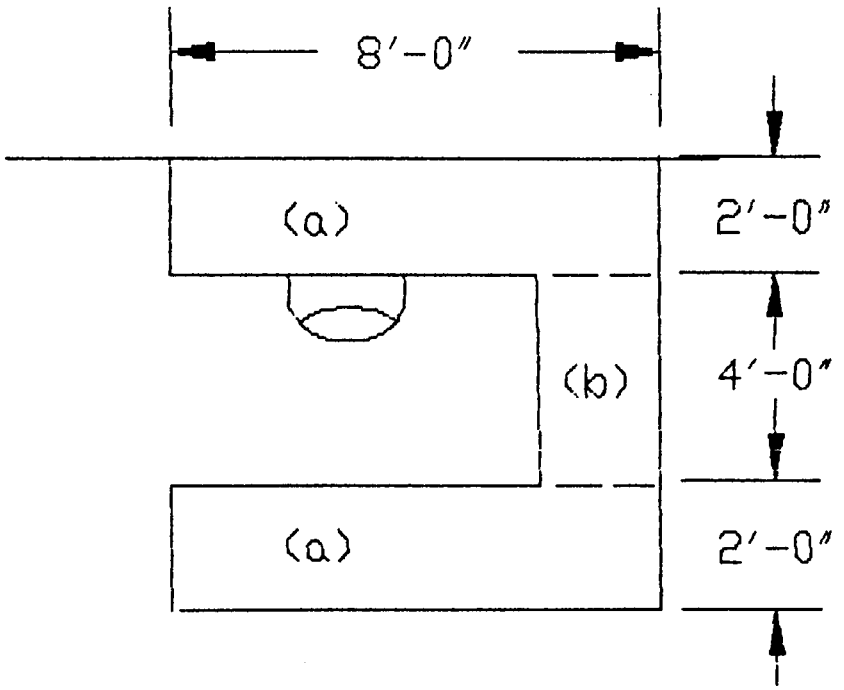
and managers was due to auxiliary areas such as lounge and conference spaces within managers total work areas, or if, in fact, managers need more floor area for their individual workspaces.

The 2 x 2 ANOVA statistical procedure was used to analyze workspace area. No significant relationships were found between this measure and job description. However, the LS means for clerical workers' and managers' workspace area needs were very close--68 square feet for clerical workers with a standard error of 4 square feet, and 72 square feet for managers with a standard error of 4 square feet (Table 2).

Hypothesis 3

Worksurface width is the lineal feet of all worksurfaces used by an individual for working or desktop storage, measured end to end (Figure IV-6). The hypothesis stated that worksurface width needs do not differ significantly among (a) introversion/extraversion, (b) workstyle, (c) job description, or (d) company (Figure IV-4). The statistics verified this hypothesis (Table 1).

Worksurface width LS means--calculated for introversion/extraversion, workstyle, and job description--had a very small range from 14.50 feet with a standard error of 0.95, to 15.7 feet with a standard error of 1.19. The



Worksurface Width =

8' + 8' + 4' = 20'

Worksurface Area =

2(a) + (b) = 2(2x8) + (2x4) = 40 sq. ft.

Figure IV-6. Worksurface width and area measures.

range of worksurface width LS means calculated by company was from 9.1 feet with a standard error of 5.17, to 19.8 feet with a standard error of 2.17. (See Table 2).

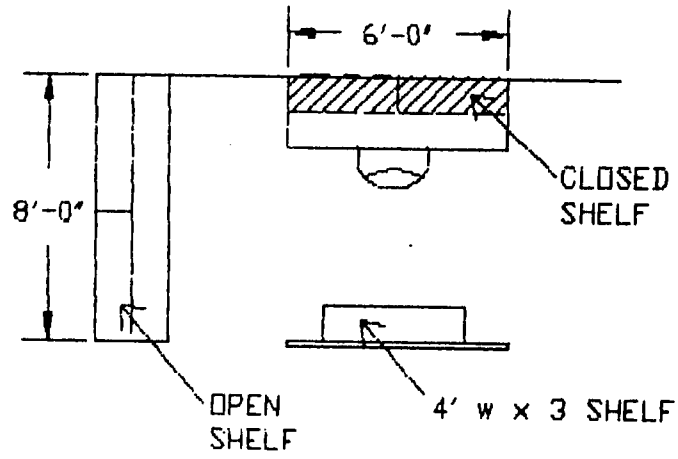
Hypothesis 4

Worksurface area is the total square footage obtained by multiplying the worksurface widths and depths of all the worksurfaces used by an individual for working or desktop storage (Figure IV-6). The hypothesis stated that worksurface area needs do not differ significantly among (a) introversion/ extraversion, (b) workstyle, (c) job description, or (d) company (Figure IV-4). The statistics verified this hypothesis (Table 1).

Worksurface area LS means for introverts and extroverts, all workstyles, and all job descriptions taken together indicate that worksurface area needs range from 34.5 square feet with a standard error of 3 square feet, to 36.1 square feet with a standard error of 2.4 square feet (Table 2).

Hypothesis 5

Open-shelf storage is the lineal footage of all open shelves in the individual's total work area (Figure IV-7). The hypothesis stated that open-shelf storage needs do not differ significantly among (a) introversion/extraversion,



Open Storage = 8' + (4'x3)= 20'

Closed Storage = 6'-0"

Figure IV-7. Open and closed shelf storage measures.

(b) workstyle, (c) job description, or (d) company (Figure IV-4). The statistics verified this hypothesis (Table 1).

LS means of open-shelf storage for introverts and extroverts, all workstyles, and all job descriptions taken together ranged from 6.6 lineal feet with a standard error of 5.4, to 14.6 lineal feet with a standard error of 3.9 (Table 2).

Hypothesis 6

Closed-shelf storage is the lineal footage of all shelves closed off from view in the individual's total work area (Figure IV-7). The hypothesis stated that closed-shelf storage needs do not differ significantly among (a) introversion /extraversion, (b) workstyle, (c) job description, or (d) company (Figure IV-4). The statistics verified this hypothesis (Table 1).

LS means of closed-shelf storage for introverts and extroverts, all workstyles, and all job descriptions taken together ranged from 0.9 lineal feet with a standard error of 1.15, to 4.0 lineal feet with a standard error of 2.2. The range of closed-shelf storage LS means calculated by company was from 0.03 lineal feet with a standard error of 2.17, to 9.01 lineal feet with a standard error of 2.77. (See Table 2).

Hypothesis 7

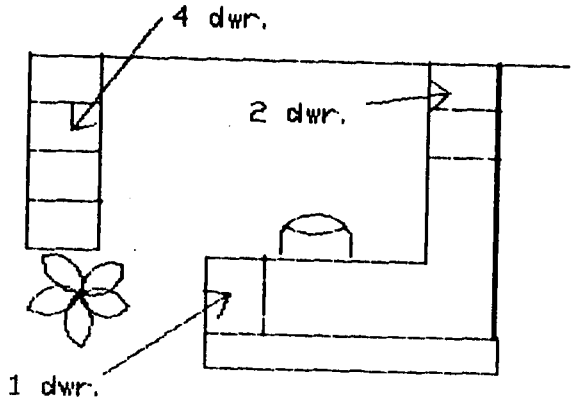
Number of file drawers is the total count of individual file drawers in the individual's total work area (Figure IV-8). The hypothesis stated that the number of file drawers needed does not differ significantly among (a) introversion/extraversion, (b) workstyle, (c) job description, or (d) company (Figure IV-4). The statistics verified this hypothesis (Table 1).

LS means of number of file drawers for all workstyles, and all job descriptions taken together ranged from 8 with a standard error of 2, to 10 with a standard error of 2 (Table 2).

Hypothesis 8

Interaction distance is the distance between a worker --seated at the primary workspace--and a visitor to the work area, when interaction between the two begins. A worker's primary worksurface is the one at which the most time is spent.

Interaction distance was measured in two ways--straight line and walking distance--depending on the nature of enclosure in the work area and layout of the work area. For a work area with a reception counter integrated with the primary or secondary worksurface, so that visitors are encouraged to interact with the worker from the counter



No. of File Drawers =
(4x4) + (2x2) + 1 = 21

Figure IV-8. File drawers measure.

instead of entering the workspace, interaction distance was measured in a straight line from where that visitor stands to the seated worker. For any other kind of room, it is was measured as the walking distance around barriers in the work area from the entrance to the seated worker. (Figure IV-9).

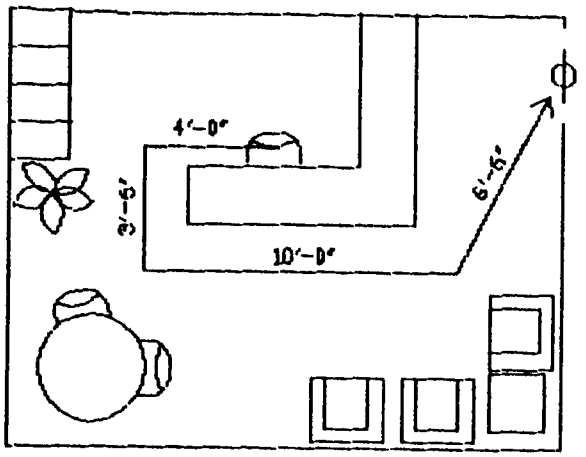
The hypothesis stated that the interaction distance does not differ significantly among (a) introversion/extraversion, (b) workstyle, (c) job description, or (d) company (Figure IV-4).

The statistical analysis confirmed (a) and (b), but rejected (c) and (d). Therefore, job description and company affiliation were a significant predictor of the interaction distance needed by workers in the sample (Table 1).

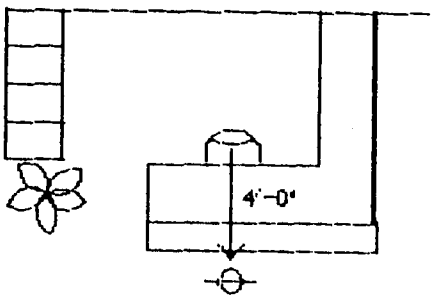
Because interaction distance was actually defined in two different ways, and because these two definitions were observed as one variable in the statistical analysis, the degree to which this statistic and LS means are significant may be altered. Therefore, LS means are not given for this variable.

Hypothesis 9

Orientation to door is the location of the entrance to a workspace defined in terms of its relationship to a



(a) Walking distance = 4' + 3'-6" + 10' + 6'-6" = 24'-0"



(b) Across-counter distance = 4'-0"

= person visiting worker

Figure IV-9. Interaction distance measures.

worker seated at the worksurface. There were five optional orientations as follows: (See Figure IV-10)

1. "Direct front" - entrance directly in front of the seated worker.

2. "Front offset" - entrance located on the wall in front of the seated worker, but not directly in front.

3. "Direct side" - entrance at a right angle to the direction the seated worker faces.

4. "Side offset" - entrance located on the wall to the side of the seated worker, anywhere between the "direct side" position on that wall and the wall the worker faces.

5. "Behind" entrance located anywhere between the "direct side" position, circling behind the seated worker, to the other side.

Two analyses were done on orientation to door: One from the worker's primary worksurface ("O1"), and the other from the secondary worksurface ("O2"). (See Figure IV-11.) A Chi-square statistic was calculated for a frequency distribution of O1 x O2, and a value of 35.48 was found to be significant at the .005 level. Therefore, O1 and O2 are highly related, and will be discussed simultaneously.

The hypothesis stated that orientation to door does not differ significantly among (a) introversion/extraversion, (b) workstyle, (c) job description, and (d) company (Figure IV-4). The statistics verified this hypothesis (Table 3).

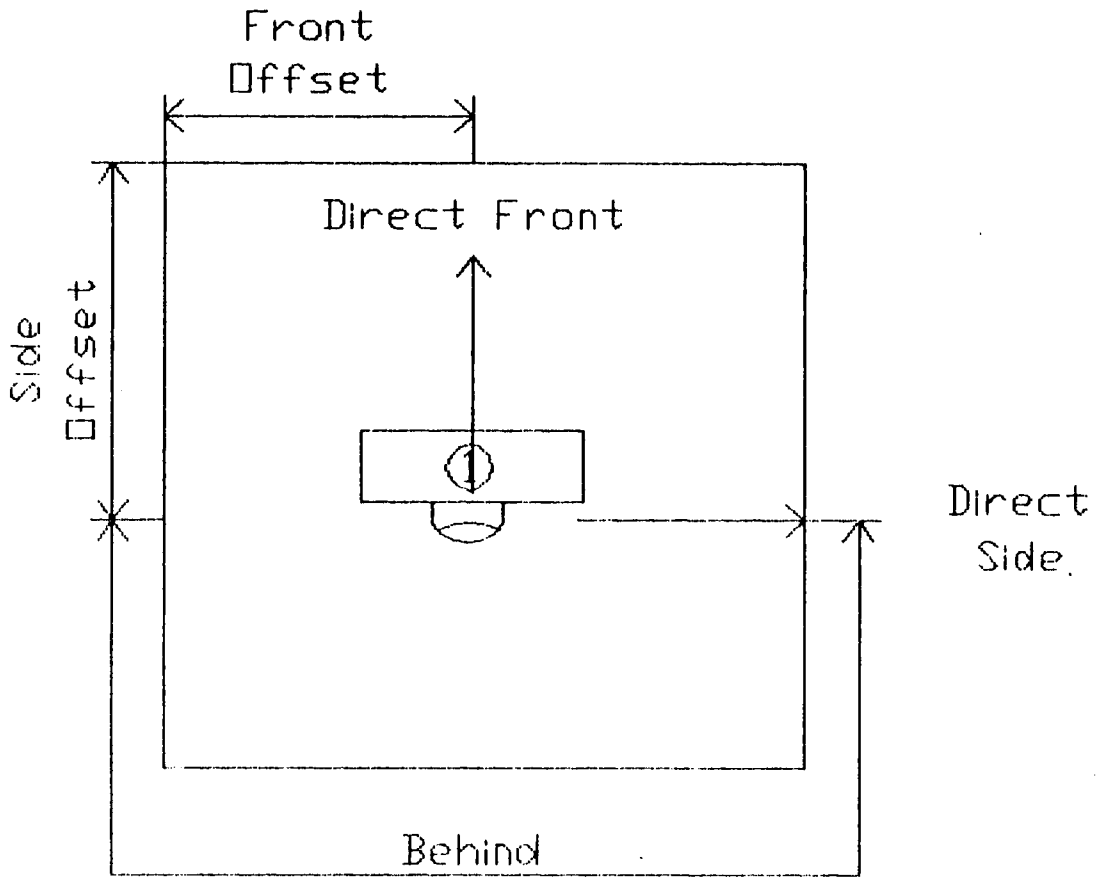
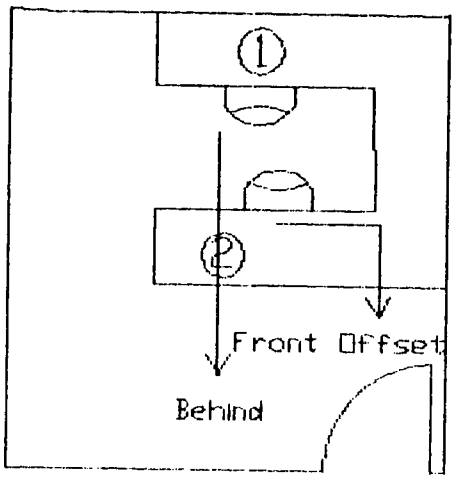


Figure IV-10. Orientation to door measures.



