

ON PSYCHOSOCIAL CONSTRUCTS IN OFFICE SETTINGS: A REVIEW OF THE EMPIRICAL LITERATURE

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ABSTRACT

This paper reviews the empirical literature on the relationships between psychosocial constructs and office settings. The constructs included in the review are *face-to-face communication* and *interaction*, *privacy*, *territoriality*, and *control* and *supervision*. The review shows that most empirical studies provide no rigorous analytic definition of a psychosocial construct. Instead, they treat a construct as a synthetic and relatively enduring quality of the internal office environment. Most empirical studies also lack rigorous experimental controls. As a result, they rarely explain any causal relationships between a psychosocial construct and office settings. Additionally, most studies do not involve different structural levels an office organization and their related psychological, social and cultural factors. The direct and indirect effects of different behavioral processes on the perception of a psychosocial construct are also not well studied in the empirical literature. Finally, even though the empirical literature emphasizes the importance of any differences between the desired and perceived levels of a psychosocial construct in dealing with satisfaction, performance or any other office outcomes, any objective measurement of a construct and its impacts on office outcomes remain unresolved in the literature.

Keywords: communication, interaction, privacy, territoriality, control, supervision, satisfaction, performance, office organization, office environment

INTRODUCTION: PSYCHOSOCIAL CONSTRUCTS IN OFFICE SETTINGS

In this paper, we review the empirical literature on a set of psychosocial constructs, which are potent and meaningful not only in the psychological and social domains but also in the spatial domains of office organizations. These constructs are *face-to-face communication* and *interaction*, *privacy*, *territoriality*, and *control* and *supervision*. Being middle range concepts, these constructs form a necessary link between the abstract description of an office organization and its physical setting. In addition to the programmatic description of people, work, structure and the reporting order of an office organization, we need a description of its psychosocial constructs to design the physical setting of the organization because individuals, groups and the organization as a whole

require certain degrees of environmental affordability in terms of these constructs. For example, in a design office, communication may be characterized by a continual discussion over the work in progress; the structure by a non-hierarchical order where status and privacy differentiation is minimal; control by a less rigorous set of behavioral codes; and so on. In contrast, in an advertising agency, communication may be characterized by an urgency to impress people immediately; the structure by a coalition between widely diverse groups where members of each group may have similar status but different roles; control by a rigorous set of behavioral codes since an internal competition for scarce resources may exist; and so on.

A conceptual framework linking an office organization, its physical setting, behavioral processes and outcome variables to the desired and perceived levels of psychosocial constructs is presented in Figure 1. The framework must not be considered as a well-supported set of propositions. Rather, it is presented as a tool with which to review the existing empirical literature, and to plan and direct future research on office settings. In the model, it is proposed that most office settings are designed or redesigned to meet some desired needs of a set of psychosocial constructs at different structural levels of the office organizations (pre-design phase in Figure 1). Office designs, once materialized and occupied, however, may influence these needs through their effects on behavior and organizational processes (occupancy phase in Figure 1). In a simple example, an individual may simply manipulate the physical setting, such as closing her office door or placing a plant near her workstation, in order to achieve the desired level of a psychosocial construct. In a more complex example, in addition to the physical features of a setting, an individual's perceived sense of a construct may also be affected by psychological processes, such as stress and overload, and past-experience, beliefs and attitude. Likewise, a group's perceived sense of a construct may be affected by such social psychological processes as choices and requirements of face-to-face communication and interactions, and regulations of immediacy; and an organization's perceived sense of a construct may be a result of the degree of congruence between organizational needs, such as adequacy of communication and security, and the physical setting of the organization.

Whether a psychosocial construct is perceived differently from what the physical setting is expected to afford is important for individual, group and organizational outcomes. However, the effects of the physical setting may be more direct in some cases than they are in the other cases. For example, an individual may perform poorly if she does complex work in a noisy space with minimum "acoustic privacy". In contrast, an individual may also perform poorly if she feels psychologically deprived of "acoustic privacy", even though she may be physiologically and functionally comfortable in her space. In both cases, individual's adaptation skills may be a mediating factor. For example, some individuals may be able to maintain a constant performance level even when the noise level in the setting changes, because

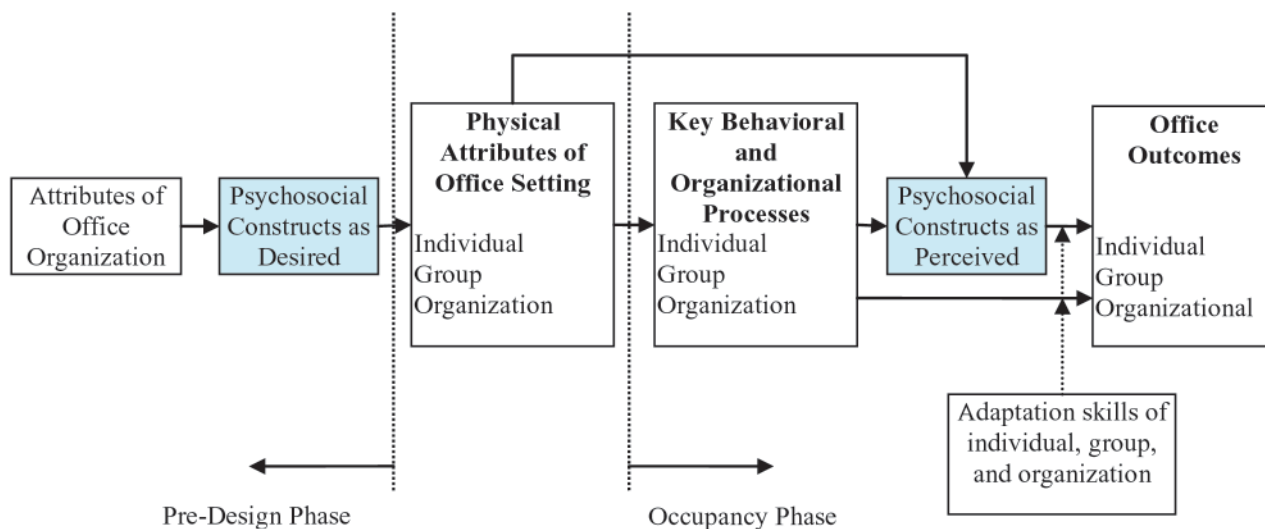


Figure 1: The conceptual framework linking organizational attributes, physical setting and behavioral processes to psychosocial constructs

they can screen-off noise easily. Likewise, office designs may affect group or organizational outcomes depending on how well the physical setting meets the needs of a construct that are essential for a group or an organization. For example, a group may not perform well, because its territoriality does not meet its functional and behavioral necessities. Adaptive skills of a group or an organization are also important for outcomes. Groups and organizations with different degrees of structural and functional flexibility may perform differently under similar environmental affordances of a psychosocial construct. Below, we present the summary of our review of the research literature on face-to-face communication and interaction, privacy, territoriality, and control and supervision in office settings taking into account the conceptual framework discussed above.

LITERATURE REVIEW

Face-to-face communication and Interaction

Communication among individuals and groups involving social and informational aspects is a necessary prelude to any relationships. It builds trust, which is an indispensable prerequisite towards more complex and riskier relationships (Kenis & Knoke, 2002; Nardi & Whittaker, 2002). Nardi and Whittaker (2002) distinguish face-to-face communication from mediated communication, and describe the unique social aspects of face-to-face communication: touch, shared activities eating and drinking together, as well as informal interactions and attention management. They along with many theorists argue that face-to-face communication is crucial for sustaining the social relationships that make distributed communication and work possible (Clark & Brennan, 1991; Hallowell, 1999; Handy, 1995; Kiesler et al., 1984; Nohria & Eccles, 1992; Olson & Olson, 2000; Rutter,

1987; Short et al., 1976). An impressive body of research also demonstrates that face-to-face communication is the most information rich medium (Clark, 1996; Clark & Brennan, 1991; Daft & Lengel, 1984; Doherty-Sneddon et al., 1997; O'Conaill et al., 1993; Short et al., 1976). We may further classify face-to-face communication into formal and informal face-to-face communication, and define informal face-to-face communication as relatively unstructured information exchanges that tend to occur during face-to-face encounters. Previous research has shown that seemingly inconsequential informal face-to-face communication may serve critical functions such as coordination, learning, innovation, and agility (Allen, 1977; Kraut & Streeter, 1996; Nardi & Engeström, 1999; Whittaker, Frohlich, & Daly-Jones 1994). Informal communications and interactions have also been shown to be extremely difficult to support using mediated communication (Kraut, 1987; Kraut et al., 1987, 1990, 1990a).

