[h1] 9.0 BUILDING-IN-USE ASSESSMENT: FOUNDATION OF WORKSPACE PSYCHOLOGY

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[h2] 9.1 Introduction
User feedback studies, in which occupants provide information on performance of the building in use, are an important source of knowledge. User feedback studies aim to assess how buildings and building systems affect the comfort, effectiveness, and well-being of building users. As studies become more numerous and sophisticated, and information is more readily available on the effects of the built environment on users, feedback mechanisms have evolved to inform all stages of building programming, design, construction, and occupancy, known as building performance evaluation (Preiser & Vischer, 2015). The building performance evaluation framework incorporates early notions of post-occupancy evaluation and links the information gleaned from users to decision-making at each stage of the building delivery cycle. The post-occupancy research focus on building occupants’ feedback yields findings that shed light on the operation and management requirements of existing buildings, generate new knowledge about the human use of space, and inform key decisions during the design and construction process.

[h2] 9.2 Assessment tools
One active area of user feedback research focuses on environments for work, specifically office buildings. Since 1989, a range of measurement tools have been developed in the form of user surveys, instrument measurements of ambient conditions, and qualitative techniques - many of which are designed with a view to practical diagnosis of building performance leading to problem correction and user-related improvements. This chapter provides an overview of ideas, concepts, and observations that have evolved from amassing, analyzing, and applying large amounts of feedback gathered from office
building occupants over a period of almost three decades in countries all over the world. Together these ideas form a coherent theory of user-building interaction which can be applied to improving worker comfort and productivity, providing cost-effective accommodation, supporting technology-supported mobile work, and mediating rapid organizational change.

Building-In-Use (BIU) Assessment, devised in the 1990’s, is one of the first tools for collecting reliable user feedback in environments for work. It aimed to standardize data gathered from building user surveys to ensure that user feedback could usefully be applied to diagnosing building performance (Vischer, 1989). A short standardized questionnaire collects feedback in the form of users’ ratings of building conditions and features. Collecting standardized data enables the construction of a database from which typical patterns of user response to office environments are calculated. Individual building scores are compared to database norms to provide a context for assessing the meaning of users’ ratings of their workspace, and to indicate whether it is superior or inferior to a “typical” office building. The evolution of this tool, its use in a wide range of work environments, and the rich variety of study outcomes led to many of the concepts and constructs discussed in this chapter.

Space for work, or workspace, is increasingly diverse. Whereas office planning was once based on simple division of workspace into large rooms containing rows of desks and a few private offices for managers, contemporary work environments include a range of individual and shared spaces, communal areas and amenities, and access to sophisticated electronic tools (Gillen, 2006). Consequently, companies increasingly apply quality as well as cost criteria to workspace design to invest in environments that actively support workers’ tasks (Vischer & Malkoski, 2015). Research indicates that workspace design and management affect not only how people feel about their job, but also work performance, loyalty, engagement, and ultimately the value of human capital to the organization. The premise of BIU Assessment is the dynamic and interactive relation between users and space: i.e. the user’s environmental experience includes the consequences of her behavior in that environment, and her experience of the environment is itself transformed by the activities she is performing (Vischer, 2008a).

[h2]9.3 Satisfaction and productivity
Early post-occupancy studies attempted to assess the success and failures of a building through users’ satisfaction ratings, and they often still do. This approach asks building users to identify what they ‘like’ and ‘dislike’ about their work environment on the implicit assumption that self-reported satisfaction with individual features is a de facto measure of building quality. The logic implies that if users like their workspace and are satisfied the workspace is successful, whereas if they are dissatisfied, the building is not
performing or has somehow failed.