①PRIMARY WORKSURFACE -

Orientation to door is "Behind".

②SECONDARY WORKSURFACE

Orientation to door is "Direct Side".

Figure IV-11. Primary and secondary worksurfaces used to measure orientation to door.

Table 3. Chi-Square Statistics Summary.

Measured according to:	Environmental Facet	Chi-Square Value	Probablility
Orientation to Door (01)°	Orientation to Door (02)°	35.48	0.005
Barriers	Orientation to Door (01)°	46.184	0.000
Barriers	Orientation to Door (02)°	16.697	0.002

°(01) Orientation to Door from the primary workspace.

°(02) Orientation to Door from the secondary workspace.

Direct front and behind orientations were preferred equally and above all other orientations for 01, and behind and direct side were preferred for 02.

Hypothesis 10

A barrier is anything within the workspace that is between a worker and a visitor during interaction. This barrier can be a desk, worksurface, panel or half wall, transaction ledge, table, etc. (Figure IV-12). The hypothesis stated that the presence of barriers in the workspace does not differ significantly among (a) introversion/extraversion, (b) workstyle, (c) job description, or (d) company (Figure IV-4). The statistics verified this hypothesis (Table 3).

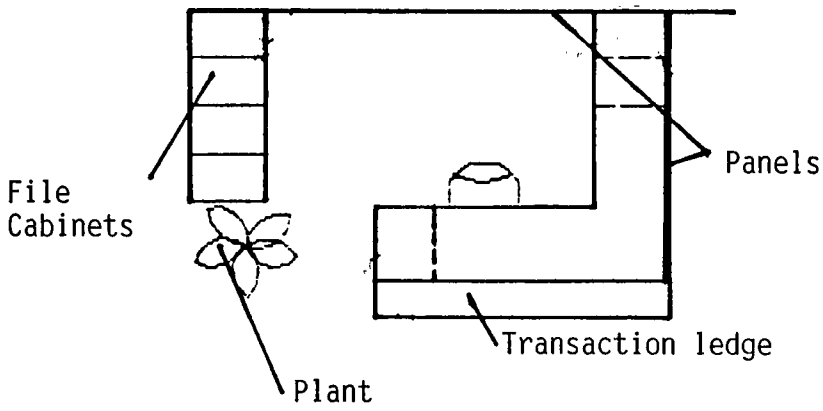
Of the total sample, 67% preferred barriers, and 33% preferred no barriers.

Hypothesis 11

To test the hypothesis--that interaction distance, orientation to door, and barriers are not related to each other--several statistical methods were used.

(1) A two-way analysis of variance with type III sum of squares determined the the effects of barriers and orientation to door on interaction distance (Table 1).

(2) Chi-square statistics determined the effects of



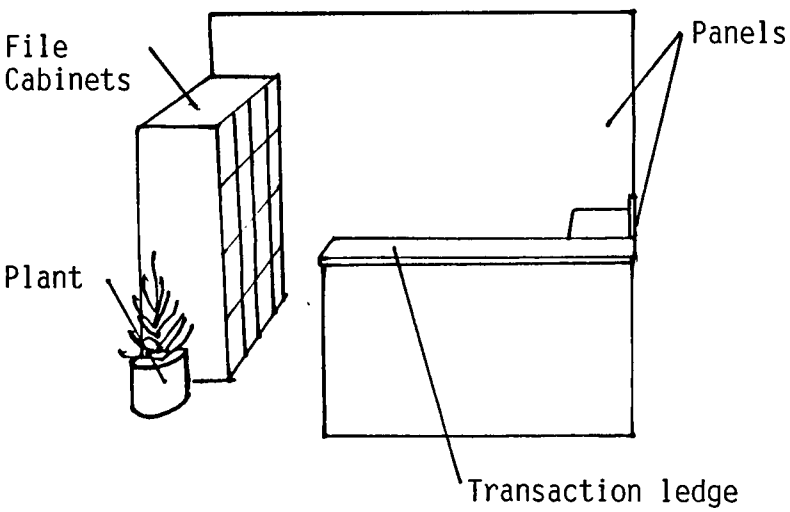


Figure IV-12. Barriers measured from scale-model.

barriers on orientation to door (Table 2), and a frequency table was used to show the nature of this relationship (Figures IV-13 and IV-14).

(3) LS means were calculated for interaction distances needs predicted by barriers and orientation to door (Table 2).

These three sets of findings will be discussed individually.

The Effects of Barriers and Orientation to Door on Interaction Distance. Using the two-way analysis of variance, the interaction distance was analyzed according to (1) the presence of barriers and the orientation to door from the primary worksurface, and (2) the presence of barriers and orientation to door from the secondary worksurface.

The relationship between the presence of barriers and interaction distance from both worksurfaces was found to be significant. The relationship between both orientations to door and interaction distance was also found to be significant.

Therefore, orientation to door from the primary worksurface is significantly related to interaction distance, considering the presence of barriers. However, orientation to door from the secondary workspace (02), is more

BR 01

Frequency / Percent / Row Pct / Col Pct	BK	DF	DS	FO	RO	SO	Total
N	14	0	14	2	0	0	30
	15.38	0.00	15.38	2.20	0.00	0.00	32.97
	46.67	0.00	46.67	6.67	0.00	0.00	
	53.85	0.00	87.50	15.38	0.00	0.00	
Y	12	27	2	11	1	8	61
	13.19	29.67	2.20	12.09	1.10	8.79	67.03
	19.67	44.26	3.28	18.03	1.64	13.11	
	46.15	100.00	12.50	84.62	100.00	100.00	
Total	26	27	16	13	1	8	91
	28.57	29.67	17.58	14.29	1.10	8.79	100.00

BK = Behind
DF = Direct Front
DS = Direct Side
FO = Front Offset
RO = Rear Offset
SO = Side Offset
N = No Barrier
Y = Barrier Used

Figure IV-13. Frequency distribution of barriers and orientation to door from the primary worksurface.

BR 02

Frequency Percent Row Pct Col Pct	BK	DF	DS	FO	SO	Total
N	15	0	11	0	0	26
	20.00	0.00	14.67	0.00	0.00	34.67
	57.69	0.00	42.31	0.00	0.00	
	34.88	0.00	68.75	0.00	0.00	
Y	28	6	5	8	2	49
	37.33	8.00	6.67	10.67	2.67	65.33
	57.14	12.24	10.20	16.33	4.08	
	65.12	100.00	31.25	100.00	100.00	
Total	43	6	16	8	2	75
	57.33	8.00	21.33	10.67	2.67	100.00

BK = Behind
DF = Direct Front
DS = Direct Side
FO = Front Offset
RO = Rear Offset
SO = Side Offset
N = No Barrier
Y = Barrier Used

Figure IV-14. Frequency distribution of barriers and orientation to door from the secondary worksurface.

significantly related to interaction distance, considering the presence of barriers, than is 01 (Table 1).

The Relationship Between Barriers and Orientation to Door. The relationship between orientation to door from both the primary ("01") and secondary ("02") worksurfaces and the presence of barriers was found to be highly significant (Table 3). Using frequency tables (Figures IV-13 and IV-14), the relationship between 01 and the presence of barriers, and the relationship between 02 and the presence of barriers was observed. The nature of this relationship is discussed according to the options for orientation to door; behind, direct front, front offset, side offset, and direct side. See Figure IV-10 for a diagram of these door locations.

Door located "behind" seated worker. Fifty-three percent of the cases where the entrance to the space was behind (BK) workers seated at 01, there was not a barrier between the workers and this entrance. This is reversed for workers seated at 02 who in 65% of the cases had barriers between themselves and an entrance located behind them.

Door located to the "direct side". Where the entrance was located to the direct side (DS) of seated workers, in 88% of the cases at 01, and 69% of the cases at

02, there were no barriers between the worker and the entrance.

Door located to the "direct front" and "side offset". Where the entrance was located to the direct front (DF), or side offset (SO) of seated workers, in 100% of the cases at 01 and 02, there were barriers between the worker and the entrance.

Door located to the "front offset". Results are very similar for entrances located at the front offset (FO) of seated workers, for whom 85% of those seated at 01 and 100% of those seated at 02 had barriers between themselves and the entrance.

Overall, from the primary worksurface ("01") the most frequently used orientations of the entrance were both behind and directly in front. These were used equally, and significantly more often than the next most frequent orientations of direct side or front offset. The side offset orientation was rarely used from the primary worksurface. (See Figure IV-13.)

From the secondary worksurface, the most frequently used orientation was behind. The second most frequent orientation was to the direct side. Direct front and front offset followed, with side offset being rarely used. (See Figure IV-14.)

Interaction Distances Needs Predicted by Barriers and Orientation to Door. LS means were used to identify interaction distances needs predicted by (1) the presence and absence of barriers, with the effects of orientation to door removed, and (2) the various optional orientations to door from the primary and secondary workspaces, with the effects of barriers removed.

The presence of barriers resulted in a higher average interaction distance than when barriers were not present. This is inconclusive, due to the two ways interaction distance was measured, and probably would be less with barriers present, if interaction distance had been measured in a straight line only. The same is true for distance averages according to orientation to door.

Hypothesis 12

Layout is the arrangement of worksurfaces in an individual's workspace. There were five optional layouts as follows (See Figure IV-15):

1. "Singular" - worksurfaces arranged in a continuous line rather than at angles to each other.

2. "Parallel" - worksurfaces arranged back to back, so that the worker has to turn 180 degrees from one to face the other.

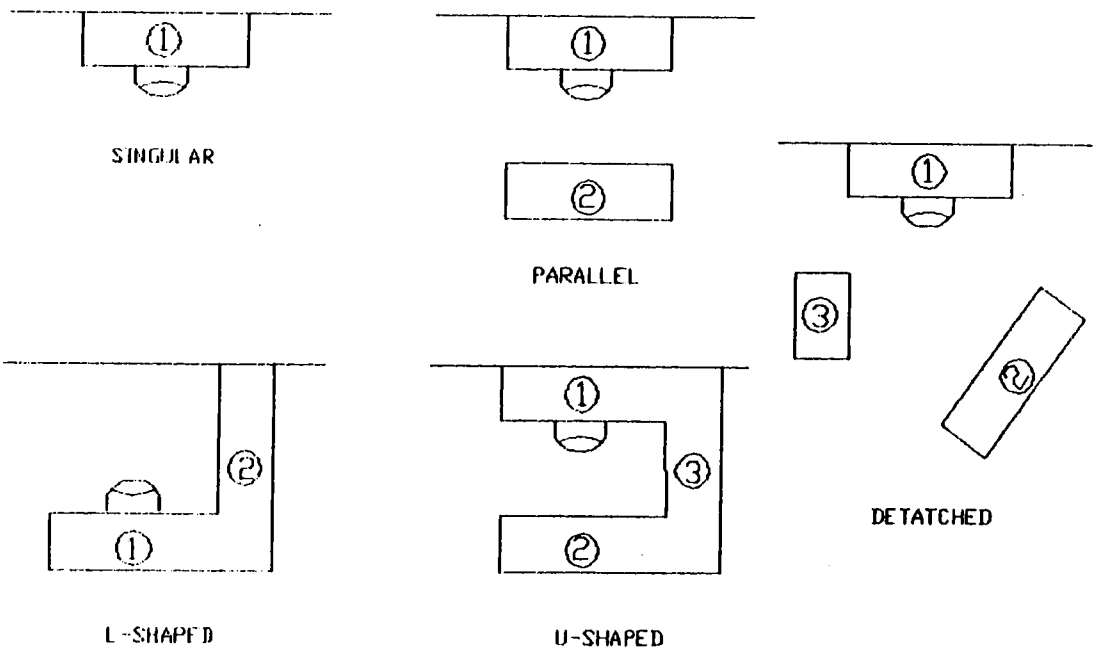


Figure IV-15. Layout measures.

3. "L-shaped" - two worksurfaces connected and at right angles to each other.

4. "U-shaped" - three worksurfaces connected and at right angles to each other.

5. "Detatched" - more than one worksurface, not connected to other worksurfaces, and not in a "parallel" arrangement.

When a combination of two arrangements was present, layout was measured by the location of the primary and secondary worksurfaces.

To test this hypothesis, which stated that layout preference does not differ significantly between (a) workstyle, and (b) job description, Chi-Square statistics and separate frequency tables were used (Figure IV-4).

There were no strong relationships indicated by between any of the layouts and any of the workstyles. However, using a frequency distribution, layout appeared to be determined by job description for, specifically, detatched (D) and parallel (P) arrangements (Figure IV-16). Clerical workers comprised 86% of all detatched layouts. Managers comprised 68% of all parallel layouts.

For managers and clerical workers combined, parallel (P) and U-shaped (U) were the most frequently used layouts. The next most frequent layout for managers and clerical workers combined was the L-shaped (L) arrangement, chosen

LAYOUT JOB

Frequency / Percent / Row Pct / Col Pct	C	M	Total
D	6	1	7
	6.74	1.12	7.87
	85.71	14.29	
	13.33	2.27	
L	11	9	20
	12.36	10.11	22.47
	55.00	45.00	
	24.44	20.45	
P	9	19	28
	10.11	21.35	31.46
	32.14	67.86	
	20.00	43.18	
S	4	3	7
	4.49	3.37	7.87
	57.14	42.86	
	8.89	6.82	
U	15	12	27
	16.85	13.48	30.34
	55.56	44.44	
	33.33	27.27	
Total	45	44	89
	50.56	49.44	100.00

D = Detached
L = L-Shaped
P = Parallel
S = Singular
U = U-Shaped
C = Clerical
M = Managerial

Figure IV-16. Frequency distribution of layout by job description.

by 22% of the sample. The least popular arrangements were singular (S) and detatched (D) layouts, each chosen by 8% of the population.

Hypothesis 13

A graphic analysis was used to analyze enclosure in terms of a series of steps (as recommended by BOSTI) instead of as a percent of total possible enclosure (as in hypothesis one). This analysis was done using a modified version of BOSTI's enclosure matrix (Figure II-9).

The matrix used for this study (Figure III-9) measured wall height according to the wall/panel heights available in the scale model study, and measured sides according to orientation to door from the primary workspace. This format of matrix was used, in order to consider the height of enclosure and orientation to door from the primary workspace, in one measure.

The wall height measure had four options (Figure IV-17):

1. "None" - no walls or panels.

2. "Low" - panels at desk height, and could be seen over when seated.

3. "Medium" - panels at eye-level, and could be seen over only when standing.

4. "High" - walls to the ceiling.

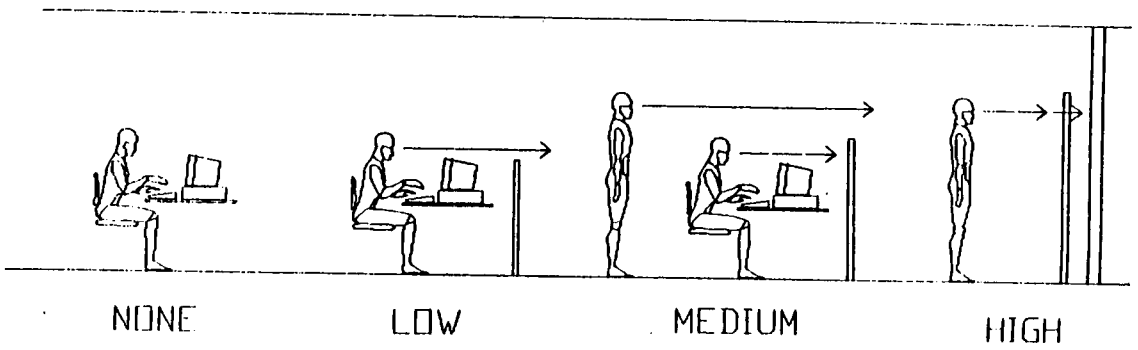


Figure IV-17. Wall/panel heights measured.

