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DEGREES OF PRIVACY AFFECTING EMPLOYEES AND THEIR WORK TASKS IN OPEN-PLAN OFFICES

By

B. Jeanneane Wood

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ABSTRACT

DEGREES OF PRIVACY AFFECTING EMPLOYEES AND THEIR WORK TASKS IN OPEN-PLAN OFFICES

BY

B. Jeanneane Wood

The purpose of this study was to determine degrees of visual and acoustical privacy that best suited employees in open-plan office environments according to job titles within organizational levels. Workers within two State of Michigan departments were randomly selected and divided into three organizational levels. Multiple methods were utilized in this study to insure that both environmental

and personal systems were measured. Approximately fifty percent of the participating departments' workers were administered a questionnaire to measure users' perceptions regarding acoustical and visual characteristics of their work spaces. Actual physical properties (visual and acoustical) of each space were documented. No changes were made to existing workstations during data collection.

A modification of Conyne and Clack's environmental and personal systems model was utilized to examine settings, behaviors and outcomes. Results from chi square tests indicate that the desire for a higher degree of enclosure by all levels of employees increased with an increase in organizational level.

Levels one and two employees reported that they predominantly worked in areas having no degree of enclosure and viewed the medium degree of enclosure as the most desirable. Level three employees reported working predominantly in work spaces having a medium

degree of enclosure but felt that a high degree of enclosure was needed to adequately serve their needs.

The self-reported inability to concentrate, inability to control access and lack of visual privacy followed the same pattern with employees in a high degree of enclosure reporting the least difficulty followed by employees in a medium degree of enclosure. A higher percentage of employees currently in a low degree of enclosure reported more difficulty concentrating, controlling access and controlling visual privacy than employees in no degree of enclosure.

Employees with no (72.9%), low (85.7%) or medium (83.3%) degrees of enclosure felt that they did not have acoustical privacy from others around them as compared to 9.1% of employees in a high degree of enclosure. Employees in a low degree of enclosure reported the greatest lack of acoustical privacy.

Sixty of 80 (75.0%) employees had activity noise readings in the range of normal conversation. Perceptions of poor acoustical privacy

may have evolved from the lack of acoustically treated surfaces and the presence of intrusive sounds 10 decibels or higher than the ambient noise readings.

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Chapter 1

Degrees of Privacy Affecting Employees and Their Work Tasks in Open-Plan Offices

The purpose of this study was to determine degrees of visual and acoustical privacy that best suited employees in open-plan office environments according to job titles/tasks within organizational levels. Activities of individual employees cannot be understood without some knowledge of their niche in the activities of an organization (Singleton, 1972).

In the last ten years, office technology has been rapidly changing due to the increased automation which is in use by all levels of workers in organizations. Prior to this time, research on job performance and how it was affected by the physical environment predominantly was performed in industrial factories (Wineman, 1982).

In the past, offices were organized as a support function to the manufacturing process to record sales transactions and monitor the production process. Office tasks consisted predominantly of paper handling. Today, office work is increasingly concerned with the generation and communication of ideas. Working with large databases of information, workers analyze, conceptualize and communicate. The office is being called upon to support a new range of activities and is no longer an adjunct to the factory (Wineman, 1982).

In a time when blue collar jobs are diminishing and white collar jobs are on the rise, this topic has become increasingly important to corporate executives, space planners and facility managers (Goodrich, 1979, 1982; Marans and Spreckelmeyer, 1982). The reason for this attention is that today more than half of the gross national product comes from a service oriented economy. Machines are "doing" more of the work while people are "thinking" the work. People now analyze, reflect, conceptualize and communicate. To do the work requires high

levels of involvement, sustained attention, creative thinking and communication with others. These procedures need to be supported by the design of the work environment (Goodrich, 1982; Pulgram and Stonis, 1984). The study of the effect of office design on members of the organization is one of the most neglected areas in the field of facilities management and design (Oldham and Rotchford, 1983).

As mentioned, office functions have become an integral part of the organization, and productivity in the office has become an important issue. Now, office design needs to provide a responsive environment with interior spaces that encourage productivity by facilitating task performance, by supporting user needs, by allowing for meaningful communication and work relationships, and by providing a stimulating, meaningful organizational climate (Goodrich, 1982). A study by Hedge, 1982, and Sundstrom, Town, Brown, Forman & McGee, 1982, found an inverse relationship between satisfaction with managerial and technical work tasks and satisfaction with

office conditions. The workers performing these more complex, demanding and satisfying jobs appeared to be more sensitive to their environment, complained that conditions in the office kept them from performing their job tasks as effectively as they would like and expressed more negative reactions to office conditions.

The theory on which this study is based conceptualizes privacy as an interpersonal boundary control process. The framework of this theory is based on several concepts:

1) Privacy is a "dialectic process" which allows for changing interpersonal contacts which range from wanting to be alone to wanting to be accessible to others.

2) Privacy is an interpersonal boundary control process which allows regulation of social interactions.

3) Privacy is a process that has satisfactory and unsatisfactory levels.

4) Privacy involves different combinations of individuals and groups.

Several functions of privacy include the regulation of interpersonal transactions, self-other processes and self-identity maintenance (Altman, 1976). Other variables relating to proxemics such as personal space are viewed as means through which optimal levels of privacy are achieved (Altman, 1976; Hall, 1969, 1973; Horowitz, 1964; Sommer, 1969).

Privacy in work spaces allows workers to complete what they need or want to do. Visual and acoustical privacy can be 1) an aid by reducing distractions and allowing concentration or 2) an acoustical necessity for personnel evaluations or other confidential matters. Where privacy is necessary, its absence can have tremendous effects on individuals or the organizations (Brill, Margulis, Konar, and BOSTI, 1984).

Brill et al., 1984, maintained that privacy in the office related to three factors. The first is control over accessibility, which relates to the ability to limit the undesired impact of the presence of others.

The second component is control over distractions and interruptions. The third factor refers to speech privacy and relates to selectively controlling who receives information about oneself or others. Brill et al., 1984 utilized features from John Archea, 1977, who emphasized that behavior was affected by 1) the ability of a worker to monitor others (visual access) and 2) of being monitored by others (visual exposure). Archea argued that the loss of privacy was associated with too much exposure and too little access. He asserted that an adequate feeling of privacy was dependent on the control of both.

Brill et al., 1984, also found a number of environmental factors to affect privacy. These were 1) degree of enclosure, 2) opaque or transparent partitions in work spaces, 3) organizational policy and security systems, 4) the location of secretaries and receptionists, 5) location of work space and 6) location of other people. That study found that enclosure is different from privacy, although this opinion

was not explained in-depth. This study addresses the visual and acoustical properties of enclosure as they relate to privacy.

The model utilized in this study incorporates features from a model by Conyne & Clack, 1981. This model, as shown in Figure 1, is based on the premise that a reciprocal causation exists between people and environments and that people use cognitive processes and coping responses to control the influence of the environment upon them. As can be seen by examining the integrated model, a physical variable cannot be related directly to an outcome variable. Although environment and people are interactive, the nature of an activity is mediated by cognitive appraisal (an individual's evaluation of the environment), and the environment is perceived as requiring a response through efforts at adapting and coping. Further, when the conceptual framework in Figure 1 is examined, it can be seen by the directionality of the arrows that adapting/coping efforts and outcomes exert direct influence on both the environmental system and

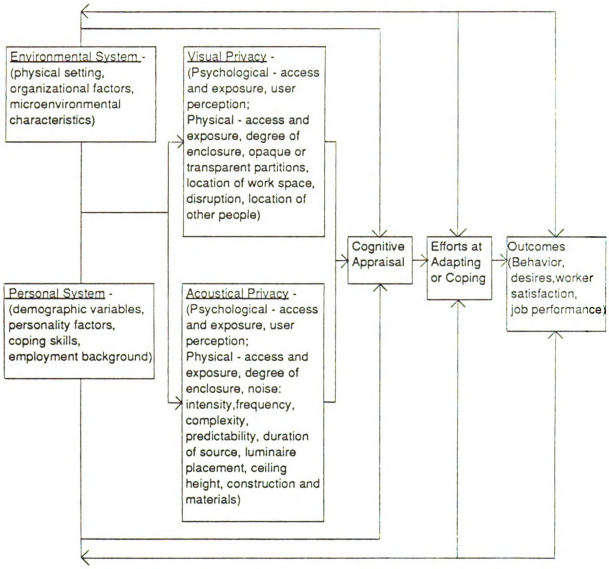
personal system which directly influence one another (Conyne & Clack, 1981).

Those who take a sociotechnical approach to open-plan space feel that the removal of walls and barriers from the environment reduce the sense of privacy that a definable work area provides, as well as reduce the opportunity for close personal relationships (Oldham and Brass, 1979). These sociotechnical studies suggest that autonomy, task identity, supervisor and co-worker feedback and friendship opportunities might especially be affected by the absence of walls or partitions because these physical boundaries create private spaces which are necessary to facilitate such discussions (Oldham and Brass, 1979; Hackman and Oldham, 1974).

In the social relations approach to open-plan space, also known as office landscaping, the absence of full height walls and barriers in open-plan offices is advocated. Followers of this approach feel that the more open areas will stimulate a higher quality and increased

Figure 1

A Model Relating Psychological and Physical Aspects of Visual and Acoustical Privacy to Outcomes



Adapted from Rudolph Moos, Evaluating Educational Environments (San Francisco: Jossey-Bass, 1979) Figure 1, p. 5. Reprinted with permission.

quantity of communications by users in the space which might result in higher job satisfaction and performance and trust in management. Many investigations supporting this approach (e.g., Hundbert and Greenfield, 1969; Ives and Ferdinands, 1974; Brookes and Kaplan, 1972; Allen and Gerstberger, 1973) have shown improved information flow and increased communication or elevated socialization.

Any unwanted interruption affecting task completion or activities is undesirable (Brill et al., 1984). As shown in Figure 1, interruptions due to noise have been found to be affected by the levels of intensity, frequency, complexity, predictability and the duration of the source (Burris-Meyer & Goodfriend, 1957; Brill et al., 1984; Krames Communication, 1985). For example, a noise may be loud but unless it stands out from other noises, it may not be distracting. Several studies (e.g., Elder, Turner & Rubin, 1979; Goodrich, 1979; Nemecek and Grandjean, 1973; Wineman, 1981) have shown that people talking and telephone conversations were the most annoying

types of noise. Physical features, such as the size and shape of the work space, orientation of the work space, and the distance to other work spaces, have been shown to affect visual and acoustical privacy. In addition to the physical characteristics of the office, the social norms of the organization must be considered with job positions. For example, people may stop to knock at a manager's office but walk right into his/her secretary's office (Wineman, 1982).

Depending on the work task, privacy may or may not be a problem. Privacy needs may fluctuate depending on the day or even on the time of day. Further research is needed to assess the degrees of privacy that best function for different work tasks (Wineman, 1982).

In a study by Marans & Spreckelmeyer, 1982, four factors were cited for their importance in affecting the overall satisfaction of an employee. First, each job description may require people to respond differently to an environment. Secondly, there is a correlation

between environmental satisfaction and the context/culture in an organization. Marans and Spreckelmeyer present the organizational mission, activities, morale and employee/employer relations as being a part of this culture. Thirdly, because people are unique, they respond to environments differently. Lastly, the microenvironmental characteristics such as actual noise levels, humidity, crowding, privacy, etc. may influence a person's satisfaction about his work environment. Although the effects of any one of these factors may be small, the cumulative effects may serve to decrease worker satisfaction and job performance (Wineman, 1982).

More research on open-plan offices is needed to determine the optimal conditions that promote positive effects on employees (Oldham and Brass, 1979). According to Hedge, 1982, a large number of studies document the disadvantages of open-plan offices as compared to the advantages, so it is important for future research to explore ways to minimize the disadvantages of open-plan offices.

Several factors have been cited for their importance in affecting the overall satisfaction of an employee. These factors include: the design of the work space, conditions of the environment, lighting, status markers, interpersonal communications and acoustical and visual privacy (Marans & Spreckelmeyer, 1982; Wineman, 1982). These studies addressed privacy and its relationship to employees according to job title/task within each organizational level. Future research needs to look at the interrelationship of all of these factors.

Assumptions:

These assumptions are applicable only to the physical environment of this site and only in this study.

1. A well designed environment can positively affect user performance and satisfaction.

2. Most employees occupy open-plan offices. However, some employees' offices vary from bullpen to open-plan to traditional layouts.

3. User perceptions of the environmental system are affected by user personality, coping skills, demographic variables and employment background.