Substantial knowledge of users’ preferences has emerged from workspace satisfaction research. For example, findings show that office workers are typically dissatisfied with ‘open plan’ offices, whether this is due to noise levels, distractions, lack of privacy, or the sameness of ‘cubicles’ (Davis et al., 2011). However, the prevalence of this finding has not prevented employers from favoring open plan layouts – in part because workstations are cheaper to construct and more flexible to reconfigure than a traditional cellular office layout, and in part because more desks and equipment can be fitted into open plan layouts. As has been argued elsewhere, whether workers like or dislike workspace features pertains more closely to happiness research than to understanding how effectively the physical environment supports work (Vischer, 2008a). More complex models of user-environment interaction, e.g., how well people can perform tasks, access needed tools, engage in appropriate communication, and identify territory, are needed to guide inquiry into workplace performance, that is, the effectiveness of workspace whose explicit objective is to support the performance of work. BIU Assessment connects workspace features with worker effectiveness: a performing workplace is designed to optimize worker productivity, so users’ judgment of whether their space does or does not support their work is a better diagnostic measure than whether or not they like it.

[h2] 9.4 Levels of productivity

Workspace design influences productivity at three identifiable levels: these are individual, group, and organizational productivity. Each category denotes a variation in scale of environmental influence (Vischer, 2006).

• Individual productivity is typically assessed at the scale of the individual workpoint, through data on how the micro-environment - specifically environmental conditions such as lighting and visual conditions, variations in temperature and humidity, furniture ergonomics, and noise privacy - influences individual task performance in terms of effects on speed and error rates as well as on incidence of illness and absenteeism.

• The productivity of groups sharing workspace, such as a teamwork environment, is typically evaluated in terms of the quality and quantity of group processes, such as rate of innovation, number of creative ideas, and speed of decision-making. Teamwork is affected by the design and layout of the team workspace, such as access, circulation, and ambient conditions such as noise. Group processes are affected by workgroup size and the relative accessibility of team members. Other environmental determinants of workgroup effectiveness include the positioning of work areas and shared space, and access to tools and equipment.

• A third level of productivity is a function of an organization’s accommodation, that is, its overall work environment, including appearance and location, workspace and amenities, communications tools and technology, and the ways these are used.
Accommodation choices support the organization’s business objectives and affect competitive advantage to varying degrees. As Figure 9.1 shows, the quality of support that the organization obtains from its accommodation can range from highly positive – actively supporting work – through neutral and poor, to highly negative (Vischer, 1996).

![Figure 9.1: Stages in the Organization-Accommodation Relationship](image)

Source: Author

In a positive organization-accommodation (O-A) relationship workers’ tasks are facilitated, and in a negative O-A relationship workers’ time and attention are lost dealing with adverse environmental conditions. The O-A relationship is dynamic and evolving as firms become attuned to the benefits of adjusting and updating workspace in response to changing technology and business processes. Locational advantages and access, as well as amenities such as fast elevators, convenient bathrooms, adequate parking, and attractive eating areas all affect organizational effectiveness.

While evidence accumulates that workspace design influences workers’ effectiveness, accounts of workspace change suggest that employees resist ‘social engineering’ solutions where employers envision a work environment aimed at eliciting maximum productivity (Vischer, 2009). Such an approach violates the socio-spatial contract, the implicit social contract between worker and employer that promises to provide a certain level of workspace quality in return for the worker’s energy, effort, and knowledge (Vischer, 2005). Contract violations, often unpremeditated, cause workers to feel devalued and increase their resistance to workspace change. In many organizations, moving workers out of private offices and into open workstations is a socio-spatial contract violation: the status, confidence, and responsibility that the employer
communicates through allocating private enclosed workspace is undermined by allocating the same open workstation to everyone.

Managers who consider supportive workspace to be an investment in their workforce require evidence to guide their environmental design decisions. Like information technology, workspace can and should be a tool for performing work. To design workspace as a tool for work, information is needed on what workers do, how they perform tasks, and ways in which they are - and are not - helped by their workspace. Ways of measuring users’ feedback such as BIU Assessment are diagnostic tools whose findings apply to all three categories of productivity: individual task performance, teamwork effectiveness, and organizational accommodation.

[9.5 Workspace comfort]
Collecting, interpreting, and applying complex feedback from users has generated a tripartite model of workspace comfort that goes beyond simple user preferences and satisfaction ratings. Basic to this model is the concept of functional comfort, connecting user satisfaction with worker productivity by defining effective or successful workspace in terms of degree of environmental support for occupants’ tasks and activities. BIU Assessment measures levels of functional comfort for a given workspace, providing a diagnosis of workplace effectiveness that captures the impact of workspace features on work performance at the different scales of productivity. As shown in Figure 9.2, functional comfort is one of three constituents of workspace comfort.