The side measures were (Figure IV-18):

1. "Front" (F) - entrance to the workspace in front of a worker seated at the primary workstation.

2. "Side" (S) - entrance on either wall to the side of the worker seated at the primary workstation.

3. "Back" (B) - entrance on the wall behind the worker seated at the primary workstation.

The hypothesis stated that when enclosure is measured as a series of steps, it does not differ significantly between (a) workstyle, and (b) job description (Figure IV-4).

The statistical analysis indicated that there was a significant difference in both enclosure preferences among different workstyles and among different job descriptions, leading to a rejection of this hypothesis in its entirety. This is supported by an analysis of instances where enclosure is broken down by three degrees--low/none, moderate, and high (Figure IV-19)--and by job description and workstyle. These degrees of enclosure are defined as follows:

1. "Low/none" - low enclosure on three or more sides, or no enclosure on three sides.

2. "Moderate" - workspace is open on more than one side.

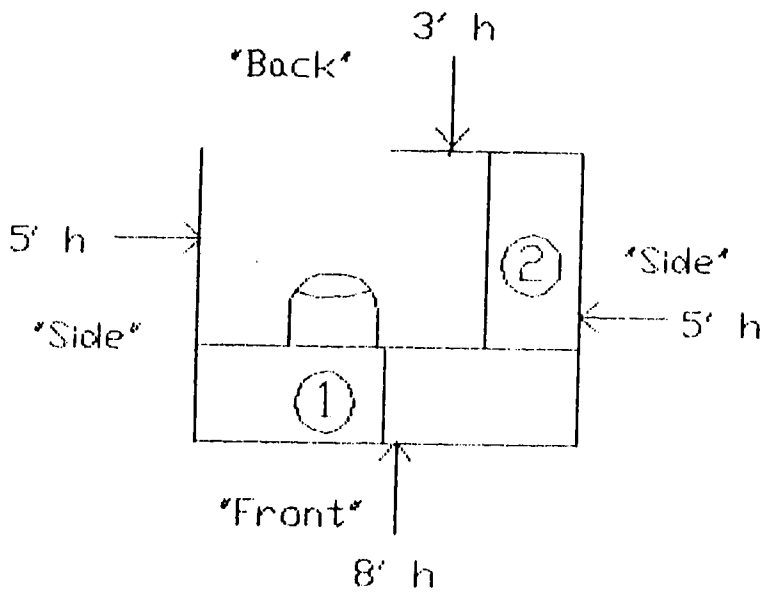
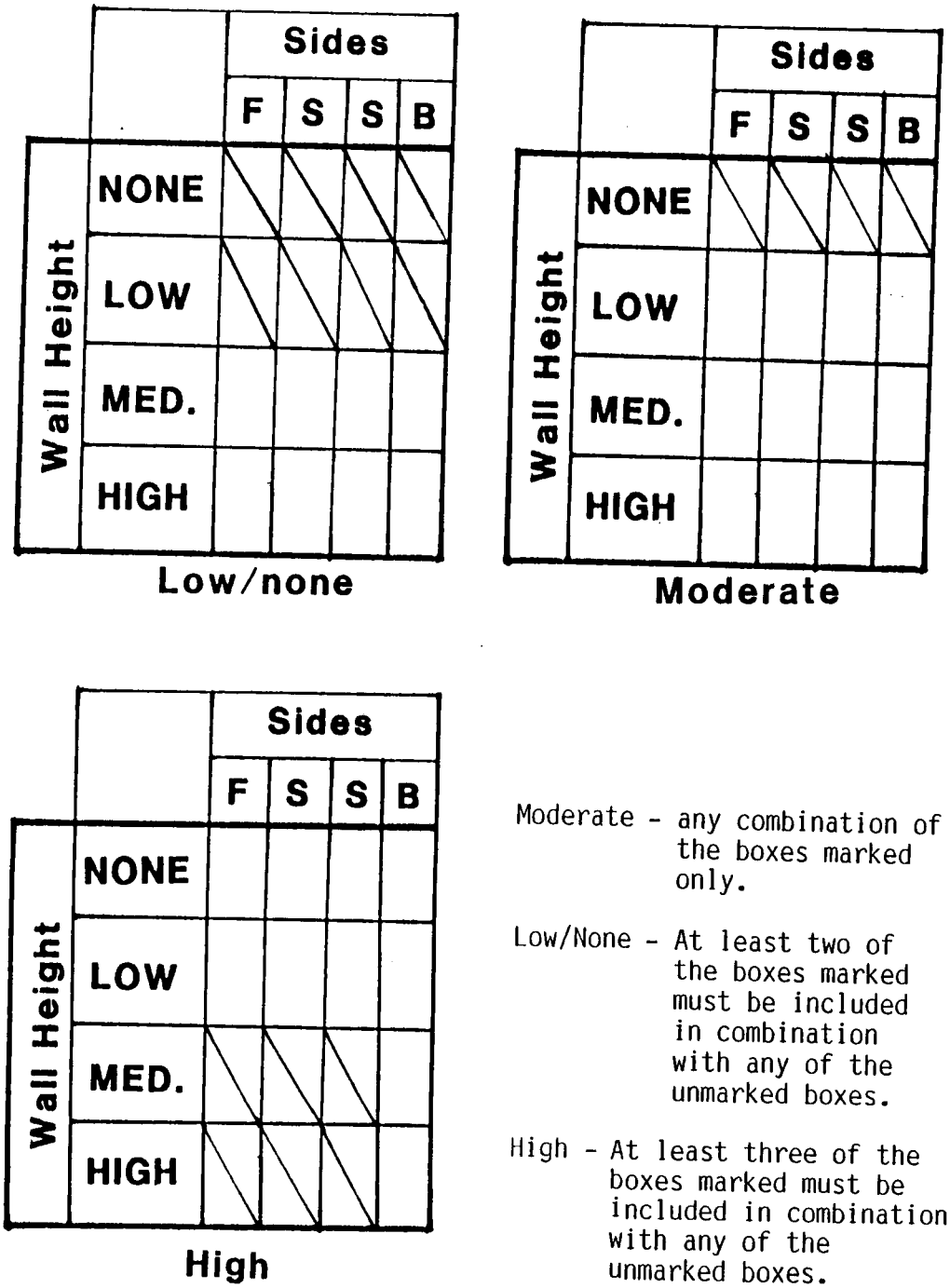


Figure IV-18. Panel heights measured by side.



Moderate - any combination of the boxes marked only.

Low/None - At least two of the boxes marked must be included in combination with any of the unmarked boxes.

High - At least three of the boxes marked must be included in combination with any of the unmarked boxes.

Figure IV-19. Enclosure matrix for graphic analysis.

3. "High" - medium height walls or higher on at least three sides.

Findings show that three of the four workstyles have the majority of responses in the high enclosure range. However, cooperators have a proportionally large number of responses in the moderate and low/none ranges.

Findings also indicated a significant difference in the enclosure preferences of clerical workers and managers. Managers were much more likely to choose offices that had a high to moderate range of enclosure than they were to choose a low range of enclosure. Visionaries are the exception to this rule, with at least one manager visionary choosing all types of enclosure. Even though they still preferred full enclosure, visionary managers, from this analysis, appear to be more willing to have less enclosure than managers in general.

The data on cooperator clerical workers also shows that they, like visionary managers, appear to be more likely prefer lower enclosure than clerical workers in general.

Hypothesis 14

The hypothesis stated that when enclosure and orientation to door are observed together, they do not differ

significantly among (a) workstyles, and (b) job description (Figure IV-4).

A matrix was used to record the frequency of each combination of degree of enclosure and orientation to door. Two frequency matrices of orientation to door from the primary worksurface were compiled for each job description according to workstyle (Figure IV-20). These frequency matrices were used to graphically identify consistency between clerical and managerial people of the same workstyle, and differences in preference among workstyles. In addition, a composite matrix of each job description was used to observe trends in preferences for clerical and managerial workers (Figure IV-21).

The statistical analysis showed that orientation to door was not related to workstyle, and that enclosure was not related to workstyle. The graphic analysis supported this finding.

No significant differences in this preference were found when job description and workstyles were observed together, with the exception of cooperator managers and visionary managers. Cooperator managers seemed to prefer high enclosure with direct front orientations strongly over other combinations. Results of the graphic analysis showed strong tendencies for visionary managers to prefer either a

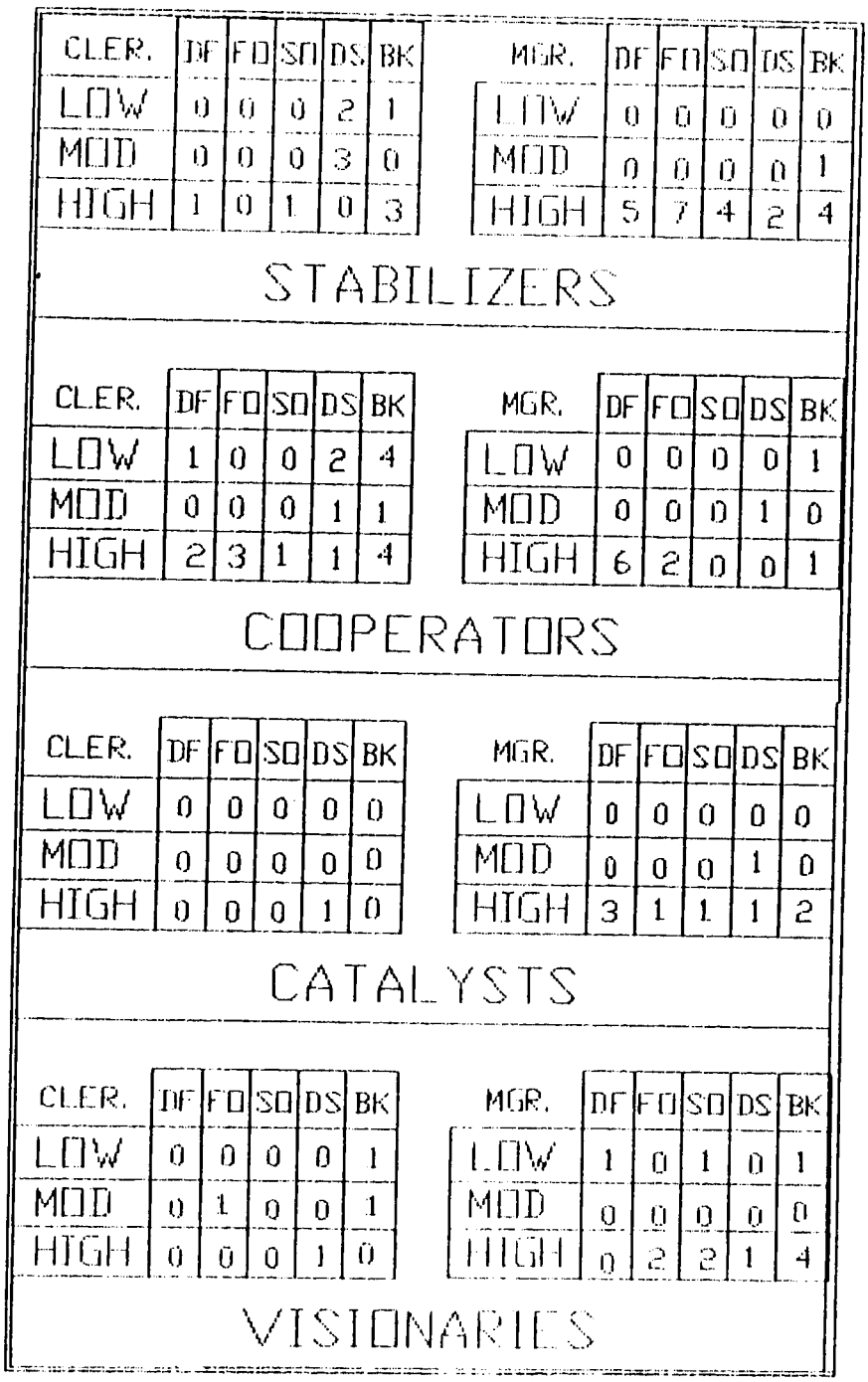


Figure IV-20. Frequency matrices of orientation to door from the primary worksurface, according to job description and workstyle.

	DF	FO	SO	DS	BK
LOW	1	0	0	4	6
MOD	0	1	0	4	2
HIGH	3	3	2	2	7

CLERICAL

	DF	FO	SO	DS	BK
LOW	1	0	0	1	2
MOD	0	0	0	2	1
HIGH	14	12	6	5	11

MANAGERIAL

Figure IV-21. Frequency matrices of orientation to door from the primary worksurface, according to job description.

high or low/none degree of enclosure, a trait not found in any other workstyle of managers. (See Figure IV-20.)

The statistical analysis also indicated that orientation to door alone was not related to job description, and that enclosure was related to job description. The graphic analysis supported these findings to an extent, but revealed new information about these factors when observed together.

A graphic analysis of the matrices revealed more vertical consistency among clerical workers of different workstyles, and more horizontal consistency among managers of different workstyles. This indicates that orientation to door (the vertical variable on the matrix, Figure IV-20) is more highly valued than enclosure by clerical workers, and enclosure (the horizontal variable) more valued by managers. There was an obvious pattern of consistency within each group, and difference between managers and clerical workers.

Managers consistently preferred high enclosure and direct front entrances. Second, they preferred front offset and behind entrances with high enclosure. Even though visionary managers preferred both high and low enclosure, they still wanted a direct front orientation to door in most cases. Therefore, even though enclosure is

more valued by managers, a direct front orientation to door is also important.

Clerical workers primarily preferred both high and low enclosure with a behind orientation to door. Second, they preferred moderate and low enclosure with a direct side orientation. (See Figure IV-21.)

Overall, all workstyles and job descriptions preferred high enclosure with any orientation to door, and low and moderate enclosure with a direct side or behind orientation to door consistently. There were virtually no responses among other combinations of enclosure and orientation to door.

The highest number of responses for orientation to door was in the behind category, with 32% of all responses in this category. All categories combined, the second highest number of responses was almost equal for the direct front orientation with 21% of the responses, and direct side with 20% of the responses. Front offset was third with 18% of the responses, and side offset last with only nine percent of the responses.

Forty-nine percent of the responses were for a high degree of enclosure, 31 percent for a low degree of enclosure (mostly clerical workers), and 20% for a moderate degree of enclosure. (See Figure IV-21.)

Discussion

Findings of this study varied in the degree to which they supported information in the literature. In addition, relevant results about what determines the nature of environmental facets needed by office workers were obtained. Figure IV-22 shows which environmental facets were found to be significantly related to introversion/-extraversion, workstyle, job description, and company affiliation. Figure IV-23 shows environmental facets that the literature proposed were significantly related to work-style and job description.

In this section, general findings categorized by introversion/extraversion, workstyle, job description, and company affiliation are discussed, followed by a discussion of each environmental facet. Facets observed singularly are discussed first, followed by those observed both alone and in combination with other facets. Facets observed alone were floor area, work surface width and area, open and closed shelf storage, file drawers, and layout. Facets observed in combination were enclosure, orientation to door, barriers, and interaction distance.