Operational Definitions:

STAFF LEVELS:

1. Level one employees:

Level one workers consist of clerical and secretarial staff. This level performs duties such as telephone answering, typing, communications, CRT operations, routine tasks, and filing (Zalesny & Farace, 1987; Sundstrom et al., 1982; Hedge, 1982).

2. Level two employees:

Level two workers consist of professional/technical staff which represent middle organizational ranks. This level performs duties such as interpretation of data, analysis of data, creative thinking, problem solving, CRT operations and detailed work (Zalesny & Farace, 1987; Sundstrom et al., 1982; Hedge, 1982).

3. Level three employees:

Level three workers consist of managerial staff representing the high organizational ranks. This level performs duties such as decision making, conceptualizing, communicating, supervising, complex tasks, planning and employee assessment (Zalesny & Farace, 1987; Sundstrom et al., 1982; Hedge, 1982).

TASK:

A task may require more than one individual, or an individual may do more than one task (Singleton, 1972).

JOB:

The sum total of all tasks merge to form a job (Singleton, 1972).

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).

PANELS AND WALLS:

1. Low panels:

Panels over which a seated person cannot see another seated person, but a standing person can see another person (Brill et al., 1984).

2. High panels:

Panels over which a standing person cannot see another standing person, but which do not go to the ceiling (Brill et al., 1984).

3. Walls:

Panels that go from the floor to the ceiling (Brill et al., 1984).

OFFICES:

1. Traditional offices:

Traditional offices are defined in this study as private offices with fixed walls and doors. (Sundstrom, Herbert and Brown, 1985).

2. Open-plan offices:

Open-plan is described in this study as an area that incorporates modular workstations defined by freestanding panels and storage units ranging from four to seven feet high. Attached to the panels may be horizontal work surfaces, drawers, shelves and cabinets. Work spaces in an open-plan typically have less enclosure than a private office but more than a bullpen office (Sundstrom, Herbert and Brown, 1982).

3. Bullpen offices:

Bullpen offices are described in this study as areas with the absence of floor-to ceiling walls and the absence of partial height panels for defining individual work areas (Zalesny, Farace, & Kurchner-Hawkings, 1985).

PSYCHOLOGICAL PRIVACY:

Privacy is a psychological phenomenon that is described as the ability to control incoming stimulation and interpersonal contact and of limiting outgoing information. This allows for 1) a variety of privacy units to take place such as: individual/individual, individual/group, etc.; 2) input and output from the individual and others; and 3) an element of control (Altman, 1975, 1976; Hedge, 1982; Sundstrom, 1981; Sundstrom et al., 1982).

ARCHITECTURAL PRIVACY:

Architectural privacy is the availability of visual and acoustical barriers (Hedge, 1982).

DEGREES OF PRIVACY:

1. No degree of psychological and architectural privacy:

No degree of psychological and architectural privacy is an area that allows for maximum interaction with others that also allows minimum levels of control (Altman, 1976). Noise levels range to a worst case decibel reading of 90 decibels (Ekker, 1989). Decibel readings between 55 and 65 are within a normal conversational range while 65 to 90 represent noises that are above normal (Krames Communication, 1985). Work areas within 1) the bullpen, 2) enclosure consisting of one or two panels of any height or 3) enclosure consisting of three sided low panels, provide no visual privacy and no control over intrusions (Brill et al., 1984).

2. Low degree of psychological and architectural privacy:

Low levels of psychological and architectural privacy allow a high degree of interaction with little element of control (Altman, 1976). Noise levels range to a worst-case decibel reading of 90 decibels (Ekker, 1989). Decibel readings between 55 and 65 are within a normal conversational range while 65 to 90 represent noises that are above normal (Krames Communication, 1985). A work area with four sided enclosure, over which a standing worker can see, provides little visual privacy and little control over intrusions (Brill et al., 1984).

3. Medium degrees of psychological and architectural privacy:

Medium levels of psychological and architectural privacy allow for some degree of interaction with some element of control (Altman, 1976). Noise levels range to a worst-case decibel reading of 80 decibels (Ekker, 1989). Decibel readings between 55 and 65 are within a normal conversational range while 65 to 80 represent noises

that are above normal (Krames Communication, 1985). Work areas with three and four sided enclosures, with a division of space above standing height, provide increased control over access and noise from people (Brill et al., 1984).

4. High degrees of psychological and architectural privacy:

High levels of psychological and architectural privacy are areas that allow for minimum selective interaction with maximum levels of control (Altman, 1976). Noise levels range to a worst-case decibel reading of 70 decibels (Ekker, 1989). Decibel readings between 55 and 65 are within a normal conversational range while 65 to 70 represent noises that are above normal (Krames Communication, 1985). "Four walls and a door (no partitions) provide a unique degree of overall privacy" (Brill et al., 1984).

INVASIONS:

1. Disturbances:

Disturbances are defined as unwanted interruptions (Hedge, 1982).

2. Distractions:

Distractions are defined as background noises and movements (Hedge, 1982).

RECEIVING ZONE / SOURCE ZONE:

In an open-plan office, individual components of speech sound energy travels from a speaker's location in a work station (source zone) to a listener's location in an adjacent workstation (receiving zone)(Product Crafters, Inc., 1984).

Hypotheses:

Hypotheses for this study were developed from 1) a review of the literature and 2) the findings of Brill et al., 1984 and Sundstrom et al., 1982, stating that the perceived degree of work space privacy is related to the degree of physical enclosure. Those studies found that the need for visual and acoustical privacy increased with the complexity of work tasks or increased levels within the organizational hierarchy. It was expected that satisfaction with the degree of enclosure would vary based on the work tasks performed by each employee. For this study, the following hypotheses were generated and tested:

Hypothesis 1: Open-plan offices with no degree of visual and acoustical privacy are appropriate for relatively few employees and their work tasks regardless of organizational level.

Hypothesis 2: Open-plan offices with low degrees of visual and acoustical privacy are appropriate for some level one employees and their work tasks.

Hypothesis 3: Open-plan offices with medium degrees of visual and acoustical privacy are appropriate for some level one employees and their work tasks.

Hypothesis 4: Open-plan offices with medium degrees of visual and acoustical privacy are appropriate for some level two employees and their work tasks.

Hypothesis 5: Offices with a high degree of visual and acoustical privacy are appropriate for some level two employees and their work tasks.

Hypothesis 6: Offices with a high degree of visual and acoustical privacy are appropriate for level three employees and their work tasks.

All of the hypotheses reflect visual access and visual exposure factors of John Archea, 1977, who acknowledged that behavior is affected by 1) the ability of a worker to have visual access of others and 2) of being visually exposed to others. If a worker can be viewed by others (too much exposure), he can be accountable by them for the work that they view. Too little exposure does not provide the information about a worker that other people require for accountability. Hypotheses three and four emphasize the need for control of interpersonal boundaries. Privacy in work spaces allows workers to complete what they need or want to do (Brill et al., 1984).

Hypotheses five and six additionally emphasize findings by Sundstrom et al., 1982, who found that privacy became more important as jobs became more complex. That study found that employees performing complex tasks were more sensitive to acoustical and visual distractions than employees performing repetitive or routine tasks.

Hypotheses one through six all reflect the concepts utilized in the model, which emphasize the relationship of environmental and personal systems. These eventually manifest themselves through measured outcomes.

Chapter 2

Method and Procedures

Subjects

The research was conducted in a Michigan governmental agency located in Lansing. Two departments were examined. Approximately half of the workers within the Department of Commerce and the Department of Engineering Scientific Data Center were randomly selected based on their department organizational level to insure that a representative sample was obtained. Employees were classified into three levels: clerical, professional/technical and managerial as they were classified by Zalesny & Farace, 1987; Sundstrom et al., 1982; Hedge, 1982; and Brill et al., 1984. The selected departments' workers were administered a questionnaire to measure users' perceptions regarding acoustical and visual characteristics of their work spaces.

The clerical group consists of the clerical and secretarial staff who represents the lower ranks of the organizational chart. The professional/technical group represents the middle ranks of the organization while the managerial group represents the highest ranks in the organization. Job titles organized by level are noted in Figure 2.

To assess visual aspects of the work area, the physical properties of each space were delineated by 1) documenting the number of walls and panels, and 2) measuring and recording the height of walls and panels. Psychological properties of each space were delineated by measuring employee perceptions.

To measure acoustical properties of the work area, physical characteristics were observed by 1) documenting the number and acoustical properties of walls and panels, 2) recording the height of walls and panels, 3) measuring ceiling height, 4) obtaining specifications for the ceiling, 5) documenting luminaire location, and

Figure 2

Job Classification by Level

Level 1 (clerical) - clerk, secretary, bookkeeping clerk, executive secretary, audit clerk, legislative assistant and steno-clerk.
Level 2 (professional/technical) - data systems analyst, technical systems programmer, supervisor of planning support unit, division coordinator, contract analyst, account executive, department administrator, policy analyst, financial specialist, assistant director, resource center coordinator, account technician, ombudsman, tax abatement specialist and communications specialist.
Level 3 (manager) - supervisor, assistant administrator, systems development manager, section manager, office manager, division director, marketing director, economical development specialist, stockroom/mailroom manager, director of special projects, director of research, bureau director, consultant and deputy director.

6) administering two noise level tests. Psychological characteristics were observed by measuring employee perceptions of their work environments.

To obtain noise level data, multistage cluster sampling was utilized to measure nearly two-thirds (64.5%) of the employees' work spaces selected to participate in the study. These workstations were measured during 1) periods of low occupation (break time) to measure the environmental ambient decibel level and 2) during times that the noise levels would reflect actual conditions with most workers present. During both the ambient decibel reading and the optimum decibel reading, measurements were taken at 1) the door of the workstation and 2) the seat location in the workstation. To reflect actual conditions, work spaces were measured on Tuesday through Thursday between 7:30 a.m. and 4:30 p.m.. Employees working flex time were absent Monday and Friday making Tuesdays through Thursdays more representative of the maximum activity and noise

that would be present in the working environment. Prior to the beginning of each new series of measurements, the receiver microphone was calibrated.

Decibels are a measure of how much pressure sound exerts upon a surface. A sound of 90 decibels is 10 times stronger than a sound of 80 decibels. A sound of 100 decibels is 100 times stronger than a sound of 80 decibels, showing that the decibel levels increase rapidly (Krames Communication, 1985). A conversational voice is around 65 decibels with a shout measuring 90 decibels or louder. The normal range of conversation extends from 50 to 65 decibels. By documenting acoustical characteristics of the work environment such as ceiling construction, luminaire placement and recorded noise levels, a more accurate assessment of what was taking place in the work environment could be made.

Procedures

In assessing the current degree of privacy for each employee, data was gathered through use of a self-check questionnaire, as shown in the Appendix. The questionnaire was internally distributed and collected. Employees were instructed to complete the questionnaire while seated in their workstations. Participation was voluntary, and participants were assured of individual confidentiality. The survey took approximately ten minutes to complete and consisted predominately of groups of questions relating to demographics, general information, acoustical privacy, work satisfaction and visual privacy, respectively.

The questionnaires were gathered from individual departments during two separate one week periods of time, with an additional week for follow-up of unreturned surveys. Each user's perceptions of the visual and acoustical characteristics of the work space were compared to the actual physical properties of the work space. A chi

square statistical test was performed throughout the study to determine the level of significance for visual and acoustical properties of the space.

Chapter 3

RESULTS

This chapter presents a summary of findings from the collected data. The first part of this chapter presents information relating directly to the hypotheses of the study. The second part gives information relating to demographic characteristics of the sample and is followed by data relating to visual characteristics of the work area, acoustical properties of the space, perceptions of significance and complexity of work tasks.

The questionnaire response rate was 70% with the break down by organizational level represented in Table 1. This Table demonstrates that each level within the organization was well represented by the rate of return.