The effects of physical settings on face-to-face communication and interaction are well studied in office literature, or more broadly in workplace literature. The important findings reported in the literature are as follows:

- 1) At the micro-level, the “sociopetal” and “sociofugal” aspects of a setting are important for face-to-face communication and interaction (Sommer, 1967; Steinzor, 1950). These are, respectively, the tendency of a setting to bring people together, or to push them apart. Likewise, an interaction across a desk involves greater psychological distance than an interaction with no intervening barrier (Campbell, 1980; Joiner, 1976; Zweigenhaft, 1976).
- 2) The physical setting of offices can affect the quality of interaction in offices (Hatch, 1987; Sundstrom et al., 1982a, 1982b; Wineman, 1982).
- 3) Locations of people and activity areas can affect face-

- to-face communication and interaction (Allen, 1970; Campbell & Campbell, 1988; Conrath, 1973; Davis, 1984; Farrenkopf & Roth, 1980; Heller et al., 1977; Leibson, 1981; Parsons, 1976).
- 4) Walking or physical distance may be linked to informal communication in office settings (Allen, 1970; Faunce, 1958; Gullahorn, 1952; Homans, 1954; Keller & Holland, 1983; Lorenzen & Jaeger, 1968; Steele, 1973; Szilagyí & Holland, 1980). In contrast, Duffy (1974a, 1974b) and Farbstein (1975) found no connection between formal communication and proximity of workspaces within the same building.
 - 5) Proximity of workspaces may predispose the development of an informal group among compatible people in an office – as an outgrowth of the informal communication associated with proximity (Gullahorn, 1952; Homans, 1950, 1954; Walker & Guest, 1952).
 - 6) The presence and absence of central gathering places may affect face-to-face communication and interaction in offices (Bechtel, 1976; Bobele & Buchanan, 1979; Brookes & Kaplan, 1972; Goodrich, 1982; Lawrence & Lorsch, 1967).
 - 7) Spatial arrangement and the location of walls, partitions, furnishings, and other barriers may affect cohesiveness and interaction among groups (Lawrence & Lorsch, 1967; Bobele & Buchanan, 1979).
 - 8) Visibility and accessibility play a powerful role in the way individuals use office spaces and communicate within them (Bechtel, 1976; Hall, 1966; Hillier & Penn, 1991, 1992; Parsons, 1976; Penn et al., 1997).
 - 9) Spatial interconnectedness is an important factor affecting observed levels of interaction and eagerness to travel for interaction in work environments (Hillier & Grajewski, 1987; Grajewski, 1992). Spatial interconnectedness is also related to how people in an area find people in other areas useful in their own work within an office (Hillier & Penn, 1991).
 - 10) Evaluation studies of open plan offices do not consistently show the expected increase in communication: Some studies report an increase (Brookes, 1972a, 1972b; Brookes & Kaplan, 1972; Hundert & Greenfield, 1969; Ives & Ferdinands, 1974; Zahn, 1991); some studies report no change or even a decrease (Boje, 1971; Clearwater, 1979; Pile, 1978; Sundstrom et al., 1982b); and others report an increase in one kind, while a decrease in another kind of communication (Boyce, 1974; Hundert & Greenfield, 1969; Oldham & Brass, 1979).
 - 11) Environmental stress caused by extreme ambient conditions such as noise and uncomfortable heat can lead to insensitivity to social cues and negative reactions to others (Cohen & Lezak, 1977; Griffitt, 1970; Griffitt & Veitch, 1971; Korte, et al., 1975; Mathews & Canon, 1975; Sauser, et al., 1978). Contrarily, such environmental stress may also create positive responses to other people in the same setting through “shared stress” (Kenrick & Johnson, 1979).

The influences of personal, social and cultural factors,

and adaptive skills of individuals, groups and organizations on performance, particularly in situations where people’s need for face-to-face communication and interaction are not fulfilled, are less studied in office literature. For example, we do not know how people with different personal, social and cultural backgrounds would react if their needs for face-to-face communication and interaction were not fulfilled in office settings. The effects of environmental perception on the quantity and quality of face-to-face communication and interaction are less studied as well. However, the relationships between face-to-face communication and office performance and outcomes are much-studied phenomena. Studies show that increased face-to-face communication and interaction may lead to positive outcomes in workplaces and/or office settings (Allen, 1977; House & Wells, 1978; Muchinsky, 1977; O’Reilly & Roberts, 1977; Oldham & Brass, 1979; Peters & Waterman, 1981). Studies also show that a lack of social interaction and support may cause work stress in certain situations (Cooper & Marshall, 1978; French & Caplan, 1970). These findings need to be carefully interpreted in office design. For example, open plan offices may increase social interaction, but reduce privacy, autonomy, task identity, and worker feedback – factors that have positive effects on worker satisfaction, motivation, and productivity (Hanson, 1978; Hundert & Greenfield, 1969; Oldham & Brass, 1979; Zeitlin, 1969).

At the level of group or organization, several studies have shown that good relationships among work groups are important for both individual and organizational health (Argyris, 1964; Cooper, 1973). According to Mulder (1960), the communication structure of an organization may determine group performance. Among the more specific issues not reported in research literature are the effects of distance on distorted perception of one group about another. For example, increased distance between working groups may reduce interaction leading to infrequent contacts and distorted perception of each other. The effects of the size and availability of meeting spaces on group interaction have also not been reported in office literature. For example, small meeting rooms may promote a pattern of small group meetings, even at stages when much larger group meetings would be more appropriate. It is likely that large social events may not occur in a setting where there is no large gathering space. Additionally, no rigorous research has been reported in office literature linking the flexibility of a setting to face-to-face communication despite the fact that interaction needs of an organization change constantly.

Privacy

The definitions of privacy include the idea of control over social contact and access to information (e.g., Altman, 1975; Justa & Golan, 1977; Westin, 1967); seclusion, withdrawal, and avoidance of interaction (e.g., Bates, 1964); and one’s sense of being on display (e.g., O’Neill, 1994). However, privacy is better understood as having three main functions: first, it ensures personal autonomy; second, it provides an emotional outlet; and third, it allows self-evaluation, syn-

thesis of information, and decision-making (Pastalan, 1970). Office literature presents a dichotomy of “psychological privacy” and “architectural privacy” (Oldham & Rotchford, 1983; Sundstrom et al., 1980). More generally, the former kind is related to social contact and access to information, and the latter kind is related to verbal and acoustic intrusions. Sundstrom (1986) uses speech privacy referring to one’s ability to hold a conversation without being overheard and visual privacy referring to one’s ability to shield oneself from being seen by others. The need for privacy has several levels in office settings (Sundstrom et al., 1982). Once one level is satisfied, an individual would aspire to the next level. The first is the need to control access to workspace; the second, the need to limit distraction and interruption; and the third, the need to be able to communicate informally with others. People or groups may suffer from a lack of privacy if they cannot control who meets them; or if they cannot prevent their conversations from being overheard; or if they cannot prevent being observed by others.

Privacy is well studied in office literature. The important research findings on the relationships between privacy and the physical setting are as follows:

- 1) An employee’s sense of perceived privacy may be related to the number of enclosed sides and the height of enclosing panels of her office (BOSTI, 1981; Brill et al., 1984-1985; Sundstrom et al., 1980, 1982a). The lack of workspace enclosure may make privacy a major problem in an office (Boyce, 1974; Brookes, 1972b; Hanson, 1978; Hedge, 1982; Hundert & Greenfield, 1969; Marans & Spreckelmeyer, 1982; McCarrey et al., 1974; Nemecek & Grandjean, 1973; Wolgers, 1973). However, the connection of physical enclosure with privacy may vary with job categories (Hedge, 1982; Sundstrom, 1987; Sundstrom et al., 1982a).
- 2) Addition of partitions to a previously open space may reduce perceived crowding and increase privacy in offices (Oldham, 1988; Oldham & Rotchford, 1983; Sundstrom et al., 1982b).
- 3) Architectural privacy may be best characterized by having a door to one’s workspace (DuVall-Early & Benedict, 1992).
- 4) In the absence of enclosing walls/partitions, privacy at work can be obtained by the use of physical barriers, such as plants, dimmed lighting, or task/ambient systems such as table lamps (Archea, 1977; Goodrich, 1982).
- 5) In a private space, one is less vulnerable to noise and distraction (Carlstam et al., 1973; Cohen, 1978, 1980; Goodrich, 1979; Hedge, 1982; Mehrabian & Russell, 1974; Sundstrom et al., 1980). Consequently, people working on complex tasks are more satisfied in private settings than non-private ones (Block & Stokes, 1989).
- 6) Density of workspaces, response to privacy, and performance in offices are related to one another (Ferguson & Weisman, 1986; Stokols et al., 1975).
- 7) Privacy is often considered more important than the area, temperature and ventilation, furniture, lighting, view, and the general aesthetics of workspaces (Farrenkopf & Roth, 1980).
- 8) Most often mentioned problem with open office planning is a lack of acoustic privacy (Boyce, 1974; Brookes & Kaplan, 1972; Goodrich, 1979; Harris, 1978; Hundert & Greenfield, 1969; Nemecek & Grandjean, 1973; Zeitlin, 1969).
- 9) The flexibility offered by modular furniture may provide a good compromise between the tension created by privacy and interaction (Cangelosi & Lemoine, 1988)
- 10) “Soft” rooms furnished with cushioned chairs, rugs, wall decorations, and incandescent lighting may elicit more intimate self-disclosure than “hard” rooms with bare floors and walls, and fluorescent lighting (Chaikin et al., 1976).