ENVIRONMENTAL FACETS	I/E	WORKSTYLE	JOB	COMPANY
Enclosure (percentage)	---	---	X	X
Enclosure (steps)	n/a	X	X	n/a
Floor area	---	---	X	X
Work surface width	---	---	---	---
Work surface area	---	---	---	---
Open-shelf storage	---	---	---	---
Closed-shelf storage	---	---	---	---
File drawers	---	---	---	---
Interaction distance	---	---	X	X
Orientation to door(01 &02)	---	---	X	---
Barriers	---	---	---	---
Layout	n/a	---	---	n/a

n/a = not observed
--- = not related
X = significantly related

Figure IV-22. Relationships between environmental facets and introversion/extraversion, workstyle, job description, and company affiliation.

ENVIRONMENTAL FACETS	WORKSTYLE (FMI)	JOB DESCRIPTION (BOSTI)
Enclosure	X	X
Floor area	n/a	X
Work surface width/area	X	---
Open/closed shelf storage	X	n/a
File drawers	n/a	---
Interaction distance	n/a	n/a
Orientation to door (Privacy--control over access, distractions, and Layout)	n/a	X
Barriers (Privacy--control over access, and Layout)	n/a	X
Layout	n/a	---

--- = observed but not found related
n/a = not observed
X = related

Figure IV-23. FMI (Workstyle) and BOSTI (Job description) findings on relationships of environmental facets to workstyle and job description.

Introversion/Extraversion

No significant relationships were found between any of the environmental facets and introversion/extraversion (Figure IV-22); therefore, introversion/extraversion will not be discussed further. None of the literature attempted to relate introversion/extraversion to environmental needs.

Workstyle

Enclosure taken as a series of steps was the only environmental facet significantly related (by graphic analysis) to workstyle (Figure IV-22). None of the other facets observed were shown to be related to workstyle.

These findings disagree to some extent with those of the Facility Management Institute's (FMI). However, FMI stressed the fine-tuned elements in the work environment (such as display and personalization and degree of clutter) more than the major elements observed in this study. It is possible that these major elements are not significant to the cognitive perception of a worker, but rather the fine-tuned elements are what appeals to this aspect of one's personality.

Also, certain combinations of environmental facets are likely to have a stronger relationship to workstyle than each of these facets alone. A finding of similar structure was evidenced in this research, when some facets observed

alone had no relationship to job description, but observed together were related to job description.

Job Description

Overall, job description was the best predictor of certain environmental needs (Figure IV-22). Enclosure, floor area, interaction distance, and orientation to door were all predicted by job description. Certain combinations of environmental facets were found to be related to job description, which were not related when observed alone. Enclosure and orientation to door taken together were related to job description.

Significance of these relationships was in direct accord with the findings of the Buffalo Organization for Social and Technological Innovation (BOSTI). However, specific findings of this study and BOSTI differed. These differences will be discussed individually under each environmental facet.

Company Affiliation

Company affiliation was a strong factor in determining enclosure, floor area, and interaction distance needs. However, this data was inconclusive as the sample distribution among companies yielded a stronger measure of job description rather than a true measure of company

trends. The literature proposed that company affiliation was a factor in determining environmental needs, but did not propose which needs or to what extent it was a factor.

Environmental Facets

Findings concerning each environmental facet are discussed individually.

Floor area. Findings concerning floor area were in agreement with those of the Buffalo Organization for Social and Technological Innovation (BOSTI) that clerical workers need less floor area than managers. The square footages drawn from scale models, however, were larger than what BOSTI found to be satisfactory for both clerical and managerial workers. The scale model indicated the average floor-area need of clerical workers as 125 square feet. In contrast, BOSTI found 78 square feet to be satisfactory for clerical workers. The scale model indicated that the average floor-area need of managers was 195 square feet. Again in contrast, BOSTI found 115 square feet to be satisfactory for managers.

For workspace floor area alone, however, the finding of an average floor-area need of 68 square feet for clerical workers was between BOSTI's findings of 40 square feet as enough and 78 square feet as satisfactory. Average

managerial workspace floor-area need was 72 square feet, very close to BOSTI's finding that 74 square feet was enough for managers.

In comparing the present study with BOSTI's study, the contrast of total floor-area findings, and the closeness of workspace-area findings may be due to the different kinds of office space encompassed by each study. The majority of BOSTI's sample worked in open-offices (systems furniture), whereas in this study the majority of subjects chose a traditional, closed-office space (full height walls). Generally, in open-office spaces, less space is taken up with circulation area around a desk or work surface, and with conference and lounge areas, than in a conventional, closed office. Therefore, it can be assumed that the extent to which square footage exceeds BOSTI's finding is due to the contrast in usage of closed versus open-office space. The workspace floor area is appropriate for open office spaces; and the total floor area appropriate for fully enclosed offices.

Work surface width and area. Findings regarding work-surface width do not support FMI's proposal that stabilizers need less work surface, and catalysts need more work surface, than other workstyles. The findings agree with BOSTI's finding that all job descriptions prefer the

same number of work surfaces (two), and therefore about the same amount of work surface.

The average mean worksurface width, according to job description, was 14.5 feet to 15.7 feet. Company affiliation data shows a range of worksurface lengths from 9.1 feet to 19.8 feet. All data averaged around 15 lineal feet of worksurface. The literature gave no specific recommendation on the length of the worksurface.

Open and closed-shelf storage. Findings on open and closed shelf storage do not agree with FMI's proposal that stabilizers need only closed storage, and visionaries need a large amount of open, but also closed-shelf storage. Findings, in fact, indicated about the same need for both storage types among all workstyles and job descriptions: 6.6 to 14.6 lineal feet of open-shelf storage, and up to four lineal feet of closed-shelf storage. Averages for closed-shelf storage need went as high as nine feet when company affiliation was taken into consideration.

File drawers. Findings on the number of file drawers needed by office workers were in contrast to BOSTI's finding that there was a trend toward significantly fewer file drawers in offices. However, the number of file drawers needed as indicated by this study was between five and ten

for all job descriptions and workstyles, significantly more than that found in BOSTI's study.

Data analysis did support BOSTI's finding that managers are more likely than clerical workers to have a greater number of file drawers. This finding was particularly the case when the number of file drawers of both job descriptions together was under five, but not over eleven. When the number of file drawers exceeded eleven, it was usually a case of a clerical worker being appointed "keeper of the files"--a situation also noted by BOSTI.

Layout. Findings on layout preference were in direct opposition to the ideal workstations proposed by FMI for each workstyle. FMI suggested an L-shaped or detached layout for cooperators, a detached layout for stabilizers, a singular or detached layout for catalysts, and a U-shaped layout for visionaries. In contrast, the findings of this study indicated that there were no differences in layout preferences of different workstyles, and that the least preferred layouts of all groups were detached and singular.

BOSTI recommended at least two work surfaces for all job types. The primary layouts (parallel, U-shaped, and L-shaped) preferred by all job types and workstyles in the sample reinforced this preference.

Enclosure. The findings on enclosure were in direct accord with the findings and recommendations of both FMI and BOSTI. In all cases except with cooperators, FMI recommended a relatively high degree of enclosure in terms of percent and number of sides. The present study supported this recommendation, finding that enclosure preference averages ranged from 63% to 80%. Also, all groups have a need for a high degree of enclosure, but clerical personnel (who tend to be cooperators) also have a need for moderate to low enclosure, provided orientation to door is to the direct side or behind. BOSTI also recommended a relatively high degree of enclosure for all groups, but a moderate to low degree for clerical workers.

The analysis of enclosure and orientation to door combined revealed significant information about enclosure needs. The results showed that there were almost no low enclosure preferences when orientation to door was to the direct front, front offset, or side offset. Conversely, all orientations to door seemed acceptable with high enclosure.

Based on the graphic analysis, less enclosure requires a direct side or behind orientation to door to work functionally (Figure IV-10). BOSTI found an increased number of distractions with low enclosure. It may be that a direct side or back orientation, which is not immediately in the field of vision, allows the worker some freedom from

distractions. It is also possible that these orientations give the workers some amount of control over their exposure (ability of others to see them) and their accessibility (the ability to limit the undesired impact of others).

Orientation to door. Results found orientation to door from the primary workspace (01) and orientation to door from the secondary workspace (02) to be highly related to each other. This finding supports BOSTI's recommendation on the importance of two worksurfaces for all job descriptions.

Results, however, do not support BOSTI's recommendations that the entry should be to the front of a workstation if at all possible, and that entry from behind is the least desireable. In fact, the preferred orientation to door for all groups was the entrance located behind the seated worker from both 01 and 02. The second most preferred orientation from 01 was direct front, and from 02 was to the direct side.

Findings from the graphic analysis of orientation to door and enclosure combined indicated that clerical workers value orientation to door more highly than do managers, and that preference for orientation to door becomes more flexible if enclosure is high. This fact is probably due to the higher control over distractions, exposure, and access provided by higher enclosure. Orientation to door was also

found to be highly related to the presence of barriers between worker and entrance to or visitors to the workspace, probably for the same control over exposure and access reasons.

Barriers. Findings concerning barriers in the workspace indicated that BOSTI's and FMI's recommendation that there be some barrier on all sides between a worker and public area is in accord with need for barriers found in this study. Barriers were preferred by two-thirds of the total sample. Preference for barriers was highly related to orientation to door--something alluded to in BOSTI's layout recommendations.

The relationship between need for barriers and orientation to door found in this study was very similar to the personal distance findings of Robert Sommer (1963). Sommer found that people feel more comfortable being approached from the side than from the front. Similarly, approachability from any orientation but the direct side was limited by the use of barriers. In contrast, in 88% of the direct-side orientation cases from 01, and in 69% of these cases from 02, no barrier was present between the worker and someone entering the workspace from the side.

The presence of barriers increased interaction distance due to the walking distance used to measure interaction distance in some cases. However, results of the study

and other literature imply that straight line distance between people can be decreased with the presence of barriers (Sommer, 1963; Hall, 1969).

Interaction distance. Interaction distance appears to be related to both orientation to door and the presence of barriers. However, due to the two measures used simultaneously for interaction distance, the significance of this relationship may vary somewhat from the findings of the statistical analysis. With this fact in mind, in combination with information from literature on interaction distance, certain relationships were suggested.

Small interaction distances were found in three situations. First, in accord with Sommer's findings, smaller interaction distances were found where the entrance was from the direct side. Also, small interaction distances were found where barriers were present, probably because the barrier works to make a smaller interaction distance comfortable to the worker. Last, interaction distances were small where the door was located to the back of the seated worker. This finding may be attributable to the control over distractions provided where the door is located to a worker's back, and a subsequent reduction in the distance the worker needs between himself and others behind him.

Average interaction distances were equal for direct-front and front-offset orientations to door. Direct-front and front-offset orientations have equal but lesser control over access and exposure than do back and direct-side orientations. Consequently, the interaction distance for direct-front and front-offset orientations was greater than distances found for back and direct-side orientations.

The longest interaction distance was for the side-offset orientation to door. This is the orientation with the least control over access and exposure.

These findings suggest that there is a relationship between control over access and exposure, depending on orientation to door, and interaction distance. Where orientation to door is such that there is high control over access and exposure, less interaction distance is needed. Also, where orientation to door is such that there is low control over access and exposure, a greater interaction distance is needed.

Summary of Findings Relevant to Conceptual Framework.

This research was based upon the assumptions stated in the conceptual framework that job satisfaction and performance are components of organizational effectiveness, and are improved by meeting worker's environmental needs. A clearer understanding was gained in this study of what

determines these environmental needs, and therefore, how the work environment can be designed to meet these needs and improve organizational effectiveness. Given that the parameters of this study included observation of only large-scale environmental facets, and a sample of primarily bureaucratically structured manufacturing companies, the following was found:

The findings did not support the Facility Management Institute's (FMI) proposal that cognitive style is a determinant of the particular environmental needs observed in this study. Nevertheless, because the environment is perceived and experienced cognitively, cognitive style cannot be removed as a factor in what causes individuals to have certain environmental needs, or as a predictor of other facets not observed in this study. The findings were unable to draw conclusions with reference to FMI's proposal that organizational culture is a determinant of environmental needs. This was due to the way company affiliation was measured, and the ineffectiveness of the Motivational Principles in Use sheet (MPU) at measuring organizational culture as was needed for this study.

The finding that job description is a strong predictor of enclosure, floor area, orientation to door, and both measures used to form interaction distance strengthens the Buffalo Organization for Social and Technological

Innovation (BOSTI) theory, even though the results concerning the number of file drawers needed and the preferred location of an entrance into the workspace differed from BOSTI's findings.

In summary, the conceptual framework that work environment facets are predicted by specific factors was shown to be true for some environmental facets predicted by job description but the facets observed were not predicted by introversion/extraversion and workstyle.

CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

This chapter includes a summary of the research, conclusions, implications of the findings on work environment design, and recommendations for further research.

Summary

This summary is meant to be a brief review of the overall research; its purpose, methodology, and findings.

Purpose

The purpose of this research was to determine the impact of personality type and job description on the environmental needs of office workers.

Methodology

The sample was comprised of 91 managerial and clerical office workers in middle and east Tennessee companies. Offices from which the sample was drawn ranged from 25 to 225 office employees. Companies varied in product, but the majority of them were from manufacturing industries,

bureaucratic in nature, which may significantly have affected the findings.

Three testing instruments were used: An Activity Information Sheet to determine job description; a Myers-Briggs Testing Indicator to determine personality type; and a scale-model study conducted one-on-one with each subject to determine work environment needs.

Both statistical and graphic analysis were conducted. The following statistical analysis methods were used: The two-way analysis of variance with type III sum of squares; Chi-square; Least Squares means; and Frequency tables. To obtain a clearer picture of how environmental facets are interrelated in the work environment, a graphic analysis was also done.

Findings

Findings revealed that personality type (introversion/extraversion and workstyle) did not predict the environmental facets observed in the study. Job description was a strong indicator of certain environmental-facets needs: enclosure, floor area, interaction distance, and orientation to door. A discussion of significant findings follows on each environmental facet.

Enclosure. Managers and clerical workers preferred a high degree of enclosure. However, clerical workers preferred a moderate to low degree of enclosure on the condition that entrance to the workspace was from their back or direct side. This orientation of the entrance was perceived by subjects as an aid to them in controlling their accessiblity to others and distractions caused by others, which are problems associated with lower enclosure.

Floor Area. Clerical workers were found to need less total floor area than managers, but about the same amount of actual work space area, not including circulation and conference areas.

Worksurfaces. Both job descriptions needed at least two work surfaces and about the same amount of work-surface area, arranged in a parallel or U-shaped layout. L-shaped layouts were preferred second to these, and several separate work surfaces (detached) and one long work surface were preferred least.

Storage. Both clerical workers and managers needed about the same amount of open and closed-shelf storage, and about the same number of file drawers. This was true as long as clerical personnel were not responsible for

maintaining department files, in which cases clerical workers had more files.

Orientation to Door. Managers preferred entrance to the workspace from the front primarily and then from the back. Clerical workers preferred the entrance to their back primarily, and then to the direct side. This difference in the needs of the two job types was produced by two factors. First, enclosure made a difference. Lower enclosure was highly related to the need for the entrance to be from the direct side and behind, whereas high enclosure was related to the direct front orientation. For clerical workers who need low enclosure to some degree, this low enclosure caused a preference for behind and direct side entrances useful as a shield to distractions. Front orientations were almost never used in cases other than with high enclosure. Also, when enclosure is high, the location of the door becomes less important than when enclosure is low.