Specific categories were determined in order to condense the responses into more usable groupings as shown in Figure 3. These

Table 1

Survey Response Rate

Organizational Level	Received Survey (%)	Returned Survey (%)
Level 1 (Clerical)	38 (21.2)	23 (18.3)
Level 2 (Professional/ Technical)	100 (55.9)	69 (54.7)
Level 3 (Manager)	41 (22.9)	32 (25.4)
Other[a]	0 (0.0)	2 (1.6)
Column Totals(%)	179(100.0)	126(100.0)[b]

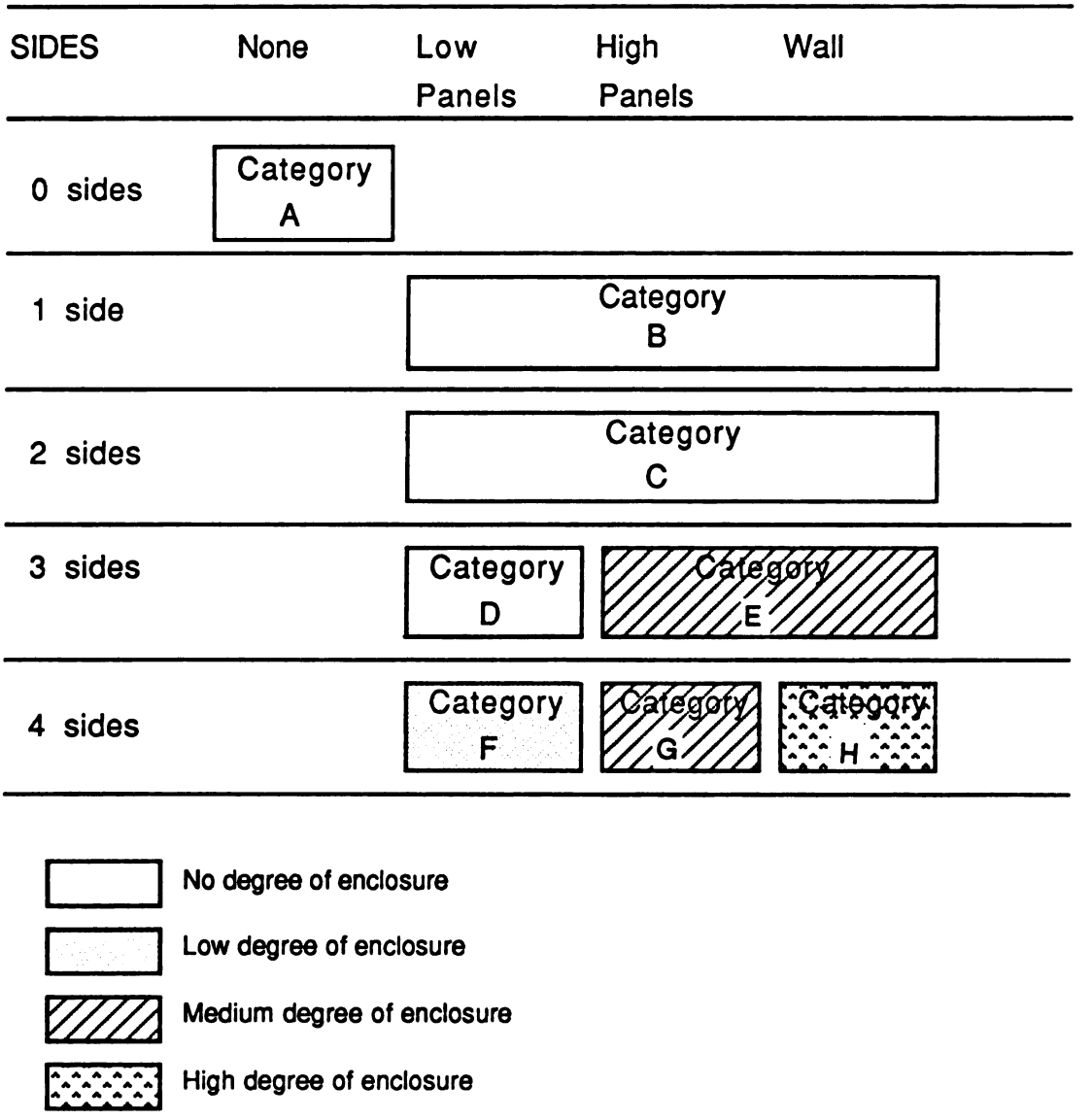
[a] Two employees involved in labor oriented work noted that they did not belong in the acknowledged three categories.
[b] Number of returned surveys. 126 is 100% of the study sample.

categories were utilized in the various tables along with the degree of enclosure for clarity throughout the following chapters.

Results concerning the degree of enclosure perceived by employees in each organizational level to adequately serve their

Figure 3

Categorization of Survey Responses



needs follow in Table 2. More than half (51.8%) of all employees (57 out of 110) indicated that a medium degree of enclosure (Categories E and G) would adequately serve their needs. With 31.8% (35 out of 110) of all workers stating that four walls (Category H) would adequately serve their needs, a high degree of enclosure held the second largest number of responses. Categories were adapted from Brill et al.,1984, although current findings differed from the former study in that more variations in responses resulted.

Table 2 illustrates that 60% of level three (managers) felt that a high degree of enclosure would adequately serve their needs while 30% of the remaining level three employees felt that a medium degree of enclosure would adequately serve their needs. Approximately sixty-two percent (62.3%) of level two (professional/ technical) workers stated that a medium degree of enclosure would adequately serve their needs. Nearly twenty-five percent (24.6%) of

Table 2

Degree of Enclosure Perceived by Employees to Adequately Serve Their Needs:

Summary of Responses by Category and Organizational Level

Degree of Enclosure	No	Low	Medium	High	Row Totals (%)
Category	A,B,C,D	F	E, G	H	
Level 1- (Clerical)	5(29.4)	1(5.9)	10(58.8)	1 (5.9)	17(100)[a]
Level 2- (Professional/ Technical)	3 (4.9)	5(8.2)	38(62.3)	15(24.6)	61(100)[a]
Level 3- (Manager)	1 (3.3)	2(6.7)	9(30.0)	18(60.0)	30(100)[a]
Other[b]	1(50.0)	0(0.0)	0 (0.0)	1(50.0)	2(100)
Column Totals	10	8	57	35	110[a]

Alpha level $p < .01$
Chi square - 44.72
Degrees of freedom - 21

Key:

[a] Six clerical, eight professional/technical, and two managers did not complete these survey questions.

[b] Two respondents involved in labor oriented work noted that they did not belong in the acknowledged three organizational levels.

the level two workers desired a high degree of enclosure. Nearly fifty-nine percent (58.8%) of level one (clerical) workers indicated that a medium degree of enclosure would adequately serve their needs. About twenty-nine percent (29.4%) of level one employees stated that a bullpen office (no degree of enclosure) would adequately serve their needs. The data in this study illustrated that the desire for a higher degree of enclosure increased with an increase in organizational level.

Demographics:

A summary of demographic information is shown in Table 3. Each demographic variable is presented and discussed below.

Organizational Level:

A representative sample of employees was taken and subdivided into organizational levels as shown in Table 3. About eighteen

Table 3
Demographic Information Summary

Organizational Level	Frequency	Percent
Level 1 (Clerical)	23	18.3
Level 2 (Prof/tech[a])	69	54.7
Level 3 (Manager)	32	25.4
Other	2	1.6
Row Totals	126	100.0

Organizational Years	Frequency	Percent
1-2	16	12.6
3-5	28	22.2
6-10	20	15.9
11-15	28	22.2
16-20	20	15.9
21-25	7	5.6
26 or more	6	4.8
Missing Response	1	.8
Row Totals	126	100.0

Hours Worked Per Week	Frequency	Percent
0-10	1	.8
11-20	3	2.4
21-30	10	7.9
31-40	79	62.7
41-50	29	23.0
51-60	2	1.6
More than 60	1	.8
Missing Response	1	.8
Row Totals	126	100.0

[a] Professional/Technical

percent (18.3%) of all workers were clerical (level one) while 54.7% were professional/technical (level two). About twenty-five percent (25.4%) of all respondents stated that they were managerial (level three) and 1.6% said that they were involved in labor oriented work and did not belong in any of the acknowledged three categories.

Organizational Years:

Length of time spent with the State of Michigan was divided into seven categories, as shown in Table 3. About twenty-two percent (22.2%) of all respondents indicated that they had worked for the organization for three to five years while an additional 22.2% had worked for 11 to 15 years. Almost sixteen percent (15.9%) of all workers indicated that they had worked for the State of Michigan for six to ten years while an additional 15.9% had worked 16 to 20 years, making these the third and fourth largest categories. The remaining

four categories fell to 12.6% and below. Approximately half (48.5%) had worked for the State of Michigan for 11 years or more and approximately half (50.7%) had worked for the State of Michigan ten years or less.

Hours Worked Per Week:

As shown in Table 3, almost two-thirds (62.7%) of all employees worked 31 to 40 hours per week. The second highest reported number of hours worked per week was 41 to 50 hours with 23% of all respondents fitting into this category. By running a cross-tabulation for this 23%, it could be seen that one-third of all level three workers and one-fourth of all level two workers were working above a normal 40 hour work week.

Visual Privacy:

To assist in determining visual privacy, data was gathered through use of a self-check instrument on the questionnaire. Respondents were asked to note the degree of enclosure that best described their current work space (see Appendix, p. 126). These results were summarized in Table 4 which compared the frequency of all responses within the organization. Approximately 12% (12.2%) of all respondents stated that they had a high degree of enclosure, 33.3% reported a medium degree of enclosure, 15.6% reported a low degree of enclosure and 38.9% reported that they had no degree of enclosure.

The State of Michigan utilized work space standards and distributed workstations according to employee civil service classification number. It was possible for workstation standards to vary within organizational levels because of the distribution of different classification numbers within organizational levels. Where discrepancies did occur, it was theorized, as shown in the model

Table 4

Actual Degree of Enclosure: Percentage of All Responses[a]

Degree of Enclosure	Percentages 0 10 20 30 40 50
NO	38.9%
LOW	15.6%
MEDIUM	33.3%
HIGH	12.2%

[a] Five clerical, twenty-nine professional/technical and two managers did not complete these survey questions. Two employees involved in labor oriented work noted that they did not belong in the acknowledged three organizational levels.

(Figure 1), that personality factors and coping skills influenced workers. Table 5 illustrates that eight of 18 (44.4%)of all level one workers reported being in a work space having no degree of enclosure while seven of 18 (38.9%) reported working in a medium degree of enclosure. Twenty-two of 40 (55%) of the level two employees reported working in open offices having no degree of enclosure. Seven of 40 (17.5%) reported working in a low degree of enclosure, while nine out of 40 (22.5%) reported working in a medium degree of enclosure. The remaining two level two workers reported working in a high degree of enclosure. Four out of 30 (13.3%) of the level three workers reported working in a work space with no degree of enclosure and four out of 40 (13.3%) reported working in a low degree of enclosure. Thirteen out of 30 (43.4%) reported working in a medium degree of enclosure and nine out of 30(30%) reported working in a high degree of enclosure.

Table 5

Actual Degree of Enclosure by Category and Organizational Level:

Frequency of Responses

Degree of Enclosure	No	Low	Medium	High	Row Totals (%)
Category	A,B,C,D	F	E, G	H	
Level 1- Clerical	8 (22.9)	3 (21.4)	7 (23.3)	0 (0.0)	18[a]
Level 2- Professional/ Technical	22 (62.9)	7 (50.0)	9 (30.0)	2 (18.2)	40[a]
Level 3- Manager	4 (11.4)	4 (28.6)	13 (43.3)	9 (81.8)	30[a]
Other[b]	1 (2.8)	0 (0.0)	1 (3.3)	0 (0.0)	2
Column Totals	35(100.0)	14(100.0)	30(100.0)	11(100.0)	90[a]

Alpha level $p < .01$
Chi square - 41.85
Degrees of freedom - 21

Key:

[a] Five clerical, twenty-nine professional/technical, and two managers did not complete these survey questions. This question should be redesigned for clarity of meaning for respondents.

[b] Two respondents involved in labor oriented work noted that they did not belong in the acknowledged three organizational levels.

Twenty-two out of 41 (53.7%) of all workers in a medium to high degree of enclosure were managers, 11 out of 41 (26.8%) were professional/technical employees, while seven out of 41 (17.1%) were clerical employees. The higher the organizational level, the larger the tendency for occupancy of a medium to high degree of enclosure.

Information in Table 6 illustrates a comparison of organizational levels between the actual degree of enclosure and the desired degree of enclosure that would adequately serve employee needs. Levels one and two employees reported that they predominantly worked in areas having no degree of enclosure but that a medium degree of enclosure was needed to adequately serve their needs. Level three employees reported working predominantly in work spaces having a medium degree of enclosure but felt that a high degree of enclosure was needed to adequately serve their needs. The preference for a higher degree of enclosure increased for all organizational levels although

Table 6

Comparison Between Actual Degree of Enclosure and Degree of Enclosure That Would Adequately Serve Employee Needs: Organizational Level Summary of Results

Degree of Enclosure	Actual %	Desired %
Level 1 -Clerical		
No	8 (49.4)	5 (29.4)
Low	3 (16.7)	1 (5.9)
Medium	7 (38.9)	10 (58.8)
High	0 (0.0)	1 (5.9)
Column Totals(%)	18(100.0)[a]	17(100.0)[b]
Level 2 - Professional/Technical		
No	22 (55.0)	3 (4.9)
Low	7 (17.5)	5 (8.2)
Medium	9 (22.5)	38 (62.3)
High	2 (5.0)	15 (24.6)
Column Totals(%)	40(100.0)[a]	61(100.0)[b]
Level 3 - Manager		
No	4 (13.3)	1 (3.3)
Low	4 (13.3)	2 (6.7)
Medium	13 (43.3)	9 (30.0)
High	9 (30.0)	18 (60.0)
Column Totals(%)	30(100.0)[a]	30(100.0)[b]

[a] Five clerical, twenty-nine professional/technical and two managers did not complete this survey question. Two employees involved in labor oriented work noted that they do not belong in the acknowledged three organizational levels.