![Figure 9.2: Tri-partite Model of Workspace Comfort](source: Author)
Physical comfort, defined in terms of meeting building codes and published comfort standards, ensures that people feel healthy and safe in the buildings they occupy. Without physical comfort there can be neither functional nor psychological comfort. Both physical and functional comfort are affected by psychological comfort: people’s sense of belonging, territory, and environmental control, often expressed as the need for privacy.

The functional comfort approach has been applied to diagnosing workplace performance in numerous office buildings. Figure 9.3 displays how users’ functional comfort ratings of workspace features are analyzed with reference to database norms, providing a profile of workspace strengths and weaknesses that delivers diagnostic information to designers, planners, and managers. A functionally comfortable workspace is a performing workplace: employers receive a return on their workspace investment in terms of increased employee effectiveness (Vischer, 2008b).

![Figure 9.3: Building-In-Use Profile indicating intervention priorities based on differences between building score and database norm](image)

Figure 9.3: Building-In-Use Profile indicating intervention priorities based on differences between building score and database norm

Source: Author

Workspace diagnosed as functionally uncomfortable slows down work, increases worker fatigue, and leads to workspace stress. In unsupportive environmental conditions – a negative O-A relationship – workers use their energy and attention to solve environmental problems. Consequently, task performance is compromised, energy for creative thinking and innovation is reduced, and the value of its human capital is not
realized by the organization (Vischer, 2007). Workspace stress occurs when elements of the physical environment interfere with the attainment of work objectives. Stressors that interfere with task performance, motivation, and social relationships “influence physiological processes, produce negative affect, limit motivation and performance, and impede social interaction” (Evans & Cohen, 1987, p.107). Today’s workspace cannot be designed as a one-time, final, and permanent ergonomic support for all office tasks, but rather needs to be adaptable and negotiable to provide ongoing support to users. Workers need the skills and opportunities to engage with and adjust their environment over time and with changing task requirements in order to optimize functional comfort and cope with workspace stress.

Measuring levels of functional comfort in a building provides a diagnosis both of more stressful/least comfortable and of less stressful/more supportive workspace conditions. Reliable occupant feedback identifies all workspace environments somewhere along the continuum ranging from functionally comfortable and supportive of work to dysfunctional and stressful.

9.6 Psychological comfort
Using BIU Assessment to measure functional comfort in buildings all over the world has shed light on the complex psychological layers that affect workers’ relationship to their physical environment. Psychological comfort is a function of a sense of belonging, i.e., territorial appropriation, along with loyalty and commitment to the organization, and sense of privacy and environmental control, all of which are mediated by the socio-spatial contract and the behavioral expectations it implies (Augustin, 2009; Vischer, 2005).

Territory, whether of the individual or the group, has psychological value both as space for one’s work and as symbolic of one’s place in the organization. Underlying these is a human behavioral schema expressed in terms of the personalization and appropriation of space: marking territory and constructing boundaries of social and environmental control. The introduction and use of new technology and sophisticated communications tools have also affected workers’ notions of territory. Territorial boundaries are not simply physical elements that enclose space: territoriality signifies sense of privacy, social status, and control. When people move out of private enclosed offices into open plan workstations, studies show they judge their environment more negatively, citing lack of privacy, acoustic conditions, and confidentiality problems (Brennan et al., 2002; McElroy & Morrow, 2010). These reasons are given irrespective of whether or not their work is confidential, or whether or not they need to be alone to perform tasks effectively. Complaints about lack of privacy abound in studies of workspace change, independent of physical characteristics such as furniture configuration and partition height.
Workers’ sense of privacy is connected to environmental control on at least two levels: mechanical or instrumental control, and control over process or empowerment (Vischer, 2012a). Instrumental control refers to mechanical actions, such as chairs and worktables that are raised and lowered, cabinets and tables on wheels, operable windows, switchable lights, and a door. Evidence indicates a positive psychological impact from instrumental control in situations where employees are informed and even trained to make use of the controls available (Vischer, 2012b). An important form of environmental control is the opportunity for personalization. Behaviors such as placing symbolic objects, family photographs, plants, and posters in individual and team workspace increase sense of belonging, loyalty, and morale (Elsbach, 2004).