Second, the orientation was measured from primary workspace. Managers frequently had their primary workspace in a parallel or U-shaped arrangement with their back to the door, and the workspace between them and the visitor was used as a secondary workspace. With this factor removed, managers prefer to face the door.

Barriers. Two-thirds of the sample preferred having some barrier between themselves and the entrance to their work area. The need for barriers was highly related to the location of the entrance, as well as the distance from the seated worker to the entrance (interaction distance). The need for barriers was parallel to the need for enclosure and, like the enclosure preference, was integrated with location of entrance to the workspace. The entrance locations needing high enclosure (those entrances located to the front of the worker) were the same locations having a high need for barriers. Lower need for barriers was associated with the same entrance locations associated with low enclosure (entrances located to the direct side or back of the worker).

Interaction Distance. Interaction distance (distance from seated worker to the entrance) followed the same pattern as barriers and enclosure: where the entrance was behind or to the direct side of the seated worker, interaction distance was lower than where the entrance was in front of the worker.

These findings support the conclusions of this research that

(1) job description is a significant predictor of certain office environment needs.

(2) office workers in general have specific needs concerning environmental facets which, when met, can improve organizational effectiveness.

(3) meeting environmental needs is dependent more on the total combination of facets rather than improvements in individual facets.

Conclusions

The research fulfilled the purpose and tested the hypotheses of this study. Considering the environmental facets and sample observed, based on the findings, the following conclusions were made.

1. Personality type, neither introversion/extroversion or workstyle, were strong predictors of the environmental facets observed. A graphic analysis showed a possible relationship between workstyle and enclosure.

2. Job description was a predictor of enclosure, floor area, interaction distance, and orientation to door.

3. A relationship between company affiliation and environmental facets was not observable, due to the ineffectiveness of the method used at measuring information relevant to this study. (See Figure IV-5.)

Personality Type

No relationships were found between introversion/extraversion and any of the environmental facets observed. Neither the Facility Management Institute (FMI) nor any other research has observed introversion/ extraversion with respect to environmental needs. This being the case, it can be stated conclusively that for the observed environmental facets, there were no significant differences in environmental facets needed by introverts and extraverts in the sample.

This study found conclusively that workstyle in itself did not determine subjects' needs for the environmental facets observed, with the exception of enclosure. Enclosure, when measured subjectively from a graphic analysis, was significantly related to two of the four workstyles. This finding indicates that with a larger sample and further analysis, a relationship between enclosure and workstyle might have been found, as proposed by the FMI study.

Subjects had a normal distribution of workstyles, similar to that found in the general office population, and in random populations in other studies (Williams et al., 1985; and Myers and McCaulley, 1985). Therefore, results were not skewed toward any one workstyle. However, for variables where one facet was chosen out of a group, such

as one of five possible layouts, some workstyles having a smaller sample size had a frequency too low to determine significant relationships with these variables. A larger sample, with other than manufacturing companies, could have yielded different results.

The Facility Management Intitute (FMI) study found higher job satisfaction among people whose workstyle, organizational culture, and work place were the same cognitive type, than that of people for whom these factors did not match up. This study was not consistent with FMI's findings. Several factors may have contributed to the discrepancy between the two studies. FMI reported only that there was a higher job satisfaction, but did not report if this difference was statistically significant. Also, they determined organizational culture and workplace characteristics arbitrarily, although based on the Myers-Briggs Testing Indicator (MBTI).

In the FMI study, more focus was given to the varying needs of different workstyles with respect to small-scale environmental facets--such as personalization and degree of clutter--than to the larger-scale facets observed in this study. It may be that these small facets do have distinct differences among workstyles, although these were not observed. Still, it can be concluded that for the environmental facets observed in this study, with the exception of

enclosure, subjects needs did not differ according to workstyle.

Job Description

In contrast to the findings on workstyle, job description significantly determined need for enclosure, floor area, interaction distance, and orientation to door, considering the definition used for clerical workers, managers, and observed environmental facets.

The definitions of clerical worker and manager may have had some effect on the overall findings about job description. Clerical subjects had a wide variety of job titles and levels of responsibility. The same was true for managers. More definitive job categorizations may have generated clearer findings. Discussions follow for each of the environmental facets found related to job description, with specific conclusions and relevent limitations.

Enclosure. Enclosure was analyzed statistically as a percentage, and graphically as a series of steps. Each measure and its' analysis strengthens and verifies the results of the other. Strong differences were present between clerical and managers' needs for enclosure in both cases. Clerical workers needed 63% enclosure on average, and managers needed 80%. The majority of managers preferred

high enclosure. Clerical workers also preferred high enclosure, but had a higher number of responses in the low and moderate enclosure categories than managers did.

Enclosure was measured in both open and closed office arrangements for the total work area rather than the individual's workspace. This definition in itself provided a difference between clerical workers and managers' degrees of enclosure. Both in this sample and in the study by the Buffalo Organization for Social and Technological Innovation, clerical workers tended to choose open spaces more often than managers. The results therefore, reflect BOSTI's findings, but also yield a limitation: Differences between the two job descriptions might not have been as pronounced if managers and clerical workers were limited to the same type space--open or closed.

Floor Area. The definition of floor area created a difference in the square footages needed by clerical workers and managers. Had a different definition been used, more consistency in square footages needed by clerical workers and managers might be found.

Considering the way in which total work area was measured, findings were the same those of the Buffalo Organization for Social and Technological Innovation (BOSTI)--The current trend of office design theories and

organizational policies give managers more total floor area than clerical workers. However, a separate analysis of immediate workspace--consisting of primary, secondary, and tertiary workspaces only--found conclusively that managers and clerical workers in the sample needed about the same square footage for this functional space.

Interaction Distance. Significant differences between the needs of clerical workers and managers for interaction distance were not conclusive due to two definitions being used for this environmental facet (straight line and walking). The significant findings might have differed, had a more precise definition been used.

Orientation to Door. Orientation to door had two measures--location of the door from the primary worksurface and from the secondary worksurface. These were so closely related that they are observed together in discussion.

Both measures were significantly different between clerical workers and managers, and were highly dependent upon enclosure. When enclosure was high, direct front and behind orientations were preferred by all job types, with front offset and direct side preferred the least. These were the same for managers, the majority of whom had high enclosure. When enclosure was low, behind was the most

preferred orientation of all job types, with direct side next, then direct front, and no preference for front offset or side offset. These were the same for clerical workers, the majority of whom preferred low enclosure. Therefore, when enclosure differences were considered, there was no difference in the orientation to door preferences of clerical workers and managers.

This finding is conclusive, based on the definitions of orientation to door, clerical worker, and manager used for this sample group. Orientation to door findings were in accord with BOSTI's conclusions that there are no differences in this environmental need for clerical workers and managers.

However, this study does differ with BOSTI on the optimum location of the entrance for all job types. BOSTI recommended always using a door to the front of the worker and never to the back. This recommendation is acceptable with the findings of this study for the front orientation, because BOSTI also recommended high enclosure for virtually all job types or the semblance of high enclosure through control over surroundings. However, results showed conclusively that orientation to door from behind was also preferred with high enclosure, and was preferred over a front orientation with low or moderate enclosure by the subjects.

It is important to note that orientation to door cannot be considered without the combined effects of barriers and straight line interaction distance.

Data on interaction distance was not conclusive due to the combining of both measures for interaction distance (straight line and walking). Further observation of these variables separately would be needed to identify their influence on orientation to door preferences.

When barriers and orientation to door were observed together, barriers were present in the majority of all orientations, with two exceptions--behind and direct side. For the behind orientation there was about an even split between use and non-use of barriers. Two-thirds of the sample using direct side orientation did not use barriers.

Even though cell frequencies were somewhat low for these orientations, a definite trend was observable. From these findings it can be stated that orientation to door did differ significantly between clerical workers and managers in the sample, with barriers present between workers and the entrance to the space, and no consideration of interaction distances.

Company Affiliation

Subjects from different companies had different enclosure, floor area, and interaction distance needs.

However, regardless of the significant differences found, the findings are not conclusive for several reasons. A discussion of these follows.

Enclosure and Floor Area. Enclosure and floor area were determined by company policy in several of the organizations from which the sample was drawn. This factor may have influenced the enclosures and floor areas used by subjects.

Interaction Distance. The way in which interaction distance was measured makes the data inconclusive, as was the case with job description.

Other Considerations. The foremost characteristic of the data on company affiliation is that it was a strong reflection of job description data, rather than an actual measure of company trends. In some companies, the subjects were primarily from one job description. In all companies, the company affiliation variables were determined by averaging the preferences of all the workers in that company for variables. Therefore, the preference of the company for each variable was determined by the larger percent job description represented in the sample from that company. Because of this enhancement of job description

data, it cannot be conclusive according to company affiliation.

Summary

All conclusions must be considered in light of the sample characteristics. The majority of companies were manufacturing and tended to be bureaucratic in organizational culture. Most of the business of mid- and lower-level managers and clerical workers in this type company is "in-house" rather than public, which means the emphasis is not as service-related as other types of companies might be.

These organizational elements may have significantly influenced subjects' responses for the environmental facets observed in this study, which are usually determined by organizational policy and not flexible according to workers' preferences in this type organization.

In light of this information, further research would be required before conclusions could be drawn on the relationship between organizational culture/company affiliation and environmental facets needs.

Implications of Research Findings on the Design of Work Environments

Implications of research findings on the programming and design of work environments are shown in Figure V-1, which identifies quantitative and qualitative aspects of the environmental facets observed.

These implications may be appropriate for manufacturing organizations with a bureaucratic culture, similar to the organizations from which subjects were drawn for this study.

Recommendations

The recommendations are geared toward the design researcher by offering ideas both for further research in office design, and also for the use of scale models in such research. These recommendations are divided by the categories of methodology, definition of variables, and future research.

Recommendations for Research Methodology in Parallel Studies

1. A wider geographical area and more variety in company product and organizational style would provide

ENVIRONMENTAL FACET	AMOUNT NEEDED	SPECIFIC REQUIREMENTS
Barriers	only needed if entrance to back, or anywhere in front of worker.	Barriers needed 50% of the time if entrance to back of worker, 80-100% of time if entrance anywhere in front of worker, and only 20% of time if entrance to the direct side of the seated worker.
Enclosure	* C-low, moderate, or high	Clerical workers prefer low and moderate enclosure only if the entrance to workspace is behind or to the side of the seated worker.
	* M-high	
Entrance to workspace	C-(1) back (2) direct side	The least preferred locations for entrance were to the direct front, front offset, and side offset.
	M-(1) back (2) direct front	With low and moderate enclosure, front offset, side offset, and direct front entrance locations are not preferred.
Floor area:		
-Total work area	C-125 sq. ft. M-195 sq. ft.	Total work area includes circulation and conference space.
-Workspace area	C-68 sq. ft. M-72 sq. ft.	Workspace area is just the areas encompassing work surfaces, and not including circulation and conference space.
Storage:		
-Open shelf	6 to 15 ft.	
-Closed shelf	4 to 9 ft.	
-File drawers	5 to 10	
Work Surfaces:		
-width	9 to 18 ft.	
-area	34 to 36 sq. ft.	
-number	2 or more	
-layout	(1) Parallel and U-shaped (2) L-shaped	The least popular layouts were detached and singular.

* = definitions of degrees of enclosure:

Low - panels that a worker can see over when seated on three or more sides; or no enclosure on at least three sides, with any height panel on the fourth side.

Moderate - panels that a worker cannot see over when seated, and open on a minimum of two sides.

High - panels a worker can just see over when standing up to walls to ceiling height walls, on at least three sides.

C = clerical worker's need.

M = manager's need.

(1), (2), etc. = order of preference for facet.

Figure V-1. Environmental facets needs of office workers.

information effective for use in the broader scope of office design.

2. Other job descriptions should be observed, including professional-technical workers, as well as different types of managers (information vs. people managers), and clerical workers (reception, keyboard, etc.). Also, a more specific analysis of task and level of responsibility of subjects could yeild more insight into fine-tuning of the environment according to job description.

3. Other organizational theory indicators such as the Managerial Grid and Likert's System IV could be used to identify organizational theories in use in companies.

4. Scale figures of different body proportions to fit different population groups should be used, to facilitate fine-tuning of models more closely attuned to full scale.

5. Environmental facets--such as display and personalization, amount of clutter, etc.--that are more fine-tuned than the ones observed in this study should be observed to identify if they are related to workstyle.

Recommendations for Definition of Variables

1. Enclosure should be defined only as a series of steps and not as a percentage of total enclosure.

2. The ratio of open to closed-shelf storage should be observed.

3. Interaction distances should be observed with several different variables: distance from seated worker to the entrance; distance from the seated worker to the point at which a visitor most often stands to interact with them; and distances for long-term, seated communication between visitor and worker.

4. The relationship among layout, orientation to door from the primary and secondary workspaces, and the presence of barriers should be observed.

Recommendations for Future Research

1. A questionnaire format could be used to analyze worker attitudes in order to:

a) more clearly determine differences among workstyle, job description, and organizational theories.

b) verify environmental facets measured by scale models.

2. Further study on the interrelated nature of environmental facets could be done in order to identify how these can be manipulated to design environments that are physically different, but provide

(a) the same "feeling" to workers.

(b) the same degree of function, comfort, and efficiency to workers.

3. The scale model method could be used to further understand why users have certain environmental requirements by asking them to:

(a) choose between a limited number of scale model work environment designs.

(b) identify what they feel "works" and "doesn't work" in a given scale model environment.

4. Since this study involved primarily bureaucratic manufacturing companies, parallel studies would be appropriate in professional, governmental, and institutional settings which have a different organizational framework.

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APPENDIXES

APPENDIX A

CONTENTS OF INFORMATION PACKET SENT TO COMPANIES

THE UNIVERSITY OF TENNESSEE
KNOXVILLE

March 1, 1988

College of Human Ecology

Textiles, Merchandising and Design

!name1! !name2! !name3!
!title!
!company!
!address!

Dear !name1! !name3!:

A few days ago, we discussed the possibility of your company participating in the office design research for my Master's thesis in Interior Design at the University of Tennessee. Enclosed is information on what is involved in the research.

You will notice on the "Phases of Research Activity" sheet a summary of the process I would like to follow with your company. The "Company Involvement" column explains your contribution. Participants need to be a cross-section of clerical, managerial, or executive personnel. As many participants as you can afford will be greatly appreciated, since a larger sample allows for greater reliability of the research results. Included in the appendix of the thesis abstract are examples of the checklists filled out by each participant, a copy of the Myers-Briggs Testing Indicator, and guidelines used to conduct a scale model office construction. As you can see under step four of the "Phases of Research Activity" sheet, a place will be needed within your offices to meet with employees for the scale model office construction portion of the research. These meetings will take about one hour per person, and will require one day for every five people involved.

Input gathered from your employees will be combined with that of similar personnel from other companies. Complete confidentiality will be maintained for your employees and your company. You will receive a summary of these results in appreciation for your assistance.

This thesis should provide you with valuable information on how specific factors in your office environment have an impact on comfort, satisfaction, and productivity. The enclosed paper "Current Office Design Research: Managerial and Financial Implications for the Organization" and thesis abstract give you additional information on what is currently known about the relationship between the office environment and productivity in dollar values, and about the goals and basis of this research.

If you have questions, feel free to contact me at (615) 974-2141. If you choose to participate, please complete the enclosed form within one week, and return in the envelope provided. I will be calling you soon to set up a time to visit your company during March or the first week of April. I look forward to speaking with you again, and hope that you will see this as an opportunity to contribute firsthand to research that aims to enhance current understanding of the relationship between design and organizational effectiveness.