[b] Six clerical, eight professional/technical and two managers did not complete this survey question. Two employees involved in labor oriented work noted that they do not belong in the acknowledged three organizational levels.

the desire for an increased degree of enclosure rose dramatically higher for professional/technical employees.

Information in Table 7 shows a comparison between user perception of visual privacy from others around them by the actual degree of enclosure by the organizational level. Forty out of 89 (44.9%) respondents felt that they did not have visual privacy from others around them. Eight out of 11 (72.7%) of employees in a high degree of enclosure felt that they had visual privacy from others around them. Sixteen out of 30 (53.3%) employees in a medium degree of enclosure felt that they had visual privacy from others around them. Six of 14 (42.9%) employees in a low degree of enclosure felt they had visual privacy from others around them while 14 out of 34 (41.2%) employees with open enclosure felt this way. The percentage of employees who felt they had visual privacy from others decreased as the degree of enclosure decreased. It is not surprising

Table 7

"I Have Visual Privacy from Others Around Me" by Actual Degree of Enclosure by Organizational Level: Frequency of Agreement

Degree of Enclosure	No			Low			Medium			High			Row Totals
Visual Privacy	A[a]	N[b]	D[c]	A	N	D	A	N	D	A	N	D	
Level 1 (Clerical)	5	0	0	0	0	3	2	1	4	0	0	0	18[d]
Level 2 (P/T[e])	1	0	7	3	2	0	6	0	3	2	0	0	39[d]
Level 3 (Manager)	9	2	10	4	0	3	7	0	6	6	2	1	30[d]
Other	3	0	1	2	0	2	1	0	0	0	0	0	2
Column Total	14	2	18	6	0	8	16	1	13	8	2	1	89[d]

Alpha level - $p < .05$
Chi square - 30.22
Degrees of freedom - 28

[a] Somewhat or strongly agreed that they had visual privacy
[b] Neither agreed nor disagreed that they had visual privacy
[c] Somewhat or strongly disagreed that they had visual privacy
[d] Five clerical, thirty professional/technical and two managers did not complete these survey questions.
[e] Professional/Technical

that more employees in workstations with no and low enclosure disagreed that they had visual privacy, while more employees in medium and high degrees of enclosure agreed that they had visual privacy. The fact that thirteen out of thirty (43.3%) level two employees disagreed is not surprising because anthropometric data on stature and standing eye level heights demonstrate that half of all passers-by can see over 60" high workstations (Panero & Zelnik, 1979, p. 86).

Acoustical Privacy:

Employee perceptions of acoustical privacy showed that the biggest noise maker in the office was voices. This response came from more than sixty percent (64.4%) of all respondents. The next two largest noise makers were reported as office machines and telephones, respectively (see Appendix, p. 130).

Information in Table 8 illustrates a comparison between the actual degree of enclosure and user perceptions of acoustical privacy from others around them. Sixty-five out of 92 (70.7%) workers completing these questions felt that they did not have acoustical privacy from others around them. Sixty-four out of 65 (98.5%) employees who felt that they did not have acoustical privacy were employees with open offices and employees with low and medium degrees of enclosure. Ten out of 18 (55.6%) employees who felt that they did have acoustical privacy were in a high degree of enclosure.

In each department, ambient background noise levels ranged between 50 and 55 decibels, and activity noise levels ranged between 58 and 75 decibels. The difference in readings at the seat and the door averaged three decibels so the average reading was recorded and is represented by the activity noise levels in Table 9. Seventy-five percent of all employees from the multistage cluster sample had noise level readings well within the normal conversational decibel

Table 8

"I Have Acoustical Privacy from Others Around Me" by Actual

Degree of Enclosure by Organizational Level: Frequency of Agreement

Degree of Enclosure	No			Low			Medium			High			Row Totals
Visual Privacy	A[a]	N[b]	D[c]	A	N	D	A	N	D	A	N	D	
Level 1 (Clerical)	0	1	7	0	0	3	0	1	6	0	0	0	18[d]
Level 2 (P/T[e])	5	4	15	0	2	5	0	1	8	2	0	0	42[d]
Level 3 (Manager)	0	0	4	0	0	4	30	0	10	8	0	1	30[d]
Other	0	0	1	0	0	0	0	0	0	0	0	0	2
Column Total	5	5	27	0	2	12	3	2	25	10	0	1	92[d]

Alpha level - $p < .01$
Chi square - 75.18
Degrees of freedom - 28

[a] Somewhat or strongly agreed that they had acoustical privacy
[b] Neither agreed nor disagreed that they had acoustical privacy
[c] Somewhat or strongly disagreed that they had visual privacy
[d] Five clerical, twenty-seven professional/technical and two managers did not complete these survey questions.
[e] Professional/Technical

range, which was already defined as 50 to 60 decibels. Employees in open-plan offices had higher noise readings than those in traditional offices by 5 to 10 decibels. Nearly twenty-three percent (22.5%) of all employees from this sample had readings near the normal range limits of 65 decibels and approximately three percent (2.5%) exceeded the normal decibel range within their workstations.

The two activity noise readings between 71 and 80 decibels, which are higher than the normal range, were from level one employees' workstations having no and medium degrees of enclosure. Ten of eighteen (55.6%) employees who had decibel readings that were equal to or higher than the normal range were in an office having no degree of enclosure. Seventeen of 25 (68%) employees in the medium degree of enclosure had normal range decibel readings.

Twenty-two of 33 (66.7%) employees in an open workstation had activity noise readings between 50-60 decibels, which are in the

Table 9

Actual Degree of Enclosure by Organizational Level by Decibel Reading: Frequency of Readings

	Ambient Noise[a]	Activity Noise[a]			
Decibel Reading	50-55	50-60	61-70	71-80	Row Totals
Level 1 - Clerical					
No	8	4	2	1	7
Low	3	1	1	0	2
Medium	7	2	2	1	5
High	0	0	0	0	0
Level 2 - Professional/Technical					
No	22	15	7	0	22
Low	7	7	0	0	7
Medium	8	6	2	0	8
High	2	1	0	0	1
Level 3 - Manager					
No	4	3	1	0	4
Low	4	4	0	0	4
Medium	13	9	3	0	12
High	9	8	0	0	8
Column Totals	87[b]	60	18	2	80[c]

[a]In both the ambient and activity noise level recordings, the door and seat location decibel readings were averaged due to small differences between the two.

[b]Five clerical, thirty professional/technical, two managers and two employees involved in labor oriented work did not have noise level readings measured at their workstations due to multistage cluster sampling.

[c]Nine clerical, thirty-one professional/technical, four managers and two employees involved in labor oriented work did not have noise level readings measured at their workstations due to multistage cluster sampling.

normal conversation range. Twelve of 13 (92.3%) employees in a low degree of enclosure had normal range decibel readings, while all employees in a high degree of enclosure possessed decibel readings in the normal range. Table 9 shows that 42.9% of all level one employees in an open office (no degree of enclosure) had activity noise readings equal to or higher than the normal conversation range.

Based on questionnaire responses, 77.8% of all employees felt that they were not free to discuss private matters in their own workstations (see Appendix, p. 131). Table 10 illustrates significant results ($p < .01$) showing that 56 out of 87 (64.4%) of all employees felt they were not free to have a conference without distracting others. Thirteen out of 16 (81.3%) level one employees felt they were not free to confer without distracting others although they usually did not need to meet privately with others in their own work space. Twenty-six out of 39 (66.7%) level two employees felt they were not free to confer without distracting others and generally had higher

conferencing needs than level one employees. Seventeen out of 30 (56.7%) level three employees felt they were not free to confer without distracting others and generally had the highest conferencing needs. All employees in a high degree of enclosure felt that they could confer without distracting others followed by percentages of employees in medium, low and no enclosure, respectively. Responses from the Likert rating scale were condensed from five to three categories due to the even distribution of positive and negative responses.

On site documentation revealed that acoustical panel treatments were lacking for two-thirds of the surveyed respondents. The Department of Engineering Scientific Data Center had some Westinghouse acoustical panels and the Department of Commerce had none. Westinghouse acoustical panels have a noise reduction coefficient (NRC) rating of .75. Vertical walls in both departments were not acoustically treated and were constructed of metal.

Both departments had ceiling heights higher than nine feet. These ceilings were constructed of Armstrong fissured tile having a noise reduction coefficient of .55-.65. Ceilings were on a five foot grid system with a 2' x 4' flat lens fluorescent fixture centered in the middle of each grid. Continuous rows of lighting were utilized with 18" from end to end of each fixture and 4' between each side.

The spaceplanning standards positioned the doors of workstations on semi-public corridors (not main traffic aisles) as shown in Figure 4. Overall, readings indicated that noise levels were higher at all doors than from the seat location in the work spaces by up to seven decibels. The difference between the two readings was no more than three decibels in more than 90% of the workstations. These two measurements were averaged to record one figure, due to the small variance. Differences in noise levels were not significant between main traffic aisles and semi-public corridors.

Table 10

"I Can Have a Conference Without Distracting Others" by by Actual Degree of Enclosure by Organizational Level : Frequency of Agreement

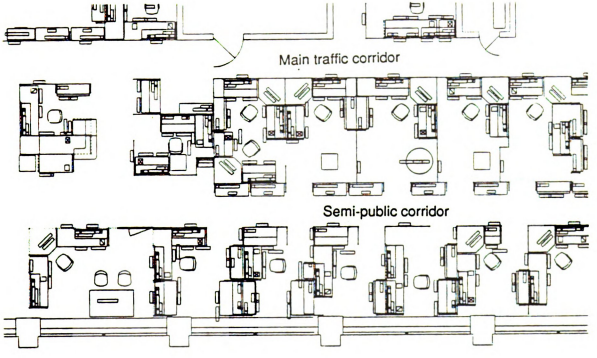
Degree of Enclosure	No			Low			Medium			High			Row Totals
Visual Privacy	A[a]	N[b]	D[c]	A	N	D	A	N	D	A	N	D	
Level 1 (Clerical)	0	1	7	0	0	3	1	1	3	0	0	0	16[d]
Level 2 (P/T[e])	1	5	15	2	0	5	2	1	6	2	0	0	39[d]
Level 3 (Manager)	0	1	3	0	0	4	3	0	10	9	0	0	30[d]
Other	1	0	0	0	0	0	0	1	0	0	0	0	2
Column Total	2	7	25	2	0	12	6	3	19	11	0	0	87[d]

Alpha level - $p < .01$
Chi square - 26.28
Degrees of freedom - 12

[a] Somewhat or strongly agreed that they could confer
[b] Neither agreed nor disagreed that they could confer
[c] Somewhat or strongly disagreed that they could confer
[d] Seven clerical, thirty professional/technical and two managers did not complete these survey questions.
[e] Professional/Technical

Figure 4

Typical Departments' Workstation Spaceplanning



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Visual and Acoustical Privacy:

When all questionnaire respondents were asked if a door would increase their working effectiveness, 74 out of 119 (62.2%) stated that it would (see Appendix, p.134). Nineteen out of 30 (63.3%) of all managers reported that they were furnished with doors (see Appendix, p. 125). Four of the 19 (21.1%) managers reported keeping their door open 60% to 79% of the time. Five of the 19 (26.3%) managers reported keeping their doors open 80% to 99% of the time while the other ten (52.6%) reported keeping their doors open 100% of the time (see Appendix, p. 125).

In the 1989 Louis Harris and Associates survey, office workers placed a great deal of importance on the physical office environment facilitating their productivity. Job productivity was not measured in this study, but more than two-thirds of the employees felt that uncontrolled noise contributed to low productivity. In this study,

losses in visual and acoustical privacy did not significantly affect job satisfaction at these two work sites (see Appendix, p.132).