Differences in personality and social and cultural factors may be related to privacy preferences (Altman, 1975; Golan & Justa, 1976; Hall, 1966; Josefowitz, 1980; Marshall, 1972; McKechnie, 1977; Patterson & Chiswick, 1981; Pedersen, 1982; Rubin & Shenker, 1978; Tolchinsky et al., 1981; Walden et al., 1981; Woodman et al., 1982). However, very little has been reported on how the physical setting may affect these relationships in offices. Additionally, there is no systematic study of the relationships between organizational and group characters and individual’s demands for privacy in office settings. For example, we do not know for sure if a person’s sense of privacy will be affected by the degree of friendliness of an office environment even when the physical setting remains unchanged. There is also a lack of study on the effects of adaptive skills on privacy in office settings. The complex relationship between privacy preference and expectation on office performance and outcomes has also not been reported in the literature. However, several studies look at the relationships between privacy and individual performance and outcomes in offices and workplaces. The findings of some of these studies are given below:

- 1) People generally show a greater degree of satisfaction as the amount of privacy increases in offices, and loss of privacy results in decreased opportunities for feedback and friendship formation and an overall decline in job satisfaction (Becker et al., 1983; Block & Stokes, 1989; Brennan et al., 2002; Ferguson, 1983; Oldham, 1988; Sundstrom & Sundstrom, 1986; Sundstrom et al., 1980; Wineman, 1982, 1986). However, privacy may also detract from performance by shielding people from the motivating effects of social facilitation or visibility to co-workers (Geen & Gange, 1977; Knowles, 1983).
- 2) Privacy influences the relationship between task complexity and individual satisfaction. For example, people working on more complex tasks are generally more satisfied in private offices than in non-private ones, and more distractions are reported in the non-private offices for those working on complex tasks than for those working on simple tasks (Block & Stokes, 1989). However, the effects of privacy on the relationship between task complexity and individual performance are not very clear. More controlled studies are necessary on the sub-

- ject matter (Sundstrom et al., 1980).
- 3) An increased sense of enclosure and visual privacy may reduce the pressure on individuals to maintain appearance and change work habits (Brookes & Kaplan, 1972; Louis Harris & Associates, 1978), and when an office has fewer barriers (walls or partitions), withdrawal rates are higher (Oldham & Fried, 1987).
 - 4) In contrast to a theory of adaptation that suggests that any influence of the physical environment, which might include the level of architectural privacy, would be short-lived because of adaptation (Sundstrom, 1986), studies show that the relationship between privacy and job-satisfaction is long-lived (DuVall-Early & Benedict, 1992).
 - 5) Noise hinders the performance of complex tasks more than it hinders the performance of simple tasks (e.g., Nagar & Pandey, 1987), and when one of several tasks is more important, noise tends to increase the effort expended on less important tasks (e.g., Broadbent, 1979). The effects of noise on performance also depend on sex, age, and personality (Baker et al. 1984; Bhatia et al., 1991; Eysenck & Graydon, 1989; Gulian & Thomas, 1986; Jennings et al., 1988; Jennings et al., 1989; Lahtela et al., 1986; Matthews, 1985; Mehrabian, 1977; Standing et al., 1990; Veitch, 1990). However, any effect of noise on performance should be interpreted with care in the context of privacy, because noise may not always lead to a lack of acoustic privacy.

Territoriality

Territory is usually understood as a physical and bounded space, but it often extends to the abstract domains of ideas in the case of humans. Though defense is the key element of territoriality, it is possible that some territories are never challenged; and even when the rights to a territory is challenged, the response of a person or group may vary depending on its degree of association with the territory. According to Knapp (1978) whether and how much a territory holder responds to infringement depend on the intruder, the reason for intrusion, the type, method, and context of intrusion, and the type of territory being invaded. Defense can be preventive, which include different physical features (e.g., spatial markers and surveillance) and symbolic barriers (e.g., personalization); it can be a reaction (e.g., forcefully pulling out the intruder from a territory); or it can be in the form of a boundary that can be social-ritualistic or simply physical to separate wanted visitors from unwanted ones.

It is likely that infringement of offices occur mostly in the form of violation of visual and acoustical privacy. Much work on infringement in offices is devoted to this issue only (see the section on *privacy*). In contrast, very little research is reported on any other issues of territoriality related to invasion, violation and contamination in offices. Davis and Altman (1976) provide a territorial typology for offices that include public, general, group, and individual territories. According to these authors, when at work individuals conform to the rules and norms of territoriality, and adopt appropriate

territorial behavior if they can identify the signs and symbols of territoriality. On territoriality in offices, the important research findings presented in office literature are as follows:

- 1) Spatial demarcation and adornment are a process of maintaining territoriality in office settings. A worker may define personal territory with objects and furnishing if existing enclosure and furnishings do not define it sufficiently (Becker & Mayo, 1971; Becker, 1973; Becker & Coniglio, 1975).
- 2) Personalization in workplace may be indicative of the degree of territorial control an individual has over her workspace (Sundstrom & Sundstrom, 1986). The structure of territorial partitions and the size of a territory may be indicative of the amount of control an individual have within it (Sebba & Churchman, 1983).
- 3) Negative reactions to potential territorial invasions can be predicted by the degree to which a worker resists permanent workspace changes and the extent to which a worker shares her workspace with others (Bordens & Wollman, 1985; Wollman et al., 1994).
- 4) One's sense of control over the physical environment and others' behavior may be related to one's sense of territoriality in workplace (Wollman et al., 1994).

Personal factors, such as sex, personality and intelligence, and competence (physical and mental) may have effects on one's perception of territoriality (Baum & Koman, 1976; Haber, 1980; Kinney et al., 1987; Mercer & Benjamin, 1980; Smith, 1981). However, only few of these studies have looked at territorial behavior in offices (for review, see Sundstrom, 1986 & 1987). In at least one study of the effects of personal factors on territoriality in offices, it is shown that one's negative reactions to potential workspace invasion may be related to one's sensitivity to personal space and the degree to which one minded taking directions about her job from someone other than a supervisor (Wollman et al. 1994). Social climate, class, status, competition of resources, ownership, and event/task may also affect territoriality (Cashdan, 1983; Greenbaum & Greenbaum, 1981; Ruback et al., 1989; Ruback & Snow, 1993; Taylor et al. 1981). Again, none of these studies looks at the effects of these social factors on territoriality in office setting. Territoriality across cultures is different in some ways but is similar in other ways (Edney & Jordan-Edney, 1974; Greenbaum & Greenbaum, 1981; Smith, 1981; Worchel & Lollis, 1982). Though the empirical evidence for a cross-cultural comparison of territoriality in offices is meager, many cultural observers have noted significant national variations. For example, on average American office appear to be more physically subdivided than Japanese offices. At Mitsubishi's Japanese headquarters, even the chairperson of the board sits at an open desk on a large office floor (Yoshino & Lifson, 1986). Scuri (1990) notes that shared offices are more common in Italy than in the United States.

Regarding its relations to other psychosocial constructs, territoriality helps to increase options and maximize freedom of choice (Altman, 1976). It also enhances one's sense of control over the environment and visitor's behavior (Altman, 1975; Edney, 1976). Territoriality is related to social interac-

tion and group identity (Greenbaum & Greenbaum, 1981). It is also related to privacy, since privacy affects the perception of territorial control (Altman, 1975 & 1976; Altman & Chemers, 1980; Marcus & Sarkissian, 1986). Additionally, being able to personalize one's territory has positive side effects (Holahan, 1976; Vinsel et al., 1980). Sometimes infringement by the right person can have positive consequences (Jason et al., 1981). However, little of the reported study is on territoriality in office settings.

Though outcomes of territoriality are not well researched in office literature, territoriality may serve to organize office behavior and reduce conflicts. When an individual or a group controls a setting, many aspects of behavior become ordered, including choice of activities and access to resources. Territoriality may also benefit office organizations by geographically fixing individuals. As a result, organizations are better off in terms of time and effort spent in communication because individuals are found at places where they are expected most. Small groups may benefit because territoriality seems to generate expectations about how visitors and hosts should behave. Individuals may benefit because they control social and resource management aspects of the territory, and hence are better able to plan and anticipate future events. Territoriality also provides individuals with the reliable access to needed contacts.

Control and Supervision

Control is direct or indirect influence by an individual or a group over the resources of other individuals or groups including their space, ideas, and pace and content of work. Supervision, on the other hand, is direct control in the form of critical watching and directing. Typically, in organizational settings supervision is the activity carried out by supervisors to oversee the productivity and progress of employees who report directly to them. In offices, control is often related to the sources of interference and stimulation. Interference problems allow our concentration to be interrupted without our being able to control the time and nature of interruption. On the other hand, over- and under-stimulation may reduce our ability to work and think effectively. Most organizations use territoriality, privacy, status markers and symbols for controlling the sources of interference and stimulation. As a result, most findings related to control are reported in studies related to these other issues. In a more limited instrumental sense, control is synonymous with "physical control" that describes the adjustability of different physical and environmental systems, such as furnishings, HVAC, and lighting in a setting (Brill et al., 1984-1985; O'Neill, 1994; Paciuk, 1990). There are two ways to exert physical control in workspaces – directly by altering environmental settings such as switching lights on and off, opening or closing doors and windows, and changing workspace furnishings; and indirectly by leaving a less desirable workspace for a more desirable one. The physical control of a setting is therefore dependent upon the availability of and ability to use alternative settings and mechanism of control in the setting.