Opportunities for employees to participate in workspace decision-making increase control over process and environmental empowerment, which both affect psychological comfort. Studies have shown that worker participation in the design process has a positive effect on people’s response to and feelings about their workspace. People who are informed about workspace-related decisions, and who participate in decisions about their own space, are more likely to have feelings of belonging and territorial ownership. This enables workplace stress reduction through positive coping with environmental demands and encourages workers to find ways of solving their environmental problems.

### 9.7 Future research

Considerable knowledge has accrued from using BIU Assessment both to assess building performance and to study the complexity of workspace psychology. The future of user feedback and its role in building performance evaluation requires strong theoretical frameworks that will lend greater coherence to existing knowledge, generate fruitful research, and create supportive work environments in office buildings.

While occupants’ satisfaction ratings provide data on their likes and dislikes, satisfaction studies generate little information about environmental support for task performance, adding value to business processes, or why owners and managers should invest in workspace improvement. Generating diagnostic data on building performance through measuring how well the environment supports work generates findings that can be applied to decisions about how and when to intervene to solve environmental problems and effect improvement through removing, replacing, or transforming workspace features. Consequently, building interventions can be prioritized and appropriately scaled, workers’ tasks are performed better, team communication and decision-making is more effective, and the organization is more productive. In addition, improved psychological comfort through empowerment helps enhance the creation and dissemination of knowledge.

Companies that value human capital want to understand how new knowledge accrues in
their organizations and how to distribute and share knowledge. Workspace plays an important role in these processes (Vischer, 2010). Worker productivity in the knowledge economy is less a matter of improving speed and accuracy of routine tasks and increasingly a function of generating new ideas, being creative, working effectively in teams, and producing knowledge that adds value to the organization. While measures of functional comfort provide indicators of effects on productivity, other productivity indicators such as reduced illness rates, increased speed and accuracy of task completion, and even rates of generating new ideas, also measure workspace effectiveness.

Psychological comfort, the feeling of belonging, is an important predictor of employee retention and reducing costly staff turnover. More extensive measurement of territorial behavior and appropriation at work will yield improved knowledge of how and why environmental features affect employees’ sense of privacy and how to meet privacy needs without compromising information exchange and team collaboration. Better understanding of territoriality, privacy and environmental control mechanisms through feedback from occupants will help organizations determine their returns on investment in environmental quality in terms of recruitment and retention of high-quality employees.

Finally, users’ workspace comfort interacts with sustainability and the ‘green’ qualities of commercial buildings (see Chapters 15, 18, and 19). Sustainable building features, such as natural ventilation, water recycling, and passive cooling technology, affect physical, functional, and psychological comfort of users, and research provides evidence of behavioral changes as a result of sustainable design features. Some studies indicate a positive effect on users’ psychological comfort as people are proud of working in sustainable buildings and feel empowered to make behavioral decisions, while others show little evidence of sustainable buildings providing more supportive workspace. There is also some evidence that giving occupants a more active role and responsibility – environmental empowerment – for changing their behavior in environmentally sustainable buildings is a necessary condition for success.

[h2] 9.8 Conclusions
The environmental psychology of workspace is a rich and diverse field of study that is still growing. As human beings in all parts of the world spend increasing amounts of time in environments for work, the effects of the physical environment on occupants’ performance, health, and morale needs to be better understood. The knowledge yielded by feedback from occupants through measurement tools such as BIU Assessment informs employers’ decisions as well as corporate investments in the work settings they create, and assists and improves the building industry as designers, facilities managers, leasing agents, and construction professionals draw on it. Business managers also seek evidence of how workspace decisions affect their personnel as companies become more agile by
implementing ongoing workspace change, often dispersing teams to more than one geographic locale. Using BIU Assessment to systematically collect reliable feedback from building users has yielded a rich mine of knowledge about building performance and a significant contribution to understanding the user-environment relationship.

[h2] 9.9 Bibliography