Significance of Tasks:

Table 11 illustrates a comparison between organizational level and decision making involvement. A significant response ($p < .01$) was found with 61 out of 125 (48.8%) of all employees agreeing that they were involved in decision making within the organization. Fifty-four out of 61 (88.5%) employees who felt they were involved in decision making were professional/technical and managerial employees. About eighty-four percent (84.3%) of the level three employees (managers) reported that they were involved in decision making compared to 39.7% of the level two employees (professional/technical). Approximately forty percent (39.7%) of the professional/ technical employees felt that they were not involved in decision making in the organization and were equally divided in their perception of

Table 11

"I Am Involved in Decision Making in My Organization" by Organizational Level: Frequency of Agreement

Organizational Level	S.A.[a]	N.A.D.[b]	S.D.[c]	Row Totals(%)
Level 1 (Clerical)	5 (21.7)	8(34.8)	10(43.5)	23(100)
Level 2 (Prof/Tech[d])	27 (39.7)	14(20.6)	27(39.7)	68(100)[e]
Level 3 (Manager)	27 (84.3)	3 (9.4)	2 (6.3)	32(100)
Other[f]	2(100.0)	0 (0.0)	0 (0.0)	2(100)
Column Totals	61	25	39	125(100)[e]

Alpha level - $p < .01$
Chi square - 39.66
Degrees of freedom - 12

Key:

[a] Somewhat agreed or strongly agreed
[b] Neither agreed nor disagreed
[c] Somewhat disagreed or strongly disagreed
[d] Professional/Technical
[e] One professional/technical employee did not complete this survey question.
[f] Two employees involved in labor oriented work noted that they did not belong in any of the acknowledged three categories.

involvement and non-involvement in decision making in the organization. Responses from the Likert rating scale were condensed from five to three categories due to the even distribution of positive and negative responses.

Eighty-one percent (80.9%) of all workers agreed that their work required the use of a number of complex skills (see Appendix, p. 128). Table 12 compares the responses of each organizational level with the degree of enclosure and the complexity of tasks. Seventy-seven out of 91 (84.6%) respondents who felt that they performed complex tasks desired a medium to high degree of enclosure. Forty-four out of 77 (57.1%) of these employees were professional/technical employees and 26 out of 77 (33.8%) were managers. Seventeen out of 28 (60.7%) of the employees who desired a high degree of enclosure were managers, while 34 out of 49 (69.4%) of the employees who desired a medium degree of enclosure were professional/technical employees.

Table 12

Performance of Complex Tasks by Organizational Level by Adequate Degree of Enclosure: Frequency of Responses

Degree of Enclosure	No			Low			Medium			High			Row Totals
Complexity of Tasks	A[a]	N[b]	D[c]	A	N	D	A	N	D	A	N	D	
Level 1 (Clerical)	5	0	0	1	0	0	6	4	0	0	1	0	17[d]
Level 2 (P/T[e])	1	0	2	3	2	0	34	2	2	10	2	3	61[d]
Level 3 (Manager)	1	0	0	2	0	0	9	0	0	17	1	0	30[d]
Other	1	0	0	0	0	0	0	0	0	1	0	0	2
Column Totals	8	0	2	6	2	0	49	6	2	28	4	3	110[d]

[a] Somewhat or strongly agreed that they performed complex skills
[b] Neither agreed nor disagreed that they performed complex skills
[c] Somewhat or strongly disagreed that they performed complex skills
[d] Six clerical, eight professional/technical and two managers did not complete these survey questions.
[e] Professional/Technical

Information in Table 13 illustrates the frequency of complex and repetitive tasks performed by employees within each organizational level. Nearly ninety-seven percent (96.9%) of managers performed complex tasks with lower but substantial percentages reported by professional/technical (78.3%) and clerical (65.2%) employees. Nearly eighty-three percent (82.6%) of clerical employees performed repetitive tasks with lower but substantial percentages reported by managers (65.6%) and professional/technical (56.5%) employees.

Information in Table 14 illustrates the frequency of employees who agreed that the current office area enhanced required communication by organizational level by actual degree of enclosure. Employees working in a high degree of enclosure and employees working in open work spaces had the most significant differences, with an alpha level of $p < .01$. Ten of eleven (90.9%) employees in a high degree of enclosure reported that the office area enhanced required communication, and 22 of 35 (62.9%) employees in an office

Table 13

Comparison between Complex and Repetitive Tasks by Organizational Level: Frequency of Tasks

Organizational Level	n	Employees who Performed Complex[a] Tasks (%)	Employees who Performed Repetitive[b] Tasks (%)
Level 1- Clerical	23	15(65.2)[c]	19(82.6)[d]
Level 2- Professional	69	54(78.3)[c]	39(56.5)[d]
Level 3- Manager	32	31(96.9)[c]	21(65.6)[d]
	124[e]	85[c]	79[d]

Alpha level p = .05
[a] Chi square - 20.98
[b] Chi square - 20.48
Degrees of freedom - 12

Key:

[c] Eight clerical, thirty professional/technical and one manager neither agreed or disagreed that they performed complex tasks.
[d] Four clerical, thirty professional/technical and eleven managers neither agreed or disagreed that they performed repetitive tasks.
[e] Two employees involved in labor oriented work noted that they did not belong in the acknowledged three organizational levels.

Table 14

"My Office Area Enhances Required Communication" by Actual Degree of Enclosure by Organization Level: Frequency of Responses

Degree of Enclosure	No			Low			Medium			High			Row Totals
Visual Privacy	A[a]	N[b]	D[c]	A	N	D	A	N	D	A	N	D	
Level 1 (Clerical)	0	0	8	1	0	2	2	3	2	0	0	0	18[d]
Level 2 (P/T[e])	3	9	10	3	1	3	3	3	4	2	0	0	41[d]
Level 3 (Manager)	0	1	3	1	0	3	2	8	2	8	1	0	29[d]
Other	0	0	1	0	0	0	0	1	0	0	0	0	2
Column Total	3	10	22	5	1	8	7	15	8	10	1	0	90[d]

Alpha level - $p < .01$
Chi square - 67.8
Degrees of freedom - 28

[a] Somewhat or strongly agreed that they had visual privacy
[b] Neither agreed nor disagreed that they had visual privacy
[c] Somewhat or strongly disagreed that they had visual privacy
[d] Five clerical, twenty-eight professional/technical and three managers did not complete these survey questions.
[e] Professional/Technical

with no enclosure reported that the office area did not enhance required communication.

Data in Table 15 shows a comparison between organizational level and difficulty in concentrating in the workstation. A significant value ($p < .05$) was found showing that 42 out of 89 (47.2%) of all employees agreed that they had trouble concentrating in their workstations regardless of level. Twenty-one out of 40 (52.5%) professional/technical employees had trouble concentrating in the workstation followed by lower but substantial percentages reported by 14 out of 30 (46.7%) managers and 7 out 17 (41.2%) clerical employees. Fourteen out of 30 (46.7%) managers reported that they did not have trouble concentrating in their workstations. Twenty-nine out of 48 (60.4%) employees with open work spaces or in low enclosure reported that they had trouble concentrating in their workstation. Fifteen out of 30 (50.0%) employees in a medium degree of enclosure and nine out of 11 (81.8%) employees in a high degree of

Table 15

"I Have Trouble Concentrating in My Workstation" by Actual Degree of Enclosure by Organizational Level: Frequency of Agreement

Degree of Enclosure	No			Low			Medium			High			Row Totals
Visual Privacy	A[a]	N[b]	D[c]	A	N	D	A	N	D	A	N	D	
Level 1 (Clerical)	3	3	1	2	1	0	2	1	4	0	0	0	17[d]
Level 2 (P/T[e])	13	3	6	4	1	2	4	2	3	0	0	2	40[d]
Level 3 (Manager)	4	0	0	3	1	0	5	1	7	2	0	7	30[d]
Other	0	0	1	0	0	0	0	0	1	0	0	0	2
Column Total	20	6	8	9	3	2	11	4	15	2	0	9	89[d]

Alpha level - $p < .05$
Chi square - 43.85
Degrees of freedom - 28

[a] Somewhat or strongly agreed that they had visual privacy
[b] Neither agreed nor disagreed that they had visual privacy
[c] Somewhat or strongly disagreed that they had visual privacy
[d] Six clerical, twenty-nine professional/technical and two managers did not complete these survey questions.
[e] Professional/Technical

enclosure felt that they did not have trouble concentrating. Responses from the Likert rating scale were condensed from five to three categories due to the even distribution of positive and negative responses.

Information in Table 16 shows a comparison between "I Have Personal Privacy in My Work Area" by "Actual Degree of Enclosure". Fifty out of 55 (90.9%) of all employees who felt they did not have enough privacy in their work area occupied work spaces with no, low and medium degrees of enclosure. Employees in high enclosure reported more privacy than workstations having lower architectural privacy, although 45.5% felt that they did not have enough personal privacy.

As illustrated in Table 17, a significant value ($p = .03$) was found in a comparison between "I Can Control the Number of People who Enter My Work Environment" and degree of enclosure. Nearly ninety-five percent (94.5%) of all employees who felt they could not control the number of people entering their work environment occupied work spaces with no,

Table 16

"I Have Enough Personal Privacy in My Work Area" by Actual Degree of Enclosure: Frequency of Agreement

Degree of Enclosure	Category	Agreed[a]	N.A.D.[b]	Disagreed[c]	Row Totals (%)
No	A,B,C,D	5(14.3)	7(20.0)	23(65.7)	35(100)
Low	F	2(14.3)	2(14.3)	10(71.4)	14(100)
Medium	E, G	5(16.7)	8(26.7)	17(56.7)	30(100)
High	H	4(36.4)	2(18.2)	5(45.5)	11(100)
Column Totals		16	19	55	90[d]

Alpha level - $p > .05$
Chi square - 26.23
Degrees of freedom - 28

Key:

[a] Somewhat or strongly agreed
[b] Neither agreed nor disagreed
[c] Somewhat or strongly disagreed
[d] 36 respondents did not complete the survey question.

Table 17

"I Can Control the Number of People Who Enter my Work Environment" by Actual Degree of Enclosure: Frequency of Agreement

Degree of Enclosure	Category	Agreed[a]	N.A.D.[b]	Disagreed[c]	Row Totals (%)
No	A,B,C,D	2 (5.9)	6(17.6)	26(76.5)	34(100)
Low	F	3(21.4)	0 (0.0)	11(78.8)	14(100)
Medium	E, G	9(31.0)	5(17.2)	15(51.7)	29(100)
High	H	7(63.6)	1 (9.1)	3(27.3)	11(100)
Column Totals		21	12	55	88[d]

Alpha level - $p < .05$
Chi square - 43.26
Degrees of freedom - 28

Key:

[a] Somewhat or strongly agreed
[b] Neither agree nor disagreed
[c] Somewhat or strongly disagreed
[d] 38 respondents did not complete the survey question.

low and medium degrees of enclosure. Nearly sixty-four percent (63.6%) of employees in a high degree of enclosure felt that they did have control over people entering their work environment.

Chapter 4

DISCUSSION

This chapter begins with a discussion and review of the hypotheses and theories as they relate to significant findings. Contributions, limitations and recommendations for future studies complete this section.

Hypotheses:

Discussion and comparison of hypotheses from responses concerning the degree of visual and acoustical privacy that best suit employees in open-plan office environments follow:

Hypothesis 1: Open-plan offices with no degree of visual and acoustical privacy are appropriate for relatively few employees and their work tasks regardless of level (levels one, two or three).

Nearly forty percent (38.9%) of all employees reported working in a work space having no enclosure, as shown in Table 4. Eight of 35 (22.9%) were level one employees, 22 of 35 (62.9%) were level two employees and four of 35 (11.4%) were level three employees, as shown in Table 5.

By definition, it is clear that when architectural privacy does not exist, visual and acoustical privacy do not exist except to a lesser degree through the amount of partial enclosure, interior finishes, and through coping behaviors such as the arrangement of furniture, orientation of the body, and utilization of ambient noise levels. As shown in Table 7, 18 of 34 (52.9%) employees with no degree of enclosure felt that they did not have visual privacy from others while 14 of 34 (41.2%) felt that they did. The model (Figure 1) shows that visual privacy is dependent on the degree of enclosure provided by the work space. Efforts at adapting or coping as cited above may be the reason. The hypothesis is accepted, not only because of the obvious

absence of architectural privacy buffers such as an adequate number of sides and heights of panels and walls, but because of 1) actual measurements of decibel levels (one-third having decibel readings close to or exceeding the limit for normal conversation, as shown in Table 9), 2) the absence of finishes that meet minimum acoustical requirements (acoustical panel treatments lacking for two-thirds of all users), 3) consequential self-reported hindrance of communication [22 of 35 (62.9%) employees, as shown in Table 14], 4) the self-reported inability of users to concentrate [20 of 34 (58.8%), as shown in Table 15], 5) and the self-reported inability of users to control access (76.5%, as shown in Table 17). Overall, 90.9% of all employees perceived that the bullpen situation was inappropriate to adequately serve their needs, as shown in Table 2.