Some important findings on the relationships between

the physical setting and control are as follows:

- 1) People prefer to have control over the physical aspects of their workspaces not only because control augments a sense of status, but also because it comes with a sense of personal freedom (Becker, 1981; Justa & Golan, 1977).
- 2) Those who most mind potential invasion of their workspace are employees who most mind taking directions from others who are not their supervisors (Wollman et al., 1994).
- 3) One's sense of control over the environment and others' behavior may be related to one's sense of territoriality in workplace (Wollman et al., 1994).
- 4) An individual's degree of control within an area can be influenced by the nature of the individual's relationship to the area, the physical characteristics of the area (e.g., the location and orientation of the desk), and the individual's status in the social environment (Davis, 1984; Sebba & Churchman, 1983).
- 5) For group work, control established by physical enclosure may facilitate the development of group cohesion (Sundstrom, 1986).
- 6) In restrictive environments, the extent to which spatial behaviors fail to correlate to the degree of interconnectedness of spaces may be a function of control (Peatross, 1997).

Regarding supervision, the effects of prison layouts on the effectiveness of supervision through surveillance, separation and isolation have been well studied by architectural and cultural historians (e.g., Evans, 1982; Foucault, 1979; Goffman, 1961; Markus, 1993, 1982; Rothman, 1980), but supervision as a direct form of control still needs acknowledgement in office literature. For example, the physical disposition of work may often be organized around the visibility and accessibility of workers in order to facilitate supervision. On this point, the workspace may resemble the panoptic space, even if it may not explicitly use the panoptic system as a model.

A lack of control over the immediate environment can be an important source of psychological and physiological strain in workplaces (Caplan et al. 1975; French & Caplan, 1970; Evans & Jacobs, 1982; Marans & Spreckelmeyer, 1982). If individuals believe that they have control over the environment of their workspace, their satisfaction with the environment is greater (e.g., Glass & Singer, 1972; Paciuk, 1990). The findings of lower worker satisfaction in open offices are often due to a perceived lack of control over input to and from the environment (McCarrey et al., 1974). The ability to control communication is also a critical variable mediating the negative effects of reduced privacy and crowding (Altman, 1975; Loo, 1973; Archea, 1977). Additionally, control over the controls of the physical environmental systems is also related to employee health outcomes (Sterling, 1986). Studies show that individuals like control but do not like the responsibility that comes with control (Nelson et al., 1984; Veitch & Gifford, 1996; Weiss, 1972). We do not know yet if the effects of a physical setting on control and supervision

depend on the nature of an organization. For example, in some organizations, an open plan setting may be used as an opportunity to build new relations and contacts, and to open up the organization to the users; while in others, the same may be used to establish control and supervision. Openness in the latter cases may result in tensions and attrition of relations. We also do not know if the effects of a physical setting on control and supervision depend on personal, social and cultural factors in office settings. In addition, there is no controlled study on workers' reaction to supervision in terms of behavioral processes and adaptive skills in office settings. Nor is there a study reporting the effects of supervision on office outcomes at the individual, group and organizational levels.

DISCUSSION

We reviewed a mixture of old and new research literature on offices focusing on a set of psychosocial constructs. More than 200 articles, book chapters, and books reporting rigorous research directly or indirectly related to the topics of the paper were included in the review. Out of which, only 3% was published in the 1950s; 6% in the 1960s; 36% in the 1970s; 36% in the 1980s; 16% in the 1990s; and the remaining 3% was published in the 2000s (Figure 2). Of course, they represent a small segment of all publications on offices. However, it is interesting to note that during the 1970s and 1980s the amount of office literature published on the psychosocial constructs under investigation was at the peak. In the 1990s and 2000s, out of many publications on offices, only some were related to these psychosocial constructs.

Several review articles on office and/or workplace research have been written during last one or two decades. For example, Walden (2004) presents a historical perspective and some recent studies on work environments. He also summarizes the general models provided by Sundstrom (1987) and Gifford (1997, 2002), and provides his own model describing the environment-behavior relations in workplaces. However, Walden does not focus on the rigorous empirical studies related to any psychosocial construct. McCoy (2002) emphasizes recent empirical findings on the relationships between the physical environment and the health, safety, and behavior of workers. Gifford (1997, 2002) reviews literature on the complex relationships between the physical environment (acoustics, indoor climate, air quality, light, color, space density and arrangements, etc.) and performance, feelings, social behavior, health and stress at work. Oldham et al. (1995) examine the effects of several characteristics of an organization's spatial configuration (i.e., distance between workstations, number of workstation boundaries, spatial density, and openness) on employees' work-related behaviors and attitudes (e.g., performance, attendance, and satisfaction). They also propose a "social interference" framework that is intended to explain the effects of these characteristics on employees. Sundstrom (1987) discusses the empirical findings on the physical environment in offices and factories at three levels of analysis - individual, interpersonal, and organizational. Wineman (1982) and Mittleman (1996) review physical comfort and task instrumentality, privacy and social

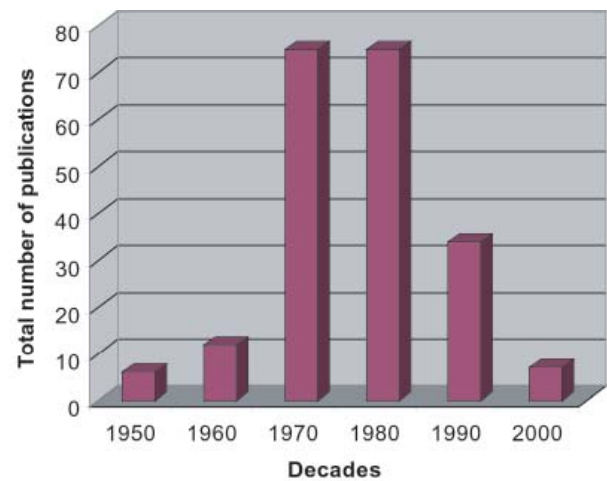


Figure 2: Total number of reviewed articles published in each decade since the 1950s

interaction, and symbolic identification focusing on physical environmental factors that influence worker satisfaction and job performance.

Unlike any of the previous reviews, the methodology of this review is innovative for it is organized around a set psychosocial constructs. Various aspects of the physical environment, behavioral processes, and performance outcomes are included in the review because of their links to these constructs. More importantly, the review methodology follows a top-down process, where a conceptual framework is defined first, and then the research articles are reviewed to find out where and how they fit in the framework. This process also helps us to find out what is missing in the research literature. The conceptual framework presupposes that each office organization has certain needs for a psychosocial construct and expects that the design of its physical setting would meet these needs. However, for several reasons, the design of the setting may fail to meet these needs. First, the design itself may have unforeseen effects on users' perception of a psychosocial construct. Second, different behavioral processes may affect users' perception of a psychosocial in different ways than expected. Third, each behavioral entity may react differently due to its adaptive skills even when the behavioral processes involved and the physical setting within which the reaction occurs remain constant. As a result, the expected and perceived levels of a construct may become non-congruent affecting outcomes at various levels of an office organization. According to this framework, any complete understanding of a psychosocial construct and its effects on outcomes may then depend on our ability to describe 1) the relationships of different organizational features such as people, function, structure, and rules and regulations to a psychosocial construct; 2) the relationships of the physical setting to a psychosocial construct; 3) the effects of behavioral processes and adaptive skills on the perception of a psychosocial construct; and 4) the effects of any non-congruent construct on office performance and outcomes.

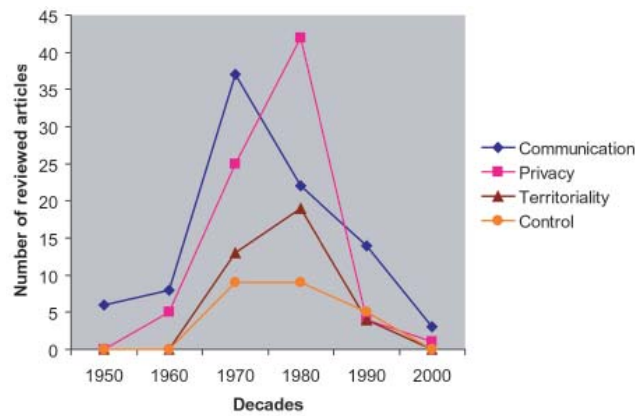


Figure 3: Number of reviewed articles on each psychosocial construct published in each decade since the 1950s

According to our review, no single research program investigates every conceptual relationship described in the framework. Of all the relationships, the ones between organizational attributes and a psychosocial construct are least studied (i.e., the pre-design phase in figure 1). The importance of these relationships cannot be underestimated because they often form the basis for office design. Our review also shows that there are many research studies on the relationships between the physical setting and the psychosocial constructs (i.e., the occupancy phase in figure 1), but the research literature on the psychosocial constructs is uneven. Of the constructs investigated here, face-to-face communication and interaction are the most studied ones; and control and supervision are the least studied ones (Figure 3). As we have suggested earlier, control and supervision are studied less frequently because in most organizations mechanisms of control include territoriality, privacy, status symbols, etc., and most studies related to control are reported in studies related to these other psychosocial constructs. However, quite a few studies report control as a function of adjustability of different physical and environmental systems instead of a psychosocial construct.