Sincerely,

Gratia Downs
Graduate Student in Interior Design

Apparel/Interior Design/Merchandising/Textile Science
1215 West Cumberland Avenue, Room 230/Knoxville, Tennessee, 37996-1900/(615) 974-2141

SUGGESTED PERSONNEL FOR INTERIOR DESIGN RESEARCH PARTICIPATION:

Company name and address: Contact person:

!company! !namea! !nameb! !namec!
!address! !title!

Please list below the individuals which might want to participate in this research. And return this form in the enclosed envelope within one week. Thanks!

Name:	Job title:	Organizational level: first 1 2 3 top	Office phone number:
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PHASES OF RESEARCH ACTIVITY

time frame:	activity:	company involvement:
variable	1. Company approval.	-list of employees to contact.
immed. after company approval	2. Contact of employees-- information packet given to each to describe research and obtain individual consent. Activity Information Sheets and Motivational Principles in Use checklist included for completion prior to meeting with researcher.	
after receiving information packet	3. Appointment scheduling- Employees called by researcher to schedule one hour appointments with each for scale model office construction.	
approx. one week after receive packet	4. Meet with employees one at a time to observe scale model office constructions. Employees refer to Activity Information Sheets to accomodate typical job activities in model office. After meet, employees given Myers-Briggs testing Indicators for later return to researcher.	-room with lg. table (6'x 3', or 18 sq. ft.) and away from view/hearing of other employees and office spaces.
(optional)	4A. Analysis of organizational theory in meeting with company-selected manager.	
June/ July 1988	6. Analysis of study results- Written report to company. Summaries of study to interested employees. Optional follow up meeting.	

Thank You!

A B S T R A C T

The Implications of Workstyle/Personality Type of
Office Workers on Work Environment Factors
Within the Corporate Structure.

by Gratia Downs

Corporate employees at the clerical, middle-management, and executive levels will be given Myers-Briggs Testing Indicators to determine workstyle. The Myers-Briggs Testing Indicator is a 50-item questionnaire which asks individuals to choose between two or three responses related to their basic preferences in regard to ways of perceiving and making decisions. From these responses, the individual's "style" of working can be expressed as one of four different types: Stabilizer, Cooperator, Catalyst, and Visionary.

Employees are also given Activity Information Sheets with lists of typical office activities such as reading information, typing, computing, meetings, etc.. When they have checked off the activites they do often, sometimes, or not at all, they use this sheet to remind them of the things they use in their office to support these activites. In addition, they receive a checklist of Motivational Principles in Use in the organization. From this which of the most commonly used organizational theories is most prevalent in the company may be identified.

This is then used when the employee constructs a scale model work environment of 1"=1'-0" scaled office furniture.

They are to construct with this model what they feel is the most efficient and comfortable workspace possible for their current job, and the one in which they feel they would be most productive.

From these scale models, enclosure, floor area, furniture layout, and furniture inventory factors will be measured. A statistical analysis will then be done to determine if there is a significant relationship between workstyle and preference for these environmental factors.

The final result will be a checklist of work environment factor preferences for each workstyle, for use by designers in large scale commercial projects when a personal interview for each worker is impractical.

An analysis of organizational/management theory in use in the organization will also be done by interviewing specific individuals in the organization familiar with theories they use. Various managerial theories such as Likert's System IV, the Managerial Grid, etc. will be used to identify implications that the theory in use by the company may have on design requirements, and how these affect work environment preferences to be used as a basis for design. See attatchments.

ACTIVITY INFORMATION SHEET

Please place a:

1. checkmark ( ) beside the activities which you do on the job, and
2. circle around the number corresponding to the heading which best describes the amount of time you spend doing this activity.

	ACTIVITY:	TIME SPENT: rarely				frequently
____	answering the phone	1	2	3	4	5
____	calculating	1	2	3	4	5
____	compiling	1	2	3	4	5
____	conducting meetings in my workspace	1	2	3	4	5
____	conducting meetings elsewhere	1	2	3	4	5
____	dictating	1	2	3	4	5
____	evaluating	1	2	3	4	5
____	filing	1	2	3	4	5
____	greeting/directing visitors	1	2	3	4	5
____	keeping records	1	2	3	4	5
____	keyboarding into computer	1	2	3	4	5
____	making graphics	1	2	3	4	5
____	photocopying	1	2	3	4	5
____	planning	1	2	3	4	5
____	reading	1	2	3	4	5
____	scheduled meetings	1	2	3	4	5
____	scheduling	1	2	3	4	5
____	searching/locating files	1	2	3	4	5
____	sorting/routing mail	1	2	3	4	5
____	taking messages	1	2	3	4	5
____	talking confidentially in workspace	1	2	3	4	5
____	talking on phone	1	2	3	4	5
____	thinking	1	2	3	4	5
____	transcribing dictation	1	2	3	4	5
____	traveling	1	2	3	4	5
____	typewriting	1	2	3	4	5
____	unscheduled meetings	1	2	3	4	5
____	writing	1	2	3	4	5

MOTIVATIONAL PRINCIPLES IN USE

The purpose of this questionnaire is to determine the motivational principles and theories most favored by today's managers. Please read each description carefully and mark the appropriate category. Indicate your organizational level, and your job title, in order to help categorize results.

Organizational level:

_____ First _____ Middle _____ Top

Job Title: _____

Check any appropriate block.	Unfamiliar	Familiar	Used in my Organization
Herzberg's Theory of Job Satisfaction- satisfiesrs as motivaters, dissatisfiers as hygiene factors			
Maslow's Hierarchy of Needs- physiological, safety, membership, self-esteem, recognition, self-actualization			
McGregor's Theory X & Theory Y- two basic assumptions on human behavior			
Managerial Grid- graph of production concerns vs. concerns for people			
Likert's System IV- four systems to categorize organizations			
In Search of Excellence- eight basic principles to stay on top			
McClelland's Achievers- scoring people's need for achievement			
Porter & Lawler's Satisfaction Theory- performance yields rewards, rewards yield satisfaction			
Likert's Principle of Supportive Relationships- linking pin team management			
Vroom's Valence Theory- motivation = Sum of valence x expectancy			
Argyris' Development Principles- normal development from infant to adult			
MBO- management by objectives			
Quality Circles- team management concept			
Hersey & Blanchard's LASI- situational management			
Tannenbaum & Schmidt's Leadership Patterns- democratic vs. authoritative			
Ouchi's Theory Z- Japanese approach to motivation			
Drucker's Survival Principles- modern businessperson's attitude			

GUIDELINES FOR SCALE MODEL STUDY

A) Introduction of model study:

Hello! I'm Gratia Downs. I am a graduate student in interior design. My thesis is centered around office design and scale models. I appreciate you taking the time to give me input from your experience in working in an office.

You know your job and how you do it better than anyone else. You know which things in your environment make it easy to get on with your work and which things prevent you from getting your work done as efficiently as possible. **What I want to know is what type of office environment you feel would be most comfortable, functional, and efficient for you to work in.**

B) Demonstration of how to use scaled furniture to construct a model:

The purpose of the scaled furniture is so that you can put the pieces together and form a work environment that feels like you could really work well there. There aren't any constraints, except that there can't be any exterior walls or windows to the outside of a building.

Begin with the furniture pieces and the scale figure. See how it feels when you use the figure to walk around and use the furniture pieces (demonstrate). You may move the pieces as much as you need to. Make the space as complete as possible. All of these pieces are accessories such as computers, typewriters, and miscellaneous pieces that can be plants, tables, wastebaskets, telephones, organizers, books, and stacks of things. After you get some of the furniture pieces in, you may start to add walls, if you want them. There are partial height walls, full height walls, doors, and windows to the interior. This is how the walls work (demonstrate), and this is how things that stick on the walls work (demonstrate).

C) Use of videotapes:

I am videotaping this process so that I can look back at it for reference.

(a) It is strictly for my own use in recording data from your model.

(b) I see that you have signed the agreement to allow use of the videotape for classroom teaching purposes. Thank you. It will be very helpful to me in teaching interior design students how to identify what is important to people in their offices, as well as how to do model studies like this one.

D) Final instructions:

You may start anywhere on the base, and take as much or as little space as you need. If you don't find something you need, tell me and I will try to make or find it. It will help me to understand what you are doing if you talk about the space as you make it, and tell me what you feel about the space. Feel free to ask any questions.

E) Questions to ask **during** the model study:

You seem to have a work grouping there. Using the scale figure and the Activity Information Sheet you have already filled out, go through a day and show me what you do.

When you are working in the space, where does one work area stop and another one or type of area begin? Which is the primary/secondary work area? How do you use it?

How do you use various storage areas differently?

Where is the entrance to the space? What/who is outside the office?

Where would you interact with people in the space? For what type activity?

When other people are in the space, interacting with you, show me where your space stops and they are at a comfortable distance.

How does the space feel to you?

Do you think that you could work comfortable, functionally, and efficiently in this space? Would you enjoy working here?

Does anything need changing? Is it missing anything important?

Myers-Briggs Type Indicator

PART I. Which Answer Comes Closer to Telling How You Usually Feel or Act?

MAKE AN "X" IN THE APPROPRIATE SQUARE

When you go somewhere for the day, would you rather
- ☐ plan what you will do and when, or
- ☐ just go?

If you were a teacher, would you rather teach
- ☐ fact courses, or
- ☐ courses involving theory?

Are you usually
- ☐ a "good mixer," or
- ☐ rather quiet and reserved?

Do you more often let
- ☐ your heart rule your head, or
- ☐ your head rule your heart?

In doing something that many other people do, does it appeal to you more to
- ☐ invent a way of your own, or
- ☐ do it in the accepted way?

Among your friends, are you
- ☐ full of news about everybody, or
- ☐ one of the last to hear what is going on?

Does the idea of making a list of what you should get done over a weekend
- ☐ appeal to you, or
- ☐ leave you cold, or
- ☐ positively depress you?

When you have a special job to do, do you like to
- ☐ organize it carefully before you start, or
- ☐ find out what is necessary as you go along?

Do you prefer to
- ☐ arrange dates, parties, etc., well in advance, or
- ☐ be free to do whatever looks like fun when the time comes?

Do you usually get along better with
- ☐ realistic people, or
- ☐ imaginative people?

When you are with a group of people, would you usually rather
- ☐ join in the talk of the group, or
- ☐ talk with one person at a time?

Is it a higher compliment to be called
- ☐ a person of real feeling, or
- ☐ a consistently reasonable person?

In reading for pleasure, do you
- ☐ enjoy odd or original ways of saying things, or
- ☐ like writers to say exactly what they mean?

Do you
- ☐ talk easily to almost anyone for as long as you have to, or
- ☐ find a lot to say only to certain people or under certain conditions?

Does following a schedule
- ☐ appeal to you, or
- ☐ cramp you?

When it is settled well in advance that you will do a certain thing at a certain time, do you find it
- ☐ nice to be able to plan accordingly, or
- ☐ a little unpleasant to be tied down?

Are you more successful
- ☐ at following a carefully worked out plan, or
- ☐ at dealing with the unexpected and seeing quickly what should be done?

Would you rather be considered
- ☐ a practical person, or
- ☐ an ingenious person?

In a large group, do you more often
- ☐ introduce others, or
- ☐ get introduced?

Do you usually
- ☐ value sentiment more than logic or
- ☐ value logic more than sentiment?

Would you rather have as a friend
- ☐ someone who is always coming up with new ideas, or
- ☐ someone who has both feet on the ground?

Can the new people you meet tell what you are interested in
- ☐ right away, or
- ☐ only after they really get to know you?

(On this next question only, if two answers are true, mark both.)
In your daily work, do you
- ☐ usually plan your work so you won't need to work under pressure, or
- ☐ rather enjoy an emergency that makes you work against time, or
- ☐ hate to work under pressure?

Do you tend to have
- ☐ broad friendships with many different people, or
- ☐ deep friendships with a very few people?

Do you admire more the people who are
- ☐ conventional enough never to make themselves conspicuous, or
- ☐ too original and individual to care whether they are conspicuous or not?

Do you usually
- ☐ show your feelings freely, or
- ☐ keep your feelings to yourself?

PART II. Which word in each pair appeals to you more?

THINK WHAT THE WORDS MEAN, NOT HOW THEY LOOK OR HOW THEY SOUND

☐ Scheduled	☐ Unplanned	☐ Systematic	☐ Spontaneous	☐ Systematic	☐ Casual		
☐ Facts	☐ Ideas	☐ Statement	☐ Concept	☐ Certainty	☐ Theory	☐ Literal	☐ Figurative
☐ Quiet	☐ Hearty	☐ Reserved	☐ Talkative	☐ Calm	☐ Lively		
☐ Convincing	☐ Touching	☐ Analyze	☐ Sympathize	☐ Justice	☐ Mercy	☐ Foresight	☐ Compassion
☐ Imaginative	☐ Matter-of-Fact	☐ Create	☐ Make	☐ Fascinating	☐ Sensible		
☐ Benefits	☐ Blessings	☐ Determined	☐ Devoted	☐ Firm-Minded	☐ Warm-Hearted	☐ Hard	☐ Soft
☐ Peacemaker	☐ Judge	☐ Gentle	☐ Firm	☐ Feeling	☐ Thinking		

Current Office Design Research:
Managerial and Financial Implications for the Organization
by Gratia Downs

Ninety to ninety-two percent of life cycle dollar outlay by an office-based organization is for personnel and salary benefits. Only 8-10% is spent on building and equipment. "These data suggest that if an investment in physical planning and design could be made that would favorably influence organizational effectiveness, and therefore reduce personnel costs, total life cycle costs could be substantially reduced." (Wineman, p.xiii, 1986).

Organizational effectiveness is a direct result of both job satisfaction and job performance. (Winemann, 1986; Sundstrom, 1986; Brill et. al.,1984; Sommer, 1983; Becker, 1981). BOSTI (the Buffalo Organization for Social and Technological Innovation) has found overall improvement of the office environment to be a key factor in job performance and job satisfaction. Their research has gone the farthest in giving tangible evidence of the economic benefits gained from an environment that ±taps the interest of its employees'. This is one of the largest and most comprehensive research projects ever done on the link of the work environment to overall organizational effectiveness. With a sample of already over 10,000 office workers, ongoing research continually being added to the results. (Wineman, 1986).

BOSTI observed eighteen facets of the office environment to determine a relationship between these and environmental satisfaction, ease of communication, job satisfaction, and job performance. (Figure 1.) These results show that there is a definite relationship between the office environment and organizational effectiveness.

There are economic improvements as well. Reduced absenteeism and turnover, resulting from improvement of these factors in the office environment, is worth an annual value of "about 17% of annual salary" for clerical workers and "about 15% of annual salary" for managers and professional/technical office workers. Dollar values of these actual savings are $6,316 per manager (Figure 2.), $4,650 per professional/technical worker (Figure 3.), and $3,042 per clerical worker (Figure 4.) annually. (Data is based on average salaries of 6,500 office workers at 156 sites across the U.S.) (Brill, et. al., pp.29-31, 1984.)

Economic returns which result from increased job performance and job satisfaction are a result of the improved fit between the physical setting and the work process. (Wineman, 1986). "Job performance refers to the effectiveness with which the individual accomplishes assigned tasks, according to such criteria as quantity, quality, or efficiency. The physical environment can influence these outcomes through psychological processes" (Sundstrom, p.4, 1986).

