ASSESSING QUALITY IN THE WORK ENVIRONMENT

Introduction

A comprehensive review of the literature has revealed literally hundreds of articles and books discussing the need to assess the built work environment. Their authors, representing many different disciplines, allude to the need for providing safe environments, or environments that optimize effectiveness and productivity. Some speak of saving corporate resources and maximizing profitability while others discuss benchmarking and sustainability. Under the umbrella of environmental assessment each discipline contributes a unique area of focus and with that focus different methodologies, different units of analysis and an increasingly confusing and complex array of environmental attributes deemed essential for identifying or providing a quality corporate workplace. Such diversity of focus, together with miscellaneous tools measuring an apparently divergent list of attributes offers an unsystematic if not meaningless definition of quality.

The purpose of this paper is not to define environmental quality per se. As others (Becker, 1990; Rapoport, 1978; Zimring, 1985) have pointed out, a quality environment can only be defined by the people for whom the specific environment is important. Rather the intention of this paper is to offer a system of analysis and categorization with which it is possible to conceptualize the full range of contextual variables that may influence the quality of a work environment. Specifically the goals of this paper are four fold:

1. To demonstrate how the Procedure for Environmental Quality Assessment (PEQA) model can be used to organize the environmental assessment tools that are published and available.

2. To provide operational definitions for the factors within the PEQA model of environmental quality assessment.
3. To demonstrate how the research and development of environmental assessment may be categorized based on the difference in intended uses and goals: Academic; Institutional; Professional.

4. Provide an analysis of how these tools may most appropriately be used.

**Procedure for Environmental Quality Assessment**

The Procedure for Environmental Quality Assessment (PEQA) model (Figure 1) (Witzling, Childress, & Lackney, 1994) demonstrates the intricacy and complexity of the environmental quality construct. This model also serves as a clear and explicit road map for finding the issues pertinent in defining quality of a workplace. First, the type of place must be identified and described; then, it must be determined how well the physical environment matches the activities and programs of the place. Quality is the degree of match between the place of the environment and the functions that are required within.

**What type of place is this?**

An environment is more than the sum of its parts. It is a place; a place has meaning (Canter, 1977, Hiss, 1991), Krampden, 1991). It has a history and a future. A place is experienced, both positively and negatively. A place is perceived as fulfilling both societal and individual needs and purposes. To assess quality in an environment, it is essential to describe and understand: how it was created and by whom; how it functions; and who uses it and why.

**How was/is the environment created ... and by whom?**

The creation of an environment is influenced by four factors: occupants, regulators, design development, and building management and service.

**Occupants.** The occupants are those people who are motivated to action on a project (either to build new or renovate what exists). It is the confluence of motivation, timing and their own requirements that result in a plan for changes such as expansion, downsizing (or right-sizing), or simply the desire to promote a different image.
Figure 1. Procedure for Environmental Quality Assessment.

Regulators. Regulations in creating a new environment may be as explicit as local, regional, or national codes that govern design and construction. Regulators also come in the form of societal and technological constraints, as well as availability of natural and financial resources. The system of inspections surrounding any construction site will typically require knowledge of and adherence to codes. Likewise, financial constraints are well regulated (sometimes in triplicate) by investment and legal advisors. Societal regulations are often unforeseen, but very powerful and capable of overriding even the tightest of legal and financial documents. For instance, issues of place type, ethnicity of workforce, or even style of architecture may be strongly dictated by societal forces. Technological regulators may define a place depending on the availability of technology necessary to achieve or support corporate goals.

Design and Development. How a place is created relies heavily on the communication between designer and client. Designers with practical and theoretical knowledge base of a specific place type, the client profile and attributes in the specific region or locale contribute substance and understanding to the design. Likewise, the client who provides substantive, thoughtful feedback to the designer gives form and meaning to the creation of the environment.

Building management and service. An environment is also shaped and created by internal lines of communication and responsibility. Just as the design team must have a leader who directs and coordinates the external creative efforts, within the corporation, it must be clear who is responsible for making decisions and the criteria they will use for making them.

How does the place function?

How a place functions may be described based on the people who occupy the place, their activities and programs, the resources available and the physical elements of the environment. As attributes of these elements vary, so will the level of functioning of the place.
People. Age, gender, culture and socio-economic status affect a person's intention and performance in a place. Aside from the changing physical characteristics that accompany the aging process, mental and social changes also occur. Issues of gender and culture may not only affect the person's level of performance, but also the ability to perform. The socio-economic status of a person reflects the experience of formal education and personal history. Those issues together create a telling profile of the people for whom the place will function, and the attributes necessary for quality functioning.