In general, the review suggests the even though it is intuitively clear that individuals, groups and organizations may react differently when their needs of a psychosocial construct are not met, the direct and indirect effects of different behavioral processes and adaptive skills of these entities in relation to a psychosocial construct in office settings are less studied. The review also suggests that psychosocial constructs such as face-to-face communication, interaction, control, supervision, territoriality, and privacy are often complex, multidimensional and interrelated. Most empirical studies provide no rigorous analytic definition of a psychosocial construct. Instead, they treat a construct as a synthetic and relatively enduring quality of the internal office environment. Most empirical studies also lack rigorous experimental controls. As a result, they rarely explain any

causal relationships between a psychosocial construct and office settings. The primary methods for studying a construct so far have been field studies and experiments, surveys and interviews, and naturalistic behavior observations. More often, researchers have examined correlations between a construct and other behavioral and environmental variables; have asked for self-reports on issues related to the constructs; and/or have observed how individuals or groups respond to different constructs in different settings. Suitability of any one method over the others has often depended on the particular research question. For example, if the question was related to environmental behavior, naturalistic observation was often preferred to a questionnaire survey. However, if the question was related to environmental perception, a questionnaire survey was preferred.

Finally, the literature review reveals that office researchers put a great emphasis on the differences between the expected and perceived levels of a psychosocial construct in dealing with performance issues of offices. However, the measurement of a psychosocial construct and its impacts on performance remain unresolved. That is because, in any ordinary complex behavioral setting, there can be any number of variables related to a psychosocial construct. Thus, an assessment of a construct using discrete variables may always be incomplete, if not erroneous. In addition, the variables of a psychosocial construct used in the reported literature are often subjective, and there is no good evidence that these variables are consciously known by the individual involved or can be objectively reported by her. Furthermore, these variables are often embedded in a complex of personal, social, and cultural phenomena. Statistical and factorial approaches to the analysis of the variables of a psychosocial construct have provided some realistic results in recent years. However, a lot more needs to be done before we are able to measure objectively a psychosocial construct, and to study its effects on office performance and outcomes empirically.

REFERENCES

- Allen, T. J. 1970. Communication networks in R & D Laboratories. *R & D Management*, 1 (1), 14-211.
- Allen, T. J. 1977. *Managing the Flow of Technology: Technology Transfer and the Dissemination of Technological Information within the R&D Organization*. Cambridge, MA: MIT Press.
- Altman, I. 1975. *The Environment and Social Behavior*. Belmont, CA: Wadsworth.
- Altman, I. 1976. Privacy: a conceptual analysis. *Environment and Behavior*, 8, 7-29.
- Altman, I. & Chemers, M. 1980. *Culture and Environment*. Monterey, CA: Brooks/Cole.
- Archea, J. 1977. The place of architectural factors in behavioral theories of privacy. *Journal of Social Issues*, 33, 116-137.
- Argyris, C. 1964. *Integrating the Individual and the Organization*. New York: Wiley.
- BOSTI - Buffalo Organization for Social and Tech-

- nological Innovation. 1981. The impact of office environment on productivity and quality of working life: comprehensive findings. Buffalo, NY: BOSTI.
- Baker, M. A., Holding, D. H. & Loeb, M. 1984. Noise, sex and time of day effects in a mathematics task. *Ergonomics*, 27, 67-80.
- Bates, A. 1964. Privacy – a useful concept? *Social Forces*, 42, 429-434.
- Baum, A. & Koman, S. 1976. Differential response to anticipated crowding: psychological effects of social and spatial density. *Journal of Personal and Social Psychology*, 34, 526-536.
- Becker, F. D. 1973. Studies of spatial markers. *Journal of Personality and Social Psychology*, 26, 439-445.
- Becker, F. D. 1981. *Workspace: Creating Environments in Organizations*. New York: Praeger.
- Becker, F. D., Gield, B., Gaylin, K., & Sayer, S. 1983. Office design in a community college: effect on work and communication patterns. *Environment and Behavior*, 15 (6), 699-726.
- Becker, F. D., & Coniglio, C. 1975. Environmental messages: Personalization and territory. *Humanities*, 11, 55-74.
- Becker, F. D., & Mayo, C. 1971. Delineating personal distance and territoriality. *Environment and Behavior*, 12 (3), 375-381.
- Bechtel, R. B. 1976. *Enclosing Behavior*. Stroudsburg, PA: Dowden, Hutchinson, & Ross.
- Bhatia, P., Shipra, & Muhar, I. S. 1991. Effects of low and high intensity noise on work efficiency. *Psychologia: An International Journal of Psychology in the Orient*, 34, 259-265.
- Block, L. K., & Stokes, G. S. 1989. Performance and satisfaction in private versus non-private worksetting. *Environment and Behavior*, 21 (3), 277-297.
- Bobele, H. K. & Buchanan, P. J. 1979, January. Building a more productive environment. *Management World*, 8 (1), 8.
- Boje, A. 1971, org. 1968. *Open Plan Offices*. London: Business Books.
- Bordens, K. S., & Wollman, N. 1985, March. Territoriality in the workplace: Personality and environmental correlates. Paper presented at the Annual Meeting of the Southeastern Psychological Association, Atlanta.
- Boyce, P. R. 1974. User's assessments of a landscaped office. *Journal of Architectural Research*, 3 (3), 44-62.
- Brennan, A., Chugh, J. S., & Kline, T. 2002. Traditional versus open office design: A longitudinal field study. *Environment and Behavior*, 34 (3), 279-299.
- Brill, M., Margulis, S. T., Konar, E., & the BOSTI Associates. 1984. *Using office design to increase productivity*. Buffalo, N.Y.: Workplace Design and Productivity Inc.
- Broadbent, D. E. 1979. Human performance and noise. In C. M. Harris (Ed.), *Handbook of Noise Control*. New York: Mcgraw-Hill.
- Brookes, M. J. 1972a. Changes in employee attitudes and work practices in an office landscape. In W. J. Mitchell (Ed.), *Proceedings of the 1972 Conference of the Environmental Design Research Association*. Los Angeles: University of California Press.
- Brookes, M. J. 1972b. Office landscape: Does it work? *Applied Ergonomics*, 3 (4), 224-236.
- Brookes, M. J. & Kaplan, A. 1972. The office environment: space planning and affective behavior. *Human Factors*, 14 (5), 373-391.
- Campbell, D. E. 1980. Professors and their offices: A Survey of person-behavior-environment relationships. In R. R. Stough & A. Wandersman (Eds.), *Optimizing Environments: Research, Practice and Policy*. Washington, D. C.: Environment Design Research Association.
- Campbell, D. E., & Campbell, T. A. 1988. A new look at informal communication: the role of the physical environment. *Environment and Behavior*, 20 (2), 211-226.
- Caplan, R. D., Cobb, S., French, J. R. P. Jr., Harrison, R. V., & Pinneau, S. R. Jr. 1975. *Job demands and worker health*. Washington, D.C.: U.S. Government Printing Office.
- Carlstam, G., Karlsson, C. G., & Levi, L. 1973. Stress and disease in response to noise. *Proceedings of the International Congress on Noise as a Public Health Problem*. Washington, D. C.: Government Printing Office.
- Cashdan, E. 1983. Territoriality among human foragers: Ecological models and an application to four Bushman groups. *Current Anthropology*, 24, 47-66.
- Chaikin, A. L., Derlega, V. J., & Miller, S. J. 1976. Effects of room environment on self-disclosure in a counseling analogue. *Journal of Counseling Psychology*, 23, 479-481.
- Clark, H. 1996. *Using language*. Cambridge: Cambridge University Press.
- Clark H., & Brennan, S. 1991. Grounding in communication. In L. Resnick, J. Levine, & Teasley, S. (Eds.), *Perspectives on socially shared cognition*. Washington DC: APA Press.
- Clearwater, Y. A. 1979. *Social-environmental relationships in open and closed offices*. Unpublished doctoral dissertation, University of California, Davis.
- Cohen, S. 1978. Environmental load and the allocation of attention. In A. Baum, J. E. Singer, & S. Vallins (Eds.), *Advances in Environmental Psychology*. Hillsdale, NJ: Erlbaum.
- Cohen, S., & Lezak, A. 1977. Noise and inattentiveness to social cues. *Environment and Behavior*, 9, 559-572.
- Cangelosi, V. E., & Lemoine, L. F. 1988. Effects of open versus closed physical environment on employee perception and attitude. *Social Behavior and Personality*, 16, 71-77.
- Conrath, D. W. 1973. Communication patterns, organizational structure and man: some relationships. *Human Factors*, 15 (5), 459-470.
- Cooper, C. L. 1973. *Group Training for Individual and Organizational Development*. Basel: S. Karger.
- Cooper, C. L. & Marshall, J. 1978. *Sources of mana-*