FACETS & BOTTOM-LINE MEASURES

- Showing the 18 facets which comprise office space, with a bar (▬) indicating which facets relate to bottom-line measures

	BOTTOM-LINE MEASURES			
FACETS	**ENV. SAT.**	**EASE COMM.**	**JOB SAT.**	**JOB PERF.**
ENCLOSURE	▬	▬		▬
LAYOUT	▬	▬		▬
FURNITURE	▬	▬	▬	
NOISE	▬	▬	▬	
FLEXIBILITY	▬	▬	▬	
PARTICIPATION	▬		▬	
COMFORT	▬		▬	
COMMUNICATION	▬	(IS THE SAME)	▬	
LIGHTING	▬		▬	PROBABLY
TEMP./AIR QUAL.	▬		▬	
FLOOR AREA		▬	▬	
PRIVACY	▬	▬		
STATUS	▬	▬		
PATHFINDING	▬	▬		
DISPLAY	▬			
APPEARANCE	▬			
OCCUPANCY		▬		POSSIBLY
WINDOWS	POSSIBLY		POSSIBLY	

Figure 1. Eighteen environmental facets observed by BOSTI in Using Office Design to Increase Productivity. (Brill, et.al., 1984.), and the presence or absence of their relationship to certain bottom-line measures.

VALUE OF BENEFITS FROM IMPROVEMENTS OF ALL FACETS OF ENVIRONMENT TAKEN TOGETHER

MANAGERS
(AVG. SALARY: $41,500)

All Facets that Relate to Job Satisfaction, Taken Together	Annual Value	Net Present Value for Five Years
Noise	$ 344	$ 1,306
Temperature Fluctuation	235	890
Glare	195	740
Comfort[1]	—	—
Floor Area[2]	—	—
Relocation Frequency	405	1,535
Work Surface Width[3]	—	—
Storage (Personal)[4]	—	—
Ease of Communication	52	196
Participation[5]	—	—
TOTAL, JOB SATISFACTION:	$ 1,231	$ 4,664
All Facets that Relate to Job Performance, Taken Together	**Annual Value**	**Net Present Value for Five Years**
Enclosure	$ 2,943	$ 11,151
Layout	2,142	8,116
TOTAL, JOB PERFORMANCE:	$ 5,085	$ 19,267
All Facets that Relate to Job Performance, and Job Satisfaction Taken Together	**$ 6,316** (about 15% of annual salary)	**$ 23,931**

[1]COMFORT: Relates only to professional/technical workers
[2]FLOOR AREA: Only *decreases* in floor area relate to job satisfaction
[3]WORK SURFACE WIDTH: Only *decreases* in work surface width relate to job satisfaction
[4]STORAGE (PERSONAL): Relates only to clerical workers
[5]PARTICIPATION: No dollar value estimate can be developed for improvements in participation, given the numbers we have.

Figure 2. Value of benefits from improvements in manager's offices due to decreased absenteeism and turnover resulting from increased job satisfaction and job performance.

VALUE OF BENEFITS FROM IMPROVEMENTS OF ALL FACETS OF ENVIRONMENT TAKEN TOGETHER

PROFESSIONAL/TECHNICAL WORKERS

(AVG. SALARY: $31,600

All Facets that Relate to Job Satisfaction, Taken Together	Annual Value	Net Present Value for Five Years
Noise	$ 254	$ 962
Temperature Fluctuation	141	534
Glare	132	500
Comfort[1]	170	674
Floor Area[2]	—	—
Relocation Frequency	252	955
Work Surface Width[3]	—	—
Storage (Personal)[4]	—	—
Ease of Communication	36	136
Participation[5]	—	—
TOTAL, JOB SATISFACTION:	$ 993	$ 3,762
All Facets that Relate to Job Performance, Taken Together	**Annual Value**	**Net Present Value for Five Years**
Enclosure	$ 2,241	$ 8,491
Layout	1,416	5,365
TOTAL, JOB PERFORMANCE:	$ 3,657	$ 13,856
All Facets that Relate to Job Performance, and Job Satisfaction Taken Together	**$ 4,650** (about 15% of annual salary)	**$ 17,668**

[1]COMFORT: Relates only to professional/technical workers
[2]FLOOR AREA: Only *decreases* in floor area relate to job satisfaction
[3]WORK SURFACE WIDTH: Only *decreases* in work surface width relate to job satisfaction
[4]STORAGE (PERSONAL): Relates only to clerical workers
[5]PARTICIPATION: No dollar value estimate can be developed for improvements in participation, given the numbers we have.

Figure 3. Value of benefits from improvements in professional/technical worker's offices due to reduced absenteeism and turnover, resulting from increased job satisfaction and job performance.

VALUE OF BENEFITS FROM IMPROVEMENTS OF ALL FACETS OF ENVIRONMENT TAKEN TOGETHER

CLERICAL WORKERS

(AVG. SALARY: $17,400)

All Facets that Relate to Job Satisfaction, Taken Together	Annual Value	Net Present Value for Five Years
Noise	$ 102	$ 387
Temperature Fluctuation	70	264
Glare	70	267
Comfort[1]	—	—
Floor Area[2]	—	—
Relocation Frequency	122	463
Work Surface Width[3]	—	—
Storage (Personal)[4]	523	1,982
Ease of Communication	18	70
Participation[5]	—	—
TOTAL, JOB SATISFACTION:	$ 905	$ 3,429
All Facets that Relate to Job Performance, Taken Together	**Annual Value**	**Net Present Value for Five Years**
Enclosure	$ 1,237	$ 4,687
Layout	900	3,450
TOTAL, JOB PERFORMANCE:	$ 2,137	$ 8,094
All Facets that Relate to Job Performance, and Job Satisfaction Taken Together	**$ 3,042** (about 17% of annual salary)	**$ 11,526**

[1]COMFORT: Relates only to professional/technical workers
[2]FLOOR AREA: Only *decreases* in floor area relate to job satisfaction
[3]WORK SURFACE WIDTH: Only *decreases* in work surface width relate to job satisfaction
[4]STORAGE (PERSONAL): Relates only to clerical workers
[5]PARTICIPATION: No dollar value estimate can be developed for improvements in participation, given the numbers we have.

Figure 4. Value of benefits from improvements in clerical worker's offices due to reduced absenteeism and turnover resulting from increased job satisfaction and job performance.

These processes are"cognitive styles" the way in which people perceive and evaluate information. Workstyle, developed from these cognitive styles, is the way people perceive, evaluate, and communicate information. (Williams, p.25-26, 1985). The most recent published large scale study of environmental behavior and organizational effectiveness was done by the Facility Management Institute of the Herman Miller Research Corporation. (Williams, 1985.) Based on Carl Jung's theory of cognitive styles, FMI measured workstyle. The most optimal workspace for increasing job performance, and for most individuals, will have to be one that is designed to facilitate workstyle.

According to FMI's theory, certain characteristics are expected to be true of each workstyle:

Stabilizers are expected to desire stability, a sense of permanence, desire for privacy while working, and a desire for security.

Cooperators are expected to want a high level of personal interaction, to consider the ordering of facts as their method of understanding the world, and desire an opportunity for easy access to others.

The Visionary is expected to have a desire to be aware of all relevant information past and present, wants reference data close at hand, develops a "big picture" of things, and wants a negotiable degree of privacy.

> The Catalyst mixes personal items with business, rarely discards anything (commonly called a "packrat"), and is adept at working with others. (Williams, 1985.)

This research aims to identify, rather than just propose, what the specific work environment preferences are of each workstyle, for some of the environmental facets outlined by BOSTI. How strong the correlations are between these facets and workstyles will help designers to know more specifically what environmental needs are for office workers. In doing this, designers can improve the fit between the employee and their workspace, and therefore improve overall organizational effectiveness, and get more return on investment from not only building and equipment, but also personnel and salary costs.

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APPENDIX B

CONTENTS OF INFORMATION PACKET SENT TO SUBJECTS PRIOR TO SCALE-MODEL STUDIES

THE UNIVERSITY OF TENNESSEE
KNOXVILLE

College of Human Ecology

Textiles, Merchandising and Design

!letterdate!

!namea! !nameb! !namec!
!company!
!address!

Dear !namea! !namec!:

As an employee of !company!, and an individual who works in an office, you have the opportunity to participate in some exciting new research. Under the direction of the Interior Design program at the University of Tennessee, Knoxville, the environmental needs of people who work in offices are being researched. Your company is helping in this effort by inviting you to participate.

The purpose of this research is to develop a body of information that interior designers and office managers can use to make offices more comfortable, efficient, and in general more enjoyable for the people who work in them.

Your input is needed. How better to learn what your workspace needs are than to ask you? I will be at your company on !dates!, and will be calling to schedule a one-hour appointment with you at this time. The attatched consent form explains the details of your involvement. If you are willing participate, please sign this form and keep one copy for your records. Your identity will be kept completely confidential, as explained in the consent form. Please also fill out the enclosed Activity Information Sheet, and Motivational Principles in Use prior to our meeting.

Your participation in this research will be greatly appreciated. The overall results of the research, involving office workers from other companies as well, will be useful to your company in making your office space a more enjoyable place to work. I look forward to meeting with you.

Sincerely,

Gratia Downs
Graduate Student in Interior Design

Apparel / Interior Design / Merchandising / Textile Science
1215 West Cumberland Avenue, Room 230 / Knoxville, Tennessee, 37996-1900 / (615) 974-2141

The Implications of Workstyle and Organizational Level of Office Workers on Work Environment Factors within the Corporate Structure

by Gratia Downs, Graduate Student in Interior Design, University of Tennessee, Knoxville

The purpose of this study is to determine characteristics preferred in work environments by office workers, in order to design offices that are more functional, efficient, and comfortable.

Your participation will take about 1 1/2 hours. You will be asked to:

1. Identify on a list: a) the typical activities you do in your work, and the relative amount of time you spend doing each, and b) the motivational principles managers in your organization use.
2. Spend about one hour constructing a scale model (with pre-made miniature office furniture provided by the researcher) of what you feel to be the most functional, comfortable, and efficient office for you in your job.
3. Answer a 50-item questionnaire (Myers-Briggs Testing Indicator) about your preferences. This will be evaluated by the researcher and the results returned to you.

The benefit you receive from this study are; short term--the results of the Myers-Briggs Testing Indicator--a description of the personality type indicated for you by your answers on the questionnaire; and, more indirect and long term--the improvement of your workspace's comfort, function, and efficiency through the possible application of principles developed from this research. There are no known risks to you from these research procedures. Your participation is voluntary, and you may refuse to participate at any time during the process without penalty or loss of benefits.

Your identity will be kept confidential. The scale model will be videotaped, however, only your hands, voice, and the model itself will show on tape. This tape will be for the sole use of the researchers in recording information from the scale model construction. If you agree, by signing the (b) statement at the bottom of this page, to allow us to use information gathered from you for classroom teaching purposes, your videotape may be used for demonstration purposes to college students in interior design. In all cases, your identity will be protected and removed from all papers and videotapes before use. Only the researchers will have access to information gathered from you. These are: Gratia Downs, graduate student; Thomas Houser, assistant professor; Alton DeLong, professor; and Suzanne Armentor, graduate student. All may be reached at the address and phone number listed below. All papers and videotapes will be kept solely by these individuals in a secure place known only to them. Only overall results will be reported, and no reference will be made to individuals.

If you have any questions about the research, either now or later, please contact Gratia Downs, or any of the researchers listed above, at the Department of Textiles, Merchandising, and Design; Room 230, 1215 West Cumberland Avenue; University of Tennessee, Knoxville; Knoxville, TN, 37996-1900, or call (615) 974-2141.

Please read both of the statements below and sign the appropriate one.

I have read and understood the explanation of this study and agree to:

(a) participate.

_____
Name (please print)

_____ _____
Signature Date

(b) participate and allow information gathered from me on papers and videotapes to be used for classroom teaching purposes.

_____
Name (please print)

_____ _____
Signature Date

Myers-Briggs Type Indicator

PART I. Which Answer Comes Closer to Telling How You Usually Feel or Act?

MAKE AN "X" IN THE APPROPRIATE SQUARE

When you go somewhere for the day, would you rather
- ☐ plan what you will do and when, or
- ☐ just go?

Do you prefer to
- ☐ arrange dates, parties, etc., well in advance, or
- ☐ be free to do whatever looks like fun when the time comes?

Are you more successful at
- ☐ following a carefully worked out plan, or
- ☐ dealing with the unexpected and seeing quickly what should be done?

If you were a teacher, would you rather teach
- ☐ fact courses, or
- ☐ courses involving theory?

Do you usually get along better with
- ☐ realistic people, or
- ☐ imaginative people?

Would you rather be considered
- ☐ a practical person, or
- ☐ an ingenious person?

Are you usually
- ☐ a "good mixer," or
- ☐ rather quiet and reserved?

When you are with a group of people, would you usually rather
- ☐ join in the talk of the group, or
- ☐ talk with one person at a time?

In a large group, do you more often
- ☐ introduce others, or
- ☐ get introduced?

Do you more often let
- ☐ your heart rule your head, or
- ☐ your head rule your heart?

Is it a higher compliment to be called
- ☐ a person of real feeling, or
- ☐ a consistently reasonable person?

Do you usually
- ☐ value sentiment more than logic or
- ☐ value logic more than sentiment?

In doing something that many other people do, does it appeal to you more to
- ☐ invent a way of your own, or
- ☐ do it in the accepted way?

In reading for pleasure, do you
- ☐ enjoy odd or original ways of saying things, or
- ☐ like writers to say exactly what they mean?

Would you rather have as a friend
- ☐ someone who is always coming up with new ideas, or
- ☐ someone who has both feet on the ground?

Among your friends, are you
- ☐ full of news about everybody, or
- ☐ one of the last to hear what is going on?

Do you
- ☐ talk easily to almost anyone for as long as you have to, or
- ☐ find a lot to say only to certain people or under certain conditions?

Can the new people you meet tell what you are interested in
- ☐ right away, or
- ☐ only after they really get to know you?

Does the idea of making a list of what you should get done over a weekend
- ☐ appeal to you, or
- ☐ leave you cold, or
- ☐ positively depress you?

Does following a schedule
- ☐ appeal to you, or
- ☐ cramp you?

(On this next question only, if two answers are true, mark both.)
In your daily work, do you
- ☐ usually plan your work so you won't need to work under pressure, or
- ☐ rather enjoy an emergency that makes you work against time, or
- ☐ hate to work under pressure?

When you have a special job to do, do you like to
- ☐ organize it carefully before you start, or
- ☐ find out what is necessary as you go along?

When it is settled well in advance that you will do a certain thing at a certain time, do you find it
- ☐ nice to be able to plan accordingly, or
- ☐ a little unpleasant to be tied down?

Do you tend to have
- ☐ broad friendships with many different people, or
- ☐ deep friendships with a very few people?

Do you usually
- ☐ show your feelings freely, or
- ☐ keep your feelings to yourself?

Do you admire more the people who are
- ☐ conventional enough never to make themselves conspicuous, or
- ☐ too original and individual to care whether they are conspicuous or not?

PART II. Which word in each pair appeals to you more?