Employees in offices with no degree of enclosure accurately felt that they did not have acoustical privacy [22 of 37 (72.9%)], and they didn't, according to actual measurements close to the limit or

exceeding the limit for normal conversation, as shown in Table 9. Levels of background noise (intrusive speech) exceeded ambient noise levels by 10 decibels or more, producing poor acoustical privacy.

Information presented in Table 13 shows that all organizational levels reported performance of both complex and repetitive tasks, so the argument for providing less privacy for employees who performed repetitive tasks cannot be made. The importance of privacy increased with the performance of complex tasks, because people who perform them are more sensitive to invasions of noise and visual distractions than those performing routine tasks (Sundstrom et al., 1982; Brill et al., 1984). Of those employees who felt that they performed complex tasks, eight of 110 (7.3%) actually wanted to work in such an open work space, as shown in Table 12.

Marans noted that each job description might require people to respond differently to an environment. Five of the eight respondents who desired no enclosure were level one employees, as shown in

Table 12. Two of the five (40%) respondents designated their job title as "secretary", two respondents designated their job title as "bookkeeping clerk", and the remaining response fell within another category. Due to the small data base within individual job titles, the results are only an indication of the degree of enclosure that was specifically conducive to their individual work tasks.

No degree of enclosure did not provide the architectural boundaries necessary for achieving control in the work environment showing support for the theory of privacy as an interpersonal boundary control process. This theory emphasizes that privacy can be an aid to 1) changing interpersonal contacts, 2) regulation of social interactions, 3) allowing satisfactory and unsatisfactory levels, 4) reducing distractions, and 5) allowing concentration (Altman, 1976; Brill, 1984).

Information in Table 2 shows that 29.4% of level one employees supported the absence of full height walls and barriers although

findings were not significant for any other level in the organization. Level one employees may have contrasting needs compared to those employees performing additional complex tasks. Establishing and maintaining social relationships through more open environments may be one coping mechanism for some level one employees in this space. Because the social climate was not measured, additional research must be completed before firm conclusions can be reached.

Hypotheses 2: Open-plan offices with low degrees of visual and acoustical privacy are appropriate for some level one employees and their work tasks.

Fourteen out of 90 (15.6%) employees reported working in a low degree of enclosure, as shown in Tables 4 and 5. The highest percentage of employees who reported 1) an inability to concentrate [64.3% in Table 15], 2) an inability to control access [78.8% in Table 17], 3) a lack of visual privacy [57.1% in Table 7] and 4) a lack of acoustical privacy [85.7% in Table 8] were employees in a low degree of enclosure.

Due to the small data base of level one employees working in a low degree of enclosure (as shown in Table 5), the results are inconclusive, and this hypothesis is not accepted or rejected. The data indicates that the suitability of low degrees of privacy is appropriate for relatively few employees and their work tasks regardless of level. Suitability of this degree of enclosure would be least appropriate for employees performing complex tasks due to the inability of employees to concentrate and control access of others around them.

Hypothesis 3: Open-plan offices with medium degrees of visual and acoustical privacy are appropriate for some level one employees and their work tasks.

Information in Table 4 shows that 33.3% of all employees reported working in a medium degree of enclosure. Table 5 shows that seven of 30 (23.3%) employees working in a medium degree of enclosure were level one employees. As shown in this table, this data base of level one employees is small. Because of this, the results are

inconclusive, and this hypothesis is not accepted or rejected. An indication of the results obtained from the data follows.

When architectural privacy in open-plan workstations is maximized, visual and acoustical privacy are present but are dependent on the number of sides and height of enclosure, furniture arrangement, bodily orientation, interior finishes and ambient noise levels. Information in Table 7 shows that 16 out of 30 (53.3%) of all employees working in a medium degree of enclosure felt that they had visual privacy from others around them. Two of seven (28.6%) level one employees reported the presence of visual privacy.

The results indicate that the medium degree of visual privacy is appropriate because of the obvious presence of privacy buffers such as panels and walls needed for performing both repetitive and complex tasks. Acoustical privacy exists by definition because the readings shown in Table 9 are within the range defined but are unacceptable because decibel readings above .65 are above the normal

range of conversation. Furthermore, the degree of acoustical privacy provided is unacceptable due to the absence of acoustical finishes with noise reduction coefficients below .80. Table 12 shows that six of 49 (12.2%) employees in a medium degree of enclosure were level one employees who performed complex tasks. Overall, Table 6 shows that 58.8% of level one employees felt that a medium degree of enclosure would adequately serve their needs.

Table 8 shows that employees in a medium degree of enclosure felt that they did not have acoustical privacy from others around them regardless of level. This perception coincided with actual decibel readings, as shown in Table 9. Three of five (60%) level one employees in a medium degree of enclosure had noise levels at or above the normal conversation range, indicating that acoustical invasions may be a drawback for level one employees in medium degrees of enclosure.

Two of six (33.3%) employees who designated their job title as secretary felt that a medium degree of enclosure would adequately serve their needs. Two of three employees (66.7%) who designated their job title as bookkeeping clerk felt that a medium degree of enclosure would adequately serve their needs.

Hypothesis 4: Open-plan offices with medium degrees of visual and acoustical privacy are appropriate for some level two employees and their work tasks.

As previously explained, Table 5 shows that nine of 30 (30.0%) employees who reported working in a medium degree of enclosure were level two employees. This hypothesis is accepted, not only because of the presence of privacy buffers such as panels and walls, but because of 1) actual measurements of decibel levels as shown in Table 9, 2) the self-reported ability to have visual privacy [66.7% of level two employees, Table 7], 3) self-reported involvement in decision making in the organization as shown by an equal 39.7% split in responses in Table 11, 4) the self-reported performance of complex

tasks [89.5% of level two employees, Table 12], and 5) the self-reported enhancement of communication [three of 10 (30%) positive and four of 10 (40%) negative, Table 14]. Overall, the perception of 62.3% of all level two employees was that a medium degree of enclosure would adequately serve their needs, as shown in Tables 2 and 6.

Table 8 shows that 83.9% of all employees in a medium degree of enclosure felt that they did not have acoustical privacy from others around them, although activity noise readings indicated otherwise, as shown in Table 9. One reason for this conflict in data may be due to the intrusive noises that were more than 10 decibels higher than the ambient background noise readings.

Three level two job titles, with sufficient numbers of employees from which to compile results were: 1) system analyst, 2) technical systems programmer and 3) account executive. In reviewing job titles, seven out of 14 (50%) system analysts desired a medium

degree of enclosure, three of five (60%) technical system programmers desired a medium degree of enclosure, while three of five (60%) account executives desired a medium degree of enclosure. Due to the small data base within individual job titles, the results are only an indication of the degree of enclosure that was considered to be specifically conducive to their individual work tasks.

Privacy in work spaces allows workers to concentrate through control of distractions and interruptions. This control allows workers to complete what they need or want to do showing support for the theory of privacy as an interpersonal boundary control process.

Hypothesis 5: Offices with high degrees of visual and acoustical privacy are appropriate for some level two employees and their work tasks.

Information in Table 4 illustrates that 12.2% of all employees reported working in an office with a high degree of enclosure. Table 5 shows that two of 11 (18.2%) employees in a high degree of enclosure were level two employees, while Table 2 illustrates that 15 of 61

(24.6%) employees felt that a high degree of enclosure would adequately serve their needs. As shown in this table, the data base of level two employees in a high degree of enclosure is small. Because of this the results are inconclusive, and this hypothesis is not accepted or rejected. The implications of the data that was recorded are as follow.

Both level two employees in a high degree of enclosure reported that they 1) could confer without distracting others [Table 10], 2) were involved in decision making [Table 11], 3) had an office that enhanced required communication [Table 14], 4) did not have trouble concentrating [Table 15], 5) and could control access [Table 17]. This data coupled with the small percentage of employees in a medium degree of enclosure who reported that they 1) could confer without distracting others [two of nine (22.2%), in Table 10], 2) were involved in decision making [five of nine (55.6%, in Table 11], 3) felt that their office enhanced communication [three of nine (33.3%), shown in Table

14], 4) reported trouble concentrating [four of nine (44.4%), in Table 15], and 5) reported an inability to control access of people into their work environment [three of nine (33.3%), in Table 17], infer that increased architectural privacy is necessary for level two employees and their work tasks. Tables 7 and 8 show that both employees felt that they had visual and acoustical privacy from others around them. This would be expected with this level of architectural privacy.

Table 8 illustrates that 90.1% employees in a high degree of enclosure accurately felt that they had acoustical privacy from others around them. Table 9 illustrates that all employees who are currently in a high degree of enclosure had decibel readings well within the normal range of conversation, already defined as 55 to 65 decibels. Open-plan offices had readings five to 10 decibels higher than in traditional offices.

Data presented in Table 12 illustrates that 48 out of 61 (78.7%) of all level two employees reported performance of complex tasks. Of

those level two employees who reported performance of complex tasks, 10 of 48 (20.8%) wanted to work in a high degree of enclosure. Privacy becomes more important as jobs become more complex (Sundstrom et al., 1982). The greater frequency of complex tasks performed, the more sensitive employees are to distractions illustrating the importance of privacy found in high enclosure. More level two employees performed complex tasks than level one employees (in Table 13) indicating a need by level two employees for a greater degree of enclosure.

The theory of privacy as an interpersonal boundary control process allows for control over changing interpersonal contacts which range from wanting to be alone to wanting to be accessible to others. Augmenting privacy in work spaces through an increase in the number and height of architectural barriers would allow workers to control access, concentrate, confer without distracting others, and

reduce visual distraction. This control allows employees to complete what they need or want to do (Altman, 1976; Brill et al., 1984).

Hypothesis 6: Offices with a high degree of visual and acoustical privacy are appropriate for level three employees and their work tasks.

Information in Table 5 shows that 81.8% of employees in a high degree of enclosure were level three employees. The hypothesis is accepted because of 1) actual measurements of decibel levels, as shown in Table 9, 2) self-reported ability to confer [nine of nine (100%) level three employees, in Table 10], 3) self-reported involvement in decision making (39.7% split response, shown in Table 11], 4) office enhancement of communication (eight out of nine (88.9%) level three employees, in Table 14], 5) the self-reported ability to concentrate in a high degree of enclosure [seven of nine (77.8%) level three employees, in Table 15], 6) ability of all employees in a high degree of enclosure to control access [seven of 11(63.6%), shown in Table 17], 7) self-reported visual privacy [six out

of nine (66.7%) level three employees, shown in Table 7] and 8) self-reported acoustical privacy [eight out of nine (88.9%) level three employees, as shown in Table 8]. This perception was accurate according to 100% of the noise level readings documented to be within the normal conversational range, shown in Table 9. Overall, Table 2 shows that 60.0% of level three employees felt that a high degree of enclosure would adequately serve their needs.

As shown in Tables 2 and 6, a desire for increased enclosure increased as organizational level increased, as found by Brill & Ferguson, 1986; Brill et al., 1984. One reason for this finding may be due to the fact that, as organizational level increased, the percentage of people performing complex tasks increased (Table 13) from 65.2% of level one employees to 78.3% of level two employees to 96.9% of level three employees. Seventeen of 29 (58.6%) level three employees who reported performance of complex tasks felt that a high degree of enclosure would adequately serve their needs, as shown in Table 12.

Three of the seven (42.9%) respondents who designated their job title as supervisors/managers felt that a high degree of enclosure was necessary to adequately serve their needs. Due to the small data base for this individual job title, the results are only an indication of the degree of enclosure specifically conducive to their work tasks.

Results support the theory of privacy as an interpersonal boundary control process which theorizes that privacy can be an aid to: 1) reducing distractions, 2) allowing concentration, and 3) allowing changing interpersonal contacts, which range from wanting to be alone to wanting to be accessible to others. Results indicate that high degrees of privacy allow regulation of social interactions, allow user control over distractions and interruptions, and allow minimum selective interaction with maximum levels of control.

Contributions and Limitations:

In future studies relating to acoustical and visual privacy, the instructions and chart in the questionnaire (see Appendix, pp. 126 and 134) requesting information on actual and adequate numbers and heights for enclosure should be designed to increase clarity of meaning for respondents. Ambiguities did not appear on the pretest, but in the final questionnaire, several people marked more than one box, which was contrary to instructions. For example, if a respondent noted that he/she had one low panel, two high panels and one wall surrounding the work space, then it was clear that Category E - three high panels - was most appropriate to enter into the data entry. If a respondent noted that he had two low panels and two high panels, the response was ambiguous and no data entry could be made.

Panel heights should be defined differently since users of different stature may describe panel heights differently. Additional clarity will increase the reliability of the instrument and the validity

of the results. Obtaining users' statures would also improve the study.