- gerial and white collar stress. In C. L. Cooper & R. Payne (Eds.), *Stress at Work*. New York: Wiley.
- Daft, R., & Lengel, R. 1984. Information richness: A new approach to managerial behavior and organizational design. *Research in Organizational Behavior*, 6, 191-233.
- Davis, T. M. R. 1984. The Influence of the physical environment in offices. *Academy of Management Review*, 9 (2), 271-283.
- Davis, G. & Altman, I. 1976. Territories at the Work-Place: Theory into Design Guidelines. *Man-Environment Systems*, 6 (1), 46-53.
- Doherty-Sneddon, G., Anderson, A., O'Malley, C., Langton, S., Garrod, S., and Bruce, V. 1997. Face-to-face and video mediated communication: a comparison of 39 dialogue structure and task performance. *Journal of Experimental: Psychology (Applied)*, 3, 105-125.
- Duffy, F. C. 1974a. Office design and organizations: 1. Theoretical basis. *Environment and Planning B*, 1, 105-118.
- Duffy, F. C. 1974b. Office design and organizations: 2. The testing of a hypothetical model. *Environment and Planning B*, 1, 217-235.
- DuVall-Early, K. & Benedict, J. O. 1992. The relationships between privacy and different components of job satisfaction. *Environment and Behavior*, 24 (5), 672-679.
- Edney, J. J. 1976. Human territories: comment on functional properties. *Environment and Behavior*, 8, 31-47.
- Edney, J. J. & Jordan-Edney, N. L. 1974. Territorial spacing on a beach. *Sociometry*, 37, 92-104.
- Evans, R. 1982. *The fabrication of virtue*. Cambridge: Cambridge University Press.
- Evans, G. W., & Jacobs, S. V. 1982. Air pollution and human behavior. In G. W. Evans (Ed.), *Environmental Stress*. New York: Cambridge University Press.
- Eysenck, M. W., & Graydon, J. 1989. Susceptibility to distraction as a function of personality. *Personality and Individual Differences*, 10, 681-686.
- Farbstein, J. D. 1975. *Organization, space and activity: The relationship of task and status to the allocation and use of space in certain organizations*. Unpublished doctoral dissertation, University of London, London.
- Farrenkopf, T., & Roth V. 1980. The university faculty office as an environment. *Environment and Behavior*, 12 (4), 467-477.
- Faunce, W. A. 1958. Automation in the automobile industry: Some consequences for in-plant social structure. *American Sociological Review*, 23, 401-407.
- Ferguson, G. S. 1983. Employee satisfaction with the office environment: Evaluation of a causal model. In D. Amedeo, J. B. Griffin, & J. J. Potter (Eds.), *Proceedings of the 1983 Environmental Design Research Association Conference*. Washington, D. C.: Environmental Design Research Association.
- Ferguson, G., & Weisman, G. 1986. Alternative approaches to the assessment of employee satisfaction with the office environment. In J. Wineman (Ed.), *Behavioral Issues in Office Design*. New York: Van Nostrand Reinhold.
- Foucault, M. 1979. *Discipline and Punish: The Birth of the Prison*. London: Penguin.
- French, J. P. R. & Caplan, R. D. 1973. Organization stress and individual strain. In A. J. Marrow (Ed.), *The Failure of Success*. New York: AMACOM.
- Geen, R. G., & Gange, J. J. 1977. Drive theory of social facilitation: Twelve years of theory and research. *Psychological Bulletin*, 84 (6), 1267-1288.
- Gifford, R. 1997. *Environmental Psychology: Principles and Practice*. Boston: Allyn & Bacon.
- Gifford, R. 2002. *Environmental Psychology: Principles and Practice* (3rd ed.). Colville, WA: Optimal Books.
- Glass, D. C., & Singer, J. E. 1972. *Urban Stress: Experiments on Noise and Social Stressors*. New York: Academy Press.
- Goodrich, R. 1982. Seven office evaluations: A review. *Environment and Behavior*, 14, 353-378.
- Goodrich, R. 1979. *How People Perceive Their Office Environment*. New York: Citibank.
- Goffman, E. 1961. *Asylums: Essays on the Social Situation of Mental Patients and Other Inmates*. New York: Anchor Books.
- Golan, M. B., & Justa, F. C. 1976. The meaning of privacy for supervisors in an office setting. *Proceedings of the Environmental Design Research Association Conference*. Washington, D. C.: Environmental Design Research Association.
- Grajewski, T. 1992. *Interaction in the work environment*. Unpublished Doctoral Dissertation, University College London, London.
- Greenbaum, P. E., & Greenbaum, S. D. 1981. Territorial personalization: group identity and social interaction in a Slavic-American neighborhood. *Environment and Behavior*, 13 (5), 574-589.
- Griffitt, W. 1970. Environmental effects on interpersonal affective behavior: Ambient effective temperature and attraction. *Journal of Personality and Social Psychology*, 15, 240-244.
- Griffitt, W., & Veitch, R. 1971. Hot and crowded: Influences of population density and temperature on interpersonal affective behavior. *Journal of Personality and Social Psychology*, 17, 92-98.
- Gulian, E. & Thomas, J. R. 1986. The effects of noise, cognitive set and gender on mental arithmetic performance. *British Journal of Psychology*, 77, 503-511.
- Gullahorn, J. T. 1952. Distance and friendship as factors in the gross interaction matrix. *Sociometry*, 15, 123-134.
- Haber, G. B. 1980. Territorial invasion in the classroom: invadee response. *Environment and Behavior*, 12 (1), 17-31.
- Hall, E. 1966. *The Hidden Dimension*. Garden City, N. Y.: Doubleday.
- Hallowell, E. M. 1999, January-February. The human moment at work. *Harvard Business Review*, 77, 58-66.

- Handy, C. 1995. Trust and the Virtual Organization. *Harvard Business Review*, 73, 40-50.
- Hanson, A. 1978. Effects of a move to an open landscape office. *Dissertation Abstracts International*, 39 (6), 3046B.
- Harris, L., & Associates. 1978. The Steelcase national study of office environments: Do they work? Grand Rapids, MI: Steelcase, Inc.
- Hatch, M. J. 1987. Physical barriers, task characteristics, and interaction activity in research and development firms. *Administrative Science Quarterly*, 32, 387-399.
- Hedge, A. 1982. The open-plan office: a systematic investigation of employee reactions to their work environment. *Environment and Behavior*, 14, 519-542.
- Heller, J., Groff, B., & Solomon, S. 1977. Toward an understanding of crowd: The role of physical interaction. *Journal of Personality and Social Psychology*, 35, 183-190.
- Holahan, C. J. 1976. Environmental change in a psychiatric setting: A social systems analyze. *Human Relations*, 29, 153-166.
- Homans, G. C. 1950. *The Human Group*. New York: Harcourt, Brace & World.
- Homans, G. C. 1954. The cash posters: A study of a group of working girls. *American Sociological Review*, 19, 724-733.
- Hillier, B. & Grajewski, T. 1987. The application of space syntax to work environments inside buildings. Unpublished Report, Unit for Architectural Studies, University College London, London.
- Hillier, B., & Penn, A. 1991. Visible colleges: structure and randomness in the place of discovery. *Science in Context*, 4 (1), 23-49.
- Hillier, B., & Penn, A. 1992. The social potential of buildings: space and the innovative milieu in scientific research laboratories. *Proceedings of the Corporate Space and Architecture Conference*, Paris.
- House, J. S. & Wells, J. A. 1978. Occupational stress and health. In A. McLean Reducing (Ed.), *Occupational Stress*. Washington, D.C.: Government Printing Office.
- Hundert, A. T., & Greenfield, N. 1969. Physical space and organizational behavior: A study of office landscape. *Proceedings of the 77th Annual convention of the American Psychological Association*, 1, 601-602.
- Ives, R. S., & Ferdinands, R. 1974. Working in a landscaped office. *Personnel Practice Bulletin*, 30 (2), 126-141.
- Jason, L. A., Reichler, A., & Rucker, W. 1981. Territorial behavior on beaches. *Journal of Social Psychology*, 114, 43-50.
- Jennings, J. R., Nebes, R., & Brock, K. 1988. Memory retrieval in noise and psychophysiological response in young and old. *Psychophysiology*, 25, 633-644.
- Jennings, J. R., Brock, K., & Nebes, R. 1989. Aging but not arousal influences the effect of environmental noise on the span of attention. *Experimental Aging Research*, 15, 61-71.
- Joiner, D. 1976. Social ritual and architectural space. In H. Proshansky, W. Ittelson, & L. Rivlin (Eds.), *Environmental psychology* (2nd Ed.). New York: Holt, Rinehart & Winston.
- Josefowitz, N. 1980. Management men and women: closed vs. open doors. *Harvard Business Review*, 53 (5), 56-62.
- Justa, F. C. & Golan, M. B. 1977. Office design: Is privacy still a problem. *Journal of Architectural Research*, 6 (2), 5-12.
- Keller, R. T., & Holland, W. E. 1983. Communicators and innovator in research and development organizations. *Academy of Management Journal*, 26, 742-749.
- Kenis, P & Knoke, D. 2002. How organizational field networks shape interorganizational tie-formation rates. *Academy of Management Review*, 27, 2, 275-293.
- Kenrick, D. T., & Johnson, G.A. 1979. Interpersonal attraction in aversive environments: A problem for the classic conditioning paradigm? *Journal of Personality and Social Psychology*, 37, 572-579.
- Kiesler, S., Siegel, J., & McGuire, T. 1984. Social psychological effects of computer mediated communication. *American Psychologist*, 39, 1123-1134.
- Kinney, J. M., Stephens, M. P., & Brockmann, A. M. 1987. Personal and environmental correlates of territoriality and use of space: An illustration in congregate housing for older adults. *Environment and Behavior*, 19, 722-737.
- Knapp, M. L. 1978. *Nonverbal Communication in Human Interaction*. New York: Holt, Rinehart and Winston.
- Knowles, E. S. 1983. Social physics and the effects of others: tests of the effects of audience size and distance on social judgments and behavior. *Journal of Personality and Social Psychology*, 45 (6), 1263-1279.
- Korte, C., Ypma, I., & Toppen, A. 1975. Helpfulness in Dutch society as a function of urbanization and environmental input level. *Journal of Personality and Social Psychology*, 32 (6), 996-1003.
- Kraut, R.E. 1987. Predicting the use of technology: The case of telework. In R.E. Kraut (Ed.), *Technology and the transformation of white collar work*. Hillsdale, NJ: Erlbaum.
- Kraut, R., Galegher, J., & Egidio, C. 1987. Relationships and tasks in scientific research collaboration. *Human Computer Interaction*, 3, 31-58.
- Kraut R.E., Egidio C., & Galegher J. 1990. Patterns of contact and communication in scientific research collaboration. In J. Galegher & R. Kraut (Eds.), *Intellectual teamwork: The Social and technological bases of cooperative work*. Hillsdale, NJ: Erlbaum.
- Kraut, R., Fish, R., Root, R., & Chalfonte, B. 1990a. Informal Communication in Organizations. In S. Oskamp and Spacapan, S. (Eds), *People's Reactions to Technology in Factories, Offices and Aerospace*. New York: Sage.
- Kraut, R.E., & Streeter, L.A. 1995. Coordination in software development. *Communications of the ACM*, 38 (3), 69-81.
- Lahtela, K., Niemi, P., Kuusela, V., & Hyphen, K.