THINK WHAT THE WORDS MEAN, NOT HOW THEY LOOK OR HOW THEY SOUND

☐ Scheduled	☐ Unplanned	☐ Systematic	☐ Spontaneous	☐ Systematic	☐ Casual		
☐ Facts	☐ Ideas	☐ Statement	☐ Concept	☐ Certainty	☐ Theory	☐ Literal	☐ Figurative
☐ Quiet	☐ Hearty	☐ Reserved	☐ Talkative	☐ Calm	☐ Lively		
☐ Convincing	☐ Touching	☐ Analyze	☐ Sympathize	☐ Justice	☐ Mercy	☐ Foresight	☐ Compassion
☐ Imaginative	☐ Matter-of-Fact	☐ Create	☐ Make	☐ Fascinating	☐ Sensible		
☐ Benefits	☐ Blessings	☐ Determined	☐ Devoted	☐ Firm-Minded	☐ Warm-Hearted	☐ Hard	☐ Soft
☐ Peacemaker	☐ Judge	☐ Gentle	☐ Firm	☐ Feeling	☐ Thinking		

ACTIVITY INFORMATION SHEET

Please place a:
1. checkmark ( ) beside the activities which you do on the job, and
2. circle around the number corresponding to the heading which best describes the amount of time you spend doing this activity.

ACTIVITY:	TIME SPENT: rarely				frequently
____ answering the phone	1	2	3	4	5
____ calculating	1	2	3	4	5
____ compiling	1	2	3	4	5
____ conducting meetings in my workspace	1	2	3	4	5
____ conducting meetings elsewhere	1	2	3	4	5
____ dictating	1	2	3	4	5
____ evaluating	1	2	3	4	5
____ filing	1	2	3	4	5
____ greeting/directing visitors	1	2	3	4	5
____ keeping records	1	2	3	4	5
____ keyboarding into computer	1	2	3	4	5
____ making graphics	1	2	3	4	5
____ photocopying	1	2	3	4	5
____ planning	1	2	3	4	5
____ reading	1	2	3	4	5
____ scheduled meetings	1	2	3	4	5
____ scheduling	1	2	3	4	5
____ searching/locating files	1	2	3	4	5
____ sorting/routing mail	1	2	3	4	5
____ taking messages	1	2	3	4	5
____ talking confidentially in workspace	1	2	3	4	5
____ talking on phone	1	2	3	4	5
____ thinking	1	2	3	4	5
____ transcribing dictation	1	2	3	4	5
____ traveling	1	2	3	4	5
____ typewriting	1	2	3	4	5
____ unscheduled meetings	1	2	3	4	5
____ writing	1	2	3	4	5

MOTIVATIONAL PRINCIPLES IN USE

The purpose of this questionnaire is to determine the motivational principles and theories most favored by today's managers. Please read each description carefully and mark the appropriate category. Indicate your organizational level, and your job title, in order to help categorize results.

Organizational level:

_____ First _____ Middle _____ Top

Job Title: _____

Check any appropriate block.	Unfamiliar	Familiar	Used in my Organization
Herzberg's Theory of Job Satisfaction- satisfiesrs as motivaters, dissatisfiers as hygiene factors			
Maslow's Hierarchy of Needs- physiological, safety, membership, self-esteem, recognition, self-actualization			
McGregor's Theory X & Theory Y- two basic assumptions on human behavior			
Managerial Grid- graph of production concerns vs. concerns for people			
Likert's System IV- four systems to categorize organizations			
In Search of Excellence- eight basic principles to stay on top			
McClelland's Achievers- scoring people's need for achievement			
Porter & Lawler's Satisfaction Theory- performance yields rewards, rewards yield satisfaction			
Likert's Principle of Supportive Relationships- linking pin team management			
Vroom's Valence Theory- motivation = Sum of valence x expectancy			
Argyris' Development Principles- normal development from infant to adult			
MBO- management by objectives			
Quality Circles- team management concept			
Hersey & Blanchard's LASI- situational management			
Tannenbaum & Schmidt's Leadership Patterns- democratic vs. authoritative			
Ouchi's Theory Z- Japanese approach to motivation			
Drucker's Survival Principles- modern businessperson's attitude			

APPENDIX C

ORGANIZATIONAL THEORIES USED FOR THE MOTIVATIONAL PRINCIPLES IN USE SHEET

Excerpt from

"Motivation and Supervision of Management Systems of the Tennessee Valley Authority (TVA)"
Appendix A

by Fanny Carrera, Wade Corbett, and Gratia Downs.

MOTIVATION AND SUPERVISION IN THE DIVISION OF MANAGEMENT SYSTEMS OF THE TENNESSEE VALLEY AUTHORITY (TVA)

TO: DR. JERRY WESTBROOK
FROM: WADE CORBETT
GRATIA DOWNS
FANNY CARRERA

MOTIVATIONAL PRINCIPLES

HERZBERG'S THEORY OF JOB SATISFACTION:

Intrinsic and extrinsic variables serve respectively to satisfy and demotivate employees. Management does the best it can with the dissatisfiers, while morale and productivity are more dependent upon the motivators. Some of these variables are

satisfiers as motivators:

achievement, advancement, recognition, responsibility, and growth opportunities.

dissatisfiers as hygiene factors:

company policy and administration, working conditions, pay, and interpersonal relations with supervisors, co-workers, and subordinates.

MASLOW'S HIERARCHY OF NEEDS:

The needs of the employees are identified so that they may be helped to satisfy their individual needs with the goal of achieving self-actualization. According the Maslow's theory, a person is at one level at a time and cannot jump levels. Listed from the bottom of the hierarchy, the following are the essential needs that individuals can have:

Physiological: essentials of survival, e.g., food, water, shelter.

Safety: protection against physical and physiological threats in the environment and confidence that physiological needs will be met in the future.

Membership: feeling of belonging, of being accepted by others, of interacting sociably, and of receiving affection and support.

Esteem: self-respect, achievement, competence, respect of others, and recognition.

Self-actualization: fulfillment of one's potential and growth as a person.

McGREGOR'S THEORY X & THEORY Y:

Individuals can be categorized as having one of two types of human behavior. The goal of the manager is to treat their employees according to their correct behavior type. In other words, it is not desirable to manage a Theory Y person as a Theory X. The following are characteristics of the two types:

Theory X:

1. People inherently dislike work and will avoid it when possible.
2. People have little ambition, avoid responsibility, and prefer to be directed.
3. Above all, people want security.
4. It is necessary to use coercion, control, and threats of punishment to get people to work.

Theory Y:

1.. Work is a natural phenomenon; and if conditions are favorable, people will not only accept responsibility, they will seek it.
2. If people are committed to organizational objectives, they will exercise self-direction and self-control.
3. Commitment is a function of rewards associated with goal attainment.
4. The capacity for creativity in problem solving is widely distributed in the population, and the intellectual potentialities of most people are underutilized.

MANAGERIAL GRID:

The two axes forming this grid are concern for productivity and concern for people. Five of the basic leader-manager styles that can be located on the grid can classified with these terms:

1. Impoverished.
2. Country Club.
3. Push for Production.
4. Middle of the Road.
5. Team Management.

LIKERT'S SYSTEM IV:

Feedback control methodology is applied to measure the relationships among input, intervening, and output variables. Four basic systems of team management can be described as

System 1: Exploitive-Authoritative.
System 2: Benevolent-Authoritative.
System 3: Consultative-Democratic.
System 4: Participative-Democratic.

In Search of Excellence:

In this best-selling book, eight attributes were listed that characterize excellent, innovative companies:

1. A bias for action.
2. Close to the customer.
3. Autonomy and entrepreneurship.
4. Productivity through people.
5. Hands-on, value driven.
6. Stick to the knitting.
7. Simple form, lean staff.
8. Simultaneous loose-tight properties.

McCLELLAND'S ACHIEVERS:

All individuals in an organizations have the need to achieve. The manager makes meeting this need in employees a goal and helps them to learn about themselves, what they want to achieve, and how to express their desire for achievement to the manager and each other. Individual workers also set long- and short-term goals for themselves in order to develop their need for achievement into active achievement.

PORTER & LAWLER'S SATISFACTION THEORY:

This theory states that performance should lead to rewards, which in turn leads to satisfaction. Restated, performance leads to satisfaction, not vice versa.

LIKERT'S PRINCIPLE OF SUPPORTIVE RELATIONSHIPS:

Managers act as "team leaders" developing workers into a team with much participation in projecting work activity and display a high sense of confidence in the abilities of their employees. Managers endeavor to serve their workers' best interests, supporting them and contributing to their sense of importance. All members of the teams see the mission of the organizations as genuinely important and see their task as essential to achieving organizational and personal goals.

VROOM'S VALENCE THEORY:

For every job activity, there are two outcomes. The first-level outcome is what must be done in order to receive the second-level outcome, which is what the individual actually wants to receive from work. A worker's motivation results out of the value they place on the second-level outcome and the probability that they are able to achieve the appropriate first-level outcome to obtain the second-level outcome.

ARGYRIS DEVELOPMENT PRINCIPLES:

An average adult has developed in such a way that they function best in an organization whey they are

1. allowed a level of independence,
2. allowed to exhibit complex rather than simple behavior and tasks,
3. seen as capable of deep commitment to goals,
4. seen as viewing work with an overall long-term time frame,
5. seen as family leaders with certain responsibilities,
6. and seen as capable of exhibiting self-control.

MBO (MANAGEMENT BY OBJECTIVES):

Managers and workers work together to set specific performance and achievement objectives. The worker's performance is then evaluated against the objectives they themselves have set in agreement with the manager.

QUALITY CIRCLES:

Workers from different areas of expertise work as teams with specific objectives set by the group. They can work together pretty much as they wish in order to meet these objectives. This approach can involve changing job assignments within the group and participation in product development, processes, joint supervision, and quality inspection.

HERSHEY & BLANCHARD'S LASI:

The manager evaluates himself (using the LASI situational questionnaire) in order to determine how he acts in certain management situations. In addition, the manager's subordinates, peers, and supervisors evaluate him/her on the same basis. The manager then works to minimize the gap between how his/her action is perceived by self and others. When the perceptions are in line with one another, the manager can then more accurately assess all the components of the situation and decide on the most appropriate action to be taken.

TANNENBAUM AND SCHMIDT'S LEADERSHIP PATTERNS:

Based on a manager's full understanding of and sensitivity to himself, those individuals with whom he is dealing, the organization, and the social environment as a whole, the manger is better able to assess which behavior would be most appropriate and effective for a given situation. Therefore, the manager acts not as a strong leader, or as a permissive one; rather, the manager acts as an insightful and flexible leader.

OUCHI'S THEORY Z:

An approach to management in which an underlying set of values is shared by all employees, which is supplemented with the premium concerns of management being

1. concern for people,
2. participation in decision making,
3. and exchange of job security for worker cooperation and involvement in the direction of the organization.

With this basis, there are a limitless number of rules or targets available to suit changing conditions, promoting creative optimization of the task at hand for the best interests of all the organization.

DRUCKER'S SURVIVAL PRINCIPLES:

Necessary principles required to survive in today's business world:

1. Human organization designed for joint performance concentrating on long-term goals.
2. Enterprise exists with society = adaptability.
3. Supply economic good or service.
4. Organic organization able to adapt to changing economy.
5. Profit.

APPENDIX D

SCALE-MODEL FURNITURE ITEMS LIST

#used	order	Equipment name:
WALLS		8'h x 2'w
		4'0w
		6'0w
		8'0w
		3'h x 2'0w
		3'0w
		4'0w
DOORS		3'9 x 8'0 (3 x 7)
		5'0 x 8'0(3 x 7
WINDOW		6'0w x 8'0h
SHELVES		7'0h x 3'0w (6)
		7'0h x 4'0w (6)
		6'0h x 2'0w (5)
		6'0h x 3'0w (5)
		3'0h x 3'w (3)
		2'9h x 3'w (2)
		2'9 x 3'w (3)
		2'0h x 4'0w (2)
WALL HG. SHELV		2' micro
		4' micro
		2' mid-stor
		3' mid-stor
		4' mid stor
		4' shelf (1'0d)
		4' deep (15" d)
FLIP DOOR		2'0w x 1'0 d
		2'6 w x 1'0 d
		4'0 w x 1'0 d
		wall cabinet
FILES		4 dwr. file

#used	order	equip. name
LAT. FILES		2'0w x 1'4 d
		2'6 w
		4'0 w
hung WKSURF.		1'6 x 4'0w
		1'6 x 2'6w
		2'0 x 2'0
		2'0 x 4'0
		2'0 x 6'0
		2'6 x 2'6
COMP. SURFACE		3'0 sq. (to 24")
		4'0 sq. (to 30")
DESKS		5'0 dbl. ped.
		6'0 exec.
TABLES		6'0 x 3'0
		6'6 x 2'0
		8'0 x 2'6
		3'0 sq.
		4'0 sq.
		60" round
		5'6 x 4'6 HMEGR
		comp 2'9 x 2'10
		comp 4'0 x 2'0
		end
		coffee
		wall hung dbd.
		table dbd.
		plan rack
SEATING		sofa
		lounge ch.
		exec

#used	order	equip. name
OTHER		computers -pc
		computers - main
		typewriter
		dictation
		phone
		printer
		stereo
		stacksr
		books
		plants -sm
		plants - large
		storage bins -4"
		storage bins - 8"
		lamps
NAME:		

APPENDIX E

ACTIVITY INFORMATION SHEET KEY

ACTIVITY INFORMATION SHEET

Please place a:
1. checkmark ( ) beside the activities which you do on the job, and
2. circle around the number corresponding to the heading which best describes the amount of time you spend doing this activity.

	ACTIVITY:	TIME SPENT: rarely				frequently	
____	answering the phone	1	2	3	4	5	M/C
____	calculating	1	2	3	4	5	C
____	compiling	1	2	3	4	5	C
____	conducting meetings in my workspace	1	2	3	4	5	M
____	conducting meetings elsewhere	1	2	3	4	5	M
____	dictating	1	2	3	4	5	M
____	evaluating	1	2	3	4	5	C/M
____	filing	1	2	3	4	5	C
____	greeting/directing visitors	1	2	3	4	5	C
____	keeping records	1	2	3	4	5	M/C
____	keyboarding into computer	1	2	3	4	5	M/C
____	making graphics	1	2	3	4	5	M/C
____	photocopying	1	2	3	4	5	C
____	planning	1	2	3	4	5	M
____	reading	1	2	3	4	5	M
____	scheduled meetings	1	2	3	4	5	M
____	scheduling	1	2	3	4	5	C
____	searching/locating files	1	2	3	4	5	C
____	sorting/routing mail	1	2	3	4	5	C
____	taking messages	1	2	3	4	5	C
____	talking confidentially in workspace	1	2	3	4	5	M
____	talking on phone	1	2	3	4	5	M/C
____	thinking	1	2	3	4	5	M
____	transcribing dictation	1	2	3	4	5	C
____	traveling	1	2	3	4	5	M
____	typewriting	1	2	3	4	5	C
____	unscheduled meetings	1	2	3	4	5	M
____	writing	1	2	3	4	5	M

M = scored as a managerial activity

C = scored as a clerical activity

VITA

Gratia Ann Downs was born in Gallatin, Tennessee on July 23, 1963. She attended Volunteer State Community College and graduated Summa Cum Laude from Middle Tennessee State University with a Bachelor of Science degree in Interior Design in June 1985. In that same month she accepted a teaching assistantship at the University of Tennessee, Knoxville, and began study toward a master's. She received the Master of Science degree with a major in Interior Design and a minor in Industrial Engineering Management in December 1988.

She is a member of Kappa Omicron Phi National Home Economics Honor Society, Tau Omicron Women's Honor Society, the American Home Economics Association, Interior Design Educators Council, and the American Society of Interior Designers. She is employed as an interior design instructor in the Home Economics department of Middle Tennessee State University, and works as a freelance commercial designer and custom furniture designer.