Multiple methods were used in this study to insure that both environmental and personal systems were measured, as illustrated in the model (see Figure 1). A single method would not contribute all of the information necessary for examining information about the setting. Two of the methods used were 1) a questionnaire to gain users' perceptions of the work spaces and 2) on-site documentation of physical properties of work spaces, i.e. office enclosure, noise levels, ceiling construction and luminaire placement. These noise level readings provided objective descriptive information about the work spaces, as demonstrated in Table 9.

A dosimeter, which is a noise level meter that measures a time weighted average of noise levels without the presence of the investigator, would result in more reliable and valid measurements. Responses such as "You should come back when the cleaning people are

here with their vacuum cleaner" and people stopping their conversations when the investigator entered the space indicate a need for more typical noise readings. In managers' offices where closed meetings were taking place, noise level readings were postponed until the meeting was over, and then lower noise levels existed. Use of a dosimeter would record average decibel readings over time rather than recording the content of discussions and would preserve confidentiality.

The sample size was a substantial one suitable for reviewing overall information in this study, but individual data bases were small for examining crosstabulations of more than two variables. It would be useful in future studies of specific work tasks to acquire a larger sample size for categorization within each job title in order to obtain more generalizable results. The findings in this study are applicable to similar government work sites, where most employees perform some of the same types of work tasks. These results can be

generalized to all organizations having 1) different organizational levels, 2) numerous open-plan workstations, and 3) similar demographic variables. The multiple methods utilized in this study help to define factors that may also influence other work environments.

Data from this study was obtained by recording actual conditions within both departments. No changes to existing workstations were implemented prior to or during data collection. Future research should set up control groups and experimental groups to determine effects from changes in architectural and psychological privacy.

Conclusions and Recommendations:

This study was based on the theory of privacy as an interpersonal boundary control process and the concepts that a relationship exists between people and their environment and that people use cognitive processes and coping responses to control the influence of the

environment upon them. Some characteristics of psychological and physical properties of visual and acoustical privacy were measured to determine the outcome of these relationships. The data in this study demonstrate that the desire for higher degrees of enclosure increased with the complexity of tasks and with an increase in the organizational levels as found by Sundstrom et al., 1982 and Brill et al., 1984. Eighty-five percent (84.6%) of employees who found their work tasks to include complex tasks requested medium to high degrees of enclosure.

The return of questionnaires closely represents the percentage of employees by level in the organization. A look at years spent by employees in the organization show that 64.4% of all employees surveyed had been with the State of Michigan over six years. About sixty-three percent (62.7%) of all employees worked a 31 to 40 hour work week. Twenty-five percent (25.4%) of all employees worked more than 40 hours per week.

Investing in employees by providing satisfactory work environments is worthwhile, because 1) data obtained from respondents shows that employees remain with the State on a long-term basis and 2) visual and acoustical privacy have been found by Brill et al., 1984; Brill & Ferguson, 1986; to affect productivity and 3) visual and acoustical privacy have been found in this study to affect a) employees' ability to confer without distracting others, b) office areas enhancement of communication, c) employees' ability to concentrate, and 4) employees' ability to control access. It is important that the visual and acoustical privacy requirements fit employee work tasks since these employees are spending approximately one-fourth of their working life in the office.

In contrast to suppositions by Brill et al., 1984, all clerical workers did not desire the same degree of enclosure as professional/ technical (level two) workers. Specifically, 40% of all workers who

described their job title as "secretarial" felt that complete openness (no degree of enclosure) would adequately serve their needs.

Nearly ninety-one percent (90.9%) of all employees did desire some degree of enclosure. All levels of employees desired an increase in enclosure for their needs to adequately be served. The greatest percentage of level one employees felt that a medium degree of enclosure would adequately serve their needs followed by work areas with no degree of enclosure. The greatest percentage of level two employees felt that a medium degree of enclosure would adequately serve their needs followed by work areas with high degrees of enclosure. The greatest percentage of level three employees felt that a high degree of enclosure would adequately serve their needs followed by work areas with a medium degree of enclosure. The desire for increased enclosure increased with an increase in organizational level.

Employees with medium, low and no degrees of enclosure, 43.3%, 57.1% and 52.9% respectively, felt that they did not have visual privacy from others around them as compared to 9.1% of employees in a high degree of enclosure. Employees with no, low or medium degrees of enclosure, 72.9%, 85.7% and 83.3% respectively, felt that they did not have acoustical privacy from others around them as compared to 9.1% of employees in a high degree of enclosure. It is obvious that four walls provide more visual and acoustical privacy than open-plan panels. In a comparison of open-plan workstations, medium degrees of enclosure provided more visual privacy than a no or low degree of enclosure, as expected. It was surprising that more employees in low enclosure felt that they did not have visual privacy than did employees in no degree of enclosure.

Sixty of 80 (75.0%) employees had activity noise readings in the range of normal conversation. Perceptions of poor privacy may have evolved from the lack of acoustically treated surfaces and the

presence of intrusive sounds 10 decibels or higher than the ambient noise readings.

The self-reported inability to concentrate and the inability to control access followed the same pattern that was found for visual privacy. Employees in a high degree of enclosure reported the least difficulty followed by employees in a medium degree of enclosure. A higher percentage of employees currently in a low degree of enclosure reported more difficulty than employees in no degree of enclosure.

To resolve some of the visual and acoustical privacy problems Brill & Ferguson, 1986, recommended the adoption of two new standard panel heights. The findings from this study provided confirmation for these recommendations. Most manufacturers make panels in three height ranges: 42 to 48 inches, 60 to 65 inches and 80 inches. According to anthropometric studies, lower panel heights never provide visual privacy to passers-by and allow half of all seated workers to have eye contact with other seated workers. Sixty

inch high panels, which were the most frequently used by the State of Michigan, allowed half of all passers-by to see over them and into people's work spaces. High panels, 80 inches, provide visual privacy but are unpopular because they are so high and present problems relating to fire codes (Brill et al., 1984). Thus, taller panels, which do the job were rejected for aesthetic and fire code purposes. Medium height panels which sometimes did the job and were aesthetically acceptable were utilized most often, while the lowest panel height which did very little in terms of providing visual privacy was utilized in some level one workstations.

A 50" panel would provide visual privacy between seated workers and a 68" panel would provide visual privacy from 95% of passers-by, which would benefit 45% more employees in 60" high open-plan workstations. The 68" height has additional benefits. It does not block all of the light, may cause people to feel less closed-in, and may increase the cut-off angle from overhead light beyond the

immediate area, thereby reducing glare on VDT screens. The 50" panel would allow people standing or walking through a space to see seated workers. It could be useful in situations where workers need quick visual and acoustical access to one another, yet need to have distractions minimized when focusing on their work (Brill et al., 1986). This could serve as an alternative for employees with no degree of enclosure who reported that they did not have adequate visual privacy.

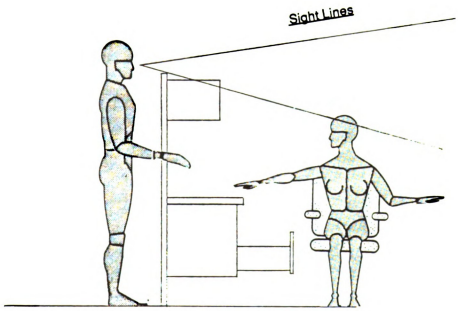
Until such panel heights are available, adding height to existing panels would solve some of the visual and acoustical issues at these two sites. System manufacturers have developed four to eight inch top caps for power and communications cabling for use with existing electrified panels. The State of Michigan does not use electrified panels in these departments but utilizes tombstones and strip plugs for getting power to individual workstations. Although the State of Michigan does not appear to have a need for excessive power, the

additional height could be obtained through use of these top caps. Visual privacy could also be enhanced by adding depth to existing panels (Brill et al., 1984). Hanging storage units on the inside or outside of the panels adjacent to the aisles would increase the depth of the workstation panel and assist in blocking the vision of passers-by, as shown in Figure 5. It should be noted that surfaces of overhead storage units on panel systems should be treated with absorptive materials in order to minimize sound reflections (Product Crafters, Inc., 1984).

According to Product Crafters, Inc., 1984, panel heights of less than 60" are relatively ineffective in producing the condition required for good open-plan speech privacy. For the 65 out of 92 (70.6%) employees who reported that they did not have adequate acoustical privacy from others around them, or when acoustical privacy is a major consideration, the 68" panel height would absorb and block a

Figure 5

Passers-by Sight Lines

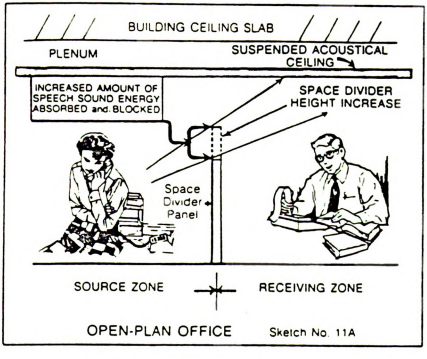


Adapted from Panero, J. and Zelnik, M. Human Dimension & Interior Space (NY: Watson-Guptill Publications, 1979). Reprinted with permission.

greater portion of the direct path speech sound energy as shown in Figure 6.

Figure 6

Pattern of Speech Sound Energy



March, J. Open Plan Acoustical Privacy (East Brunswick, NJ: Product Crafters, Inc., 1984) Sketch 11A. Reprinted with permission.

Most open-plan acousticians believe a minimum noise reduction coefficient (NRC) rating of .80 is necessary for open-plan panels (Product Crafters, Inc., 1984). Some employees in the Department of Engineering Scientific Data Center utilized Westinghouse acoustical panels which had a noise reduction coefficient rating below .80. Employees in the Department of Commerce utilized Westinghouse nonacoustical panels. On site documentation revealed that acoustical panels were lacking for two-thirds of the surveyed respondents and were either below the recommended minimum noise reduction coefficient or nonexistent for all employees.

In addition to acoustically treated open-plan panels, two other essential design components are necessary for achieving acoustical privacy. These are 1) the acoustical ceiling system and 2) the background sound masking system (Product Crafters, Inc).

Both departments were standardized on an Armstrong fissured ceiling with a noise reduction coefficient rating of .55-.65.

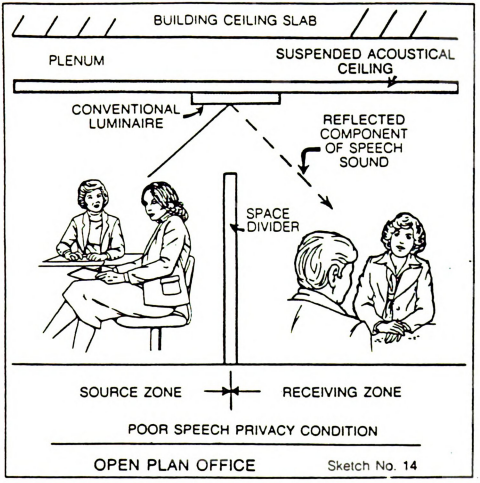
Reichenbach Inc., local ceiling contractors, stated that architects specify ceilings to have a noise reduction coefficient of .50 or more. Therefore ceilings at these two sites were in line with common installations.

As a general rule, the greater the acoustical ceiling height, the better the acoustical condition of the space for promoting privacy (Product Crafters Inc., 1984). The fact that these two work sites had ceiling heights above nine feet puts the State in a good position to control acoustics and promote acoustical privacy in an economical manner.

The selected luminaires (fixtures) are also a factor in acoustical privacy. Especially important is their overhead placement with respect to the location of workstation panels and their occupants. Their physical size and design are important. As shown in Figure 7, a conventional light fixture positioned directly above a panel will create an additional reflective surface for speech sound

Figure 7

Speech Sound Patterns



March, J. Open Plan Acoustical Privacy (East Brunswick, NJ: Product Crafters, Inc., 1984) Sketch 14. Reprinted with permission.

transmittance. This condition exists at these two sites because the ceiling system was laid out in a regular five foot grid pattern while the workstations themselves varied in size and placement.

Currently, the 2' x 4' flat-lensed fluorescent fixtures are centered in the middle of the five foot grid pattern. According to Product Crafters, Inc., 1984, luminaires should be distributed in an intermittent staggered pattern (10' on center) and 2' x 4' flat-lensed lighting fixtures should be avoided when planning for acoustical privacy. Small (1'x4' or 2'x2') acoustically optimized fixture assemblies that minimize and produce sound reflections should be specified and selected for use.