1986. Noise and visual choice-reaction time: A large-scale population survey. *Scandinavian Journal of Psychology*, 27, 52-57.
- Lawrence, P. R. & Lorsch, J. W. 1967. *Organization and Environment: Managing Differentiation and Integration*. Cambridge, MA: Harvard University Graduate School of Business.
- Leibson, D. E. 1981. How Corning designed a "talking" building to spur productivity. *Management Review*, 70 (9), 8-13.
- Loo, C. 1973. Important issues in researching the effects of crowding on humans. *Representative Research in Social Psychology*, 4 (1), 219-226.
- Lorenzen, H. J., & Jaeger, D. 1968. The office landscape: A "systems" concept. *Contract*, 9 (1), 164-173.
- Marans, R. W., & Spreckelmeyer, K. F. 1982. Evaluating open and conventional office design. *Environment and Behavior*, 14 (3), 333-351.
- Marcus, C., & Sarkissian, S. 1986. *Housing As If People Mattered*. Berkeley: University of California Press.
- Markus, T. A. 1993. *Buildings and Power: Freedom and Control in the Origin of Modern Building Types*. London: Routledge.
- Markus, T. A. (Ed.). 1982. *Order in Space and Society: Architectural Form and its Context in the Scottish Enlightenment*. Edinburgh: Mainstream Publishing, Co.
- Marshall, N. J. 1972. Privacy and environment. *Human Ecology*, 1, 93-110.
- Mathews, K. E., & Canon, L. K. 1975. Environmental noise level as a determinant of helping behavior. *Journal of Personality and Social Psychology*, 32, 571-577.
- Matthews, G. 1985. The effects of extraversion and arousal on intelligence test performance. *British Journal of Psychology*, 76, 479-493.
- Mazumdar, S. 1992. Sir, Please do not take away my cubicle. The phenomenon of environmental deprivation. *Environment & Behavior*, 4, 561-580.
- McCarrey, M. W., Peterson, L., Edwards, S., & Von Kulmiz, P. 1974. Landscape office attitudes: Reflections of perceived degree of control over transactions with environment. *Journal of Applied Psychology*, 59 (3), 401-403.
- McCoy, J. M. 2002. Work environments: The changing workplace. In R. B. Bechtel, & A. Churchman (Eds.), *Handbook of Environmental Psychology*. New York: John Wiley, 443-460.
- McKechnie, G. E. 1977. The environmental response inventory in application. *Environment and Behavior*, 2, 255-275.
- Mehrabian, A. 1977. Individual differences in stimulus screening and arousability. *Journal of Personality*, 45, 237-250.
- Mehrabian, A., & Russell, J. A. 1974. *An Approach to Environmental Psychology*. Cambridge, MA: MIT Press.
- Mercer, G. W., & Benjamin, M. L. 1980. Spatial behavior of university undergraduates in double occupancy residence rooms: An inventory of effects. *Journal of Applied Social Psychology*, 10, 32-44.
- Mittleman, D. 1996, April. The impact of physical environment on performance and satisfaction in the white collar office: An overview of the literature. *Proceedings of the IFIP 8.4 Conference on the International Office of the Future*. Tuscon AZ.
- Muchinsky, P. M. 1977. Organizational communication: relationships to organizational climate and job satisfaction. *Academy of Management Journal*, 20, 592-607.
- Mulder, M. 1960. Communication structure, decision structure, and group performance. *Sociometry*, 23, 1-14.
- Nagar, D., & Pandey, J. 1987. Affect and performance on cognitive task as a function of crowding and noise. *Journal of Applied Psychology*, 17, 147-157.
- Nardi, B. & Whittaker, S. 2002. The place of face-to-face communication in distributed work. In P.J Hinds & S Kiesler, (Eds.), *Distributed Work*, Cambridge, MA: MIT Press.
- Nardi, B. & Engeström, Y. (Guest Eds.). 1999. Special issue on invisible work. *Journal of Computer Supported Cooperative Work*, 8, 1-167.
- Nelson, T. M., Nilsson, T. H., & Johnson, M. 1984. The interaction of temperature, illuminance and apparent time on sedentary work fatigue. *Ergonomics*, 27, 89-101.
- Nemecek, J. & Grandjean, E. 1973. Results of an ergonomic investigation of large-space offices. *Human Factors*, 15 (2), 111-124.
- Nohria, N., & Eccles, R. 1992. *Networks and Organizations*. Boston: Harvard Business School Press.
- O'Conaill, B., Whittaker, S., & Wilbur, S. 1993. Conversations over videoconferences: an evaluation of the spoken aspects of video mediated interaction. *Human Computer Interaction*, 8, 389-428.
- Oldham, G. R. 1988. Effects of changes in workspace partitions and spatial density on employee reactions: a quasi-experiment. *Journal of Applied Psychology*, 73, 253-258.
- Oldham, G. R. & Brass, D. J. 1979. Employee Reactions to an open-plan office: a naturally occurring quasi-experiment. *Administrative Science Quarterly*, 24, 267-284.
- Oldham, G. R., & Rotchford, N. L. 1983. Relationships between office characteristics and employee reactions: A study of the physical environment. *Administrative Science Quarterly*, 28, 542-556.
- Oldham, G. R., & Fried, Y. (1987). Employee reactions to workplace characteristics. *Journal of Applied Psychology*, 72, 75-80.
- Oldham, G. R., Cummings, A., & Zhou, J. 1995. The spatial configuration of organizations: A review of the literature and some new research directions. *Personnel and Human Resources Management*, 13,1-37.
- Olson, G., & Olson, J. 2000. Distance Matters. *Human Computer Interaction*, 15 (2&3), 139-178.
- O'Neill, M. J. 1994. Work space adjustability, storage, and enclosure as predictors of employee reactions and performance. *Environment and Behavior*, 26 (4) 504-526.

- O'Reilly, C. A. & Roberts, K. H. 1977. Task group structure, communication, and effectiveness in three organizations. *Journal of Applied Psychology*, 62, 674-681.
- Pastalan, L. A. 1970. Privacy as an expression of human territoriality. In L. A. Pastalan & D. H. Carson (Eds.), *Spatial Behavior of Older People*. Ann Arbor: University of Michigan Press.
- Parsons, H. M. 1976. Work environments. In I. Altman and J. F. Wohlwill (Eds.), *Human Behavior and Environment: Advances in Theory and Research*. Vol.1. New York: Plenum.
- Patterson, A. H. & Chiswick, N. R. 1981. The role of the social and physical environment in privacy maintenance among Iban of Borneo. *Journal of Environmental Psychology*, 1, 131-139.
- Paciuk, M. 1990, April. The role of personal control over the environment in thermal comfort and satisfaction at the workplace. The 21st Environmental Design Research Association Conference. Champaign-Urbana, IL.
- Pedersen, D. M. 1982. Cross validation of privacy factors. *Perceptual and Motor Skills*, 55, 57-58.
- Peatross, D. 1997. The spatial dimension of control in restrictive settings. Proceedings of the Space Syntax Symposium, University College London, London.
- Penn, A., Desyllas, J., & Vaughan, L. 1997. The space of innovation. Proceedings of the Space Syntax Symposium, University College London, London.
- Peter, T. J., & Waterman, R. H. 1981. In *Search of Excellence: Lessons From America's Best-Run Companies*. New York: HarperCollins.
- Pile, J. F. 1978. *Open Office Planning: A Handbook for Interior Designers and Architects*. London: Architectural Press.
- Rothman, D. 1980. *Conscience and Convenience: The Asylum and its Alternative in Progressive America*. Boston: Little, Brown and Co.
- Ruback, R. B., Pape, K. D., & Doriot, P. 1989. Waiting for a phone: Intrusion on callers leads to territorial defense. *Social Psychology Quarterly*, 52, 232-241.
- Ruback, R. B., & Snow, J. J. 1993. Territoriality and non-conscious racism at water fountains: Intruders and drinkers (Blacks and Whites) are affected by race. *Environment and Behavior*, 25, 250-267.
- Rubin, Z., & Shenker, S. 1978. Friendship, proximity, and self-disclosure. *Journal of Personality*, 46, 1-22.
- Rutter, M. 1987. *Communicating by telephone*. Oxford: Pergamon Press.
- Sausser, W. I., Arauz, C. G., & Chambers, R. M. 1978. Exploring the relationship between level of office noise and salary recommendations: A preliminary research note. *Journal of Management*, 4 (1), 57-63.
- Scuri, F. 1990. Artificial versus natural: New Italian work environments. Paper presented at the International Association and their Physical Setting (IAPS) 11 Conference, Ankara, Turkey.
- Sebba, R., & Churchman, A. 1983. Territories and territoriality in the home. *Environment and Behavior*, 15 (2), 191-210.
- Short, J., Williams, E., & Christie, B. 1976. *The social psychology of telecommunications*. New York: Wiley.
- Smith, H. W. 1981. Territorial spacing on a beach revisited: A cross-national exploration. *Social Psychology Quarterly*, 44, 132-137.
- Sommer, R. 1967. Small group ecology. *Psychological Bulletin*, 67, 2.
- Sommer, R. 1967. Sociofugal space. *American Journal of Psychology*, 72, 654-659.
- Standing, L., Lynn, D., & Moxness, K. 1990. Effects of noise upon introvert and extroverts. *Bulletin of the Psychonomic Society*, 28, 138-140.
- Steele, F. 1971. Physical settings and organization development. In H. Hornstein, W. Burke, B. benedict, R. Lewicki, and M. Hornstein (Eds.), *Strategies of Social Change: A Behavioral Science Analysis*. Glencoe, Ill.: The Free Press.
- Steele, F. I. 1973. *Physical Settings and Organizational Development*. Reading, MA: Addison-Wesley.
- Steinzor, B. 1950. The spatial factors in face-to-face discussion groups. *Journal of Abnormal and Social Psychology*, 45.
- Sterling, E. M. 1986. Indoor air quality – total environment performance: Comfort and productivity issues in modern office buildings. *Resource – The Canadian Journal of Real Estate*, 21-24.
- Stokols, D., Smith, T. E., & Prostor, J. J. 1975. Partitioning and perceived crowding in a public space. *American Behavioral Scientist*, 18, 792-814.
- Sundstrom, E. 1986. *Workplaces: The psychology of the physical environment in offices and factories*. New York: Cambridge University Press, 309-311.
- Sundstrom, E. 1987. Work environments: Offices and factories. In D. Stokols and I. Altman (Eds.), *Handbook of Environmental Psychology*. New York: John Wiley & Sons.
- Sundstrom, E. D., & Sundstrom, M. G. 1986. *Work Places: The Psychology of the Physical Environment in Offices and Factories*. New York: Cambridge University Press.
- Sundstrom, E., Burt, R., & Kamp, D. (1980). Privacy at work: architectural correlates of job satisfaction and job performance. *Academy & Management Journal* 23, 101-117.
- Sundstrom, E., Town, J., Brown, D., Forman, A., & McGee, C. 1982a. Physical enclosure, type of job, and privacy in the office. *Environment and Behavior*, 14 (5), 543-559.
- Sundstrom, E., Herbert, R. K., & Brown, D. W. 1982b. Privacy and communication in an open-plan office: A case study. *Environment and Behavior*, 1, 379-392.
- Szilagyi, A., & Holland, W. 1980. Changes in Social Density: Relationships with functional interaction and perceptions of job characteristics, role stress, and work satisfaction. *Journal of Applied Psychology*, 65 (1), 28-33.
- Taylor, R.B., Gottfredson, S. D., & Brower, S. 1981.

Territorial cognitions and social climate in urban neighborhoods. *Basic and Applied Social Psychology*, 2, 289-303.

Tolchinsky, P. D., McCuddy, M. K., Adams, J., Ganster, D. C., Woodman, R. W., & Fromkin, H. C. 1981. Employee perception of invasion of privacy: A field simulation experiment. *Journal of Applied Psychology*, 66, 308-313.

Veitch, J. A. 1990. Office noise and illumination effects on reading comprehension. *Journal of Environmental Psychology*, 10, 209-217.

Veitch, J. A., & Gifford, R. 1996. Choice, perceived control, and performance decrements in physical environment. *Journal of Environmental Psychology*, 16, 269-276.

Vinsel, A., Brown, B. B., Altman, L., & Foss, C. 1980. Privacy regulation, territorial displays, and effectiveness of individual functioning. *Journal of Personality and Social Psychology*, 39, 1104-1115.

Walden, R. 2004. Work environments. *Encyclopedia of Applied Psychology*, Vol. 3, Elsevier, Inc., 699-707.

Walden, T. A., Nelson, P. A., & Smith, D. E. 1981. Crowding, privacy and coping. *Environment and Behavior*, 13, 205-224.

Walker, C. R., & Guest, R. H. 1952. *The man on the assembly line*. Cambridge, MA: Harvard University Press.

Weiss, J. M. 1972. Psychological factors in stress and disease. *Scientific American*, July, 226 (6), 104-113.

Whittaker, S., Frohlich, D., & Daly-Jones, O. 1994. Informal Workplace Communication: What is it Like and How Might We Support It? Proceedings of CHI'94 Conference on Computer Human Interaction. New York: ACM Press, 130-137.

Wineman, J. D. (Ed.). 1986. *Behavioral Issues in Office Design*. New York: Van Nostrand Reinhold.

Wineman, J. D. (Ed.). 1982. *Environment and Behavior: Office Design and Evaluation I & II*, 14, 3 & 4.

Wineman, J. D. 1982. The office environment as a source of stress. In G. W. Evans (Ed.), *Environmental Stress*. New York: Cambridge University Press.

Wineman, J. D. & Serrato, M. (1998). Facility design for high-performance team. Supporting Work Team Effectiveness. Eds. E. Sundstrom and Associates. San Francisco: Jossey-Bass Publishers.

Wolgers, B. 1973. Study of office environment-attitudes to office landscapes and open-plan offices. *Build International*, 6, 143-146.

Wollman, N., Kelly, B. M., & Bordens, K. S. 1994. Environmental and interpersonal predictors of reactions to potential territorial intrusions in the workplace. *Environment and Behavior*, 26 (2) 179-194.

Woodman, R. W., Ganster, D. C., Adams, J., McCuddy, M. K., Tolchinsky P., & Fromkin H. 1982. A survey of employee perceptions of information privacy in organizations. *Academy of Management Journal*, 25, 647-663.

Worchel, S., & Lollis, M. 1982. Reactions to territorial contamination as a function of culture. *Personality and Social Psychology Bulletin*, 8, 370-375.

Yoshino, M. Y., & Lifson, T. B. 1986. *The Invisible Link: Japan's Sogo Shosha and the Organization of Trade*.

Cambridge, MA: MIT Press.

Zahn, L. G. 1991. Face to face communication in an office setting: The effects of position, proximity and exposure. *Communication Research*, 18, 737-754.

Zeitlin, L. R. 1969. A comparison of employee attitudes toward the conventional and the landscaped office. Report. New York: New York Port Authority.

Zweigenhaft, R. L. 1976. Personal space in faculty office: Desk placement and the student-faculty interaction. *Journal of Applied Psychology*, 61, 529-532.