The third design component for achieving acoustical privacy in the open-plan office is a background sound masking system (Product Crafters, Inc., 1984). More than a 10 decibel difference sometimes existed between the ambient background noise and the level of intrusive speech noise producing poor acoustical privacy. According

to Burris-Meyer & Goodfriend, 1957, and Product Crafters, Inc., 1984, the total ambient background sound level should be maintained to the same relative level ± one or two decibels as the level of intrusive speech for good speech privacy in the receiving zone to be attained. This sound level should blend with the background sound patterns of the normal office so that it remains unnoticed and should not contain any sound frequencies that disturb occupants. Where achievement of acoustical privacy is a main goal, an acoustical consultant should be contracted (Product Crafters, Inc., 1984; Burris-Meyer & Goodfriend, 1957).

Approximately two-thirds of all respondents felt that a door would assist them in completing their tasks, even though employees who currently possess doors did not close them to maximize privacy needs. Nearly fifty-three percent (52.6%) of all managers who had doors kept them open 100% of the time while the other 47.4% kept them open 60 - 99% of the time. For this reason, recommendations

for changes do not include the addition of doors, but focus on increasing panel heights and perimeter depth, acoustically treating vertical surfaces, more effectively placing luminaires and utilizing a background sound masking system.

For the long term, the State of Michigan should 1) begin specifying acoustical panels with a noise reduction coefficient above .80, 2) use more effective panel height standards, 3) continue specifying acoustically treated ceilings, and 4) utilize a background sound masking system to offset the difference between the ambient background noise and the level of intrusive speech. The State of Michigan purchases about $1,000,000 worth of workstations annually and is an ideal user (client) to demand such criteria. Manufacturers are usually responsive to the needs and desires of the market, especially when the client is such a major user of their product. The State of Michigan owns and leases facilities estimated at 6.2 million

dollars. These facilities must be maintained and kept up-to-date for employees.

In this study, employees did not report a decrease in job satisfaction and thought that privacy would affect productivity. Future research needs to address the interrelatedness of the design - size and shape of the work space, the condition of the environment and microenvironment, existence and type of status markers, interpersonal communications, as well as visual and acoustical privacy. Although the influence of these factors may be small, the cumulative effects of these factors may have negative impacts on employees in their work environment (Wineman, 1982).

This study provides a clearer knowledge of visual and acoustical privacy that will help in establishing the interrelatedness of these factors. This work can 1) benefit the specific departments involved in the study, 2) be generalized for future design applications and 3) provide documentation for management to utilize when obtaining

funds for private work environments. With a clearer knowledge of these factors, work spaces of the future can be designed to support the needs of office workers.

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APPENDIX

This questionnaire was developed as part of a Michigan State University study to determine the levels of privacy that best suit various work tasks in office environments. In finding what works best for office employees, the information will be shared with the Department of Management and Budget for consideration in improved design and layouts of future work environments. Please complete the questionnaire while seated in your work space.

On the following pages you will find different questions relating to your job. Please read them carefully. It should take approximately 15 minutes to complete the entire questionnaire.

The questions are designed to obtain perceptions of your job and your reactions to it. There are no trick questions. Your individual answers will be kept completely confidential. Please answer each item as honestly and frankly as possible.

Please return the completed questionnaire by March 10 to Ann McCourt's secretary.

Thank you for your cooperation.

This questionnaire was developed as part of a Michigan State University study to determine the levels of privacy that best suit various work tasks in office environments. In finding what works best for office employees, the information will be shared with the Department of Management and Budget for consideration in improved design and layouts of future work environments. Please complete the questionnaire while seated in your work space.

On the following pages you will find different questions relating to your job. Please read them carefully. It should take approximately 15 minutes to complete the entire questionnaire.

The questions are designed to obtain perceptions of your job and your reactions to it. There are no trick questions. Your individual answers will be kept completely confidential. Please answer each item as honestly and frankly as possible.

Please return the completed questionnaire to Virginia Wills by March 10.

Thank you for your cooperation.

Demographics:

What category best describes your level in the organization?
1) clerical 23 2) professional/technical 69 3) managerial 32 4) other 2

What is your brief job title? _____

Years working in present job:
0-6 months 15 7 mn-1 yr 11 1-2 yr 29 3-5 yr 37 6-10 yr 19 11 yr or more 15

Years working in this organization:
1-2 16 3-5 28 6-10 20 11-15 28 16-20 20 21-25 7 26 or more 6

Sex: Male 58 Female 68

Age: under 20 13 20-29 48 30-39 46 40-49 14 50-59 4 60 and over 1

Educational level:

Grade school	0	College degree	39
Some high school	0	Some graduate work	7
High school degree	12	Master's degree	22
Some college experience	7	Higher degree than master's	7

I work ___ hours per week in this office?

0-10	1
11-20	3
21-30	10
31-40	79
41-50	29
51-60	2
greater than 60	1

Circle the response that is most applicable to you. Response alternatives range from 1 to 5 with 1 being strongly agree, 2 - somewhat agree, 3 - neither agree or disagree, 4 - somewhat disagree and 5 - strongly disagree

General:

The nearest person is ___ feet from me.
(from center of your chair to the center of their chair).

0-5	41
6-10	68
11-15	9
16-20	6
greater than 20	1

I am electronically monitored to measure my job performance. yes 3 no 123

My office has a door that can be closed: yes 19 no 107

I keep my door open: less than 59% 0 60-79% 4 80-99% 5 100% 10

My job often takes me away from the office:
less than 19% 66 20-39% 44 40-59% 12 60-79% 2 80-99% 1 100% 0

Place a check in the box that best describes your level of enclosure.

*Low panels-panels over which a seated person cannot see another seated person but a standing person can see another person.

*High panels-Panels over which a standing person cannot see another standing person but which do not go to the ceiling.

*Wall-Panels/partitions that go from floor to ceiling.

Height of sides of panels/walls

Number of sides of panels of walls	None	Low Panels	High Panels	Wall
0				
1				
2				
3				
4				

For the following questions circle the response that is most applicable to you. Response alternatives range from 1 to 5 with 1 being strongly agree, 2 - somewhat agree, 3 - neither agree or disagree, 4 - somewhat disagree and 5 - strongly disagree

	Frequency of Responses				
	1	2	3	4	5
I have control over the rate at which I am expected to do work.	32	61	6	19	6
I share common work areas with others.	23	33	19	19	32
I am annoyed when others use my work space.	17	30	44	21	14
I have trouble concentrating in my work station.	18	48	16	30	14
I have access to private meeting areas for important meetings.	46	42	12	15	10
I am close to the people I interact with most often.	37	45	18	13	12
My telephone calls are screened.	11	10	15	21	68
I am involved in decision making in my organization.	18	43	25	20	19
I would like to increase my productivity.	44	51	25	3	2
I am easily accessible by others.	66	47	10	2	1
The work that I perform is important to the organization.	72	41	12	0	1
I can easily concentrate on my work.	12	36	22	41	14
I am aware of others in nearby areas.	70	43	7	4	1

This job is one where a lot of other people can be affected by how well the work gets done.	60	42	8	5	1
The work that I do significantly affects the lives of other people.	39	54	22	6	5
The job requires me to use a number of complex skills.	50	52	15	3	6
My job requires a lot of cooperative work with other people.	51	57	14	2	1
I work closely with other people in performing my work tasks (clients or other people in the organization).	56	54	12	4	0
I have many opportunities to get to know other people while on the job.	56	43	17	8	1
I have many chances to help other people while at work.	49	47	17	12	0
My work area is located close to the people that I need to work with.	37	45	24	15	4
My work area is located near personal facilities. e.g. restrooms, eating areas, etc.	32	53	16	16	9
I can work uninterrupted for long periods.	16	48	17	29	15
I have enough personal privacy in my work area.	6	17	23	33	47
My office area enhances required communication.	13	21	32	20	38
I am adjacent to a corridor.	24	38	27	20	17
Many people pass by my work space on a day to day basis.	24	38	27	20	17

My work space is irregularly shaped.	43	31	18	19	15
I have grown used to interruptions.	17	19	31	28	31
Having a door to close on unwanted distractions would increase my effectiveness when working.	30	42	22	19	11
My work requires deep thought and concentration.	59	37	20	4	4
I have control of social contact with others around me.	31	55	18	13	6
I frequently get bored.	10	24	28	34	30
Most of my work is performed while in a seated position.	27	22	20	19	36
The job requires me to perform repetitive tasks.	44	35	25	13	9
I am visible to my supervisor.	16	30	24	28	28

Number of coworkers work spaces within a distance of 25 feet.
0 ___ 1 ___ 2 __ 3 __ 4 __ 5 __ 6 __ 7 __ 8 __ 9 __ 10 __ 11 __ 12 __

I share my office space with ___ people.
0 49, 1 2, 2 1, 3 10, 4 8, 5 10, 6 7, 7 13, 8 10, 9 11, 10 or greater 5

I take work home because it is difficult to complete at work. yes ___no ___

I am adjacent to a corridor. yes 72 no 52

Acoustics:

I am engaged in telephone conversation ___ % of my normal work day:
0-5 78 6-10 34 11-15 4 16-25 2 26-35 1 over 36% 2

Others around me use the telephone ___ % of a normal work day:
0-5 18 6-10 22 11-15 27 16-25 24 26-35 16 over 36% 17

The biggest noise maker in my office is: (Check one)

voices	76
office machines	23
nearby meetings	2
telephones	14
other	3

During your last normal work day, how often were you distracted by a noise from your work? (minutes per day)

0-10	21
11-20	22
21-30	22
31-40	14
41-50	9
51-60	8
greater than 60	25

What were the causes of these distractions? (check all that are applicable)

voices	111
office machines	55
nearby meetings	21
telephones	72
telephone conversations	65
other (be specific)	11

The ceiling is acoustically treated: yes 114 no 12

The walls are acoustically treated: yes 35 no 89

The floor is acoustically treated: yes 113 no 13

There is a sound masking system in my work environment: yes 7 no 118

Circle the response that is most applicable to you. Response alternatives range from 1 to 5 with 1 being strongly agree, 2 - somewhat agree, 3 - neither agree or disagree, 4 - somewhat disagree and 5 - strongly disagree

	Frequency of Responses				
	1	2	3	4	5
My work environment has uncontrollable noise.	39	47	15	17	8
Uncontrolled noise is irritating.	61	39	20	2	3
Uncontrolled noise contributes to low productivity.	45	42	27	7	4
I can control the level of noise when it is too high.	8	21	20	36	41
It is easy to offer feedback to fellow employees.	15	52	19	28	9
I have acoustical privacy from those around me.	5	12	11	25	72
I feel free to discuss private matters in my workstation.	10	7	11	16	82
In my office it is easy to talk openly to all people and to ask advice from any person.	19	27	15	28	37
I can have a conference without distracting others.	12	11	14	40	47
The noise in my office is not distracting.	8	13	19	38	46
I have sufficient acoustical privacy in my work area.	8	13	12	39	52
I can have confidential conversations easily.	9	7	7	20	82
My work area provides the acoustical privacy I need to do my work.	11	16	17	31	48

Satisfaction:					
The design of the work environment is functionally important to an organization.	84	37	2	2	1
Carefully selected furnishings can make your office environment an effective place to work.	84	34	4	1	0
I am satisfied with my work.	32	70	12	9	3
I enjoy my work.	51	55	12	8	0
This space adequately serves my needs.	18	36	18	28	26
The layout of the office is satisfactory.	14	28	21	35	28
I like my boss/manager.	59	42	15	3	2
Visual:					
I can control the number of people who enter my work environment.	11	15	15	37	46
I have visual privacy from others around me.	19	37	7	31	31
I have sufficient visual privacy in my work area.	19	36	16	31	23
My work area provides the visual privacy I need to do my work.	18	45	23	26	14

During your last normal work day, how often were you distracted by a person from your work? (minutes per day)

0-10	22
11-20	17
21-30	22
31-40	16
41-50	8
51-60	38
greater than 60	0

What were the causes of these distractions? (check all that are applicable)

see people working	16
see people passing	67
people seeing you	70
people entering space	93
people looking over panels	40
other (be specific)	5

I can see ____ out of my work space from where I usually perform my work tasks.

0"	20
up to 5'	32
up to 10'	40
up to 20'	12
over 20'	19

Place a check in the box to describe the level of enclosure that would adequately serve your work needs.

*Low panels-panels over which a seated person cannot see another seated person but a standing person can see another person.
*High panels-Panels over which a standing person cannot see another standing person but which do not go to the ceiling.
*Wall-Panels/partitions that go from floor to ceiling.

Height of sides of panels/walls

Number of sides of panels of walls	None	Low Panels	High Panels	Wall
0				
1				
2				
3				
4				

In the preceding question, would a door assist you in completing your tasks?

yes 74 no 45