Aging is frequently cited as a variable indicating prediction of physical and mental function (Lawton, 1986). Including: illumination requirements for good vision change (Cohen & Weisman, 1989), temperature ranges for thermal comfort change (Cohen & Weisman, 1989), and competence in way finding may change (Weisman, 1990) due to aging. Age also has important social considerations. Young adults who are likely parents of young children will have different social needs than older parents of teenagers, or adults with no children. These issues will be reflected in different needs such as child care, insurance, training and transportation requirements.

Gender issues, more than simply providing for male and female occupants, may influence how a place functions (Weisman, 1992). How a place functions can be described by the diversity or homogeneity of the occupants, and the degree to which they are empowered based on those differences.

The socio-economic status of the occupants may present specific issues to functioning of a place. The occupant's educational levels, their income levels, and their perceptions of status, may influence how a place functions. Great disparities can influence morale. High socio-economic status may require a place to function with a heavy reliance on highly specialized or sophisticated technology. A low socio-economic status may demand more training programs, or unionization.
Activities and programs. How a place functions may be described based on required interactions (Becker & Steele, 1995; Sundstrom, 1987): whether the tasks to be done are performed individually or in aggregates. Increasingly corporations are acknowledging the benefit of working in groups or teams, in which case small personal spaces may function well for individual uses, leaving more and larger spaces designated for encouraging team work. Some corporations have also defined new ways of working with "hotelling" and other versions of non-territorial officeing -- some individuals do not receive assigned work spaces, rather places are sequentially shared when attendance is required. In the case of home based work or telecommuting, "the place" required for functioning is not within the physical confines of the corporate office at all.

Resources. The physical functioning of a place may be described by its system of operations, maintenance, conservation and provision of services to its customers. Operations implies the system within the building for getting things done, administratively and physically. Operations includes looking to the current and past performance of the buildings system to project and plan for future situations. The operations team plans and executes a program of action for keeping the environmental system optimally active.

A responsibility of maintenance is to insure that the physical environment and systems run efficiently through a program of preservation of the status quo. Maintenance assures that the ambient and physical environment are consistent and are experienced as reliable. Likewise, it is important to an organization that its resources be conserved, this has both economic and production implications.

Services provided to the individuals by the organizations are also important resources. Services may be social or physical. Social services may include on-site child care, fitness programs, and insurance programs. Physical services may be as diverse as on-site company stores, transportation, food service or printing.
**Environment.** The most commonly cited measures of quality of an environment are safety, objective physical elements and the core building systems. It is almost self-evident that environmental quality can to some degree be described as the level of safety it provides. From issues of life and death to ergonomically designed equipment or furniture, safety is a primary consideration. Objective physical elements include structure of the building, its layout, its components -- its tangible attributes. This also includes the ambient environment such as air quality, and other sensory features, such as sounds and smells. The most frequently evaluated features in assessment of the building systems are the mechanical and electrical system: the physical performance of the building itself independent of occupant perceptions.

**Who uses this place and why?**

The work environment is also defined by who works there and their reasons for choosing this place of employment. The reasons may be societal, organizational or individual.

**Society.** Societal constraints determine who uses a work environment. Within a society is an available workforce contained within a larger population and they are mutually defining. That workforce has specific attributes based on issues larger than the individual or organization. Global, national or regional conditions of the economy, politics, or religion can determine not only who is available to work, but their attitudes toward the work. Within a society there are mores or standards of behavior and ethics that shape the profile of the workforce.

**Organizational mission.** How the organization fits into a society and how well it suits the people within the society is to a large degree determined by the organization's larger goal. The organizational mission may be simply to make a profit for its owners and investors; or it may be to develop and provide a quality product to the marketplace while also providing a quality work place. Although the two are not mutually exclusive, they may appear to be resulting in ambiguity or confusion for both
Social climate. Within the work environment there is a stated, explicit social climate, and a more implicit one based on physical cues interpreted by the occupants. The degree to which an individual or team experiences a sense of freedom, support, and unity of action may be derived from the physical attributes and be a measure of the social climate. The meanings of place associated with these physical attributes may affect work performance. Meanings communicated may be an indicators of environmental match with activities and programs required or needed for functioning. The influence of these issues will affect the morale of groups and the social climate within the organization.

Individual experience. The person's ability to do the work may be influenced by the individual's experience of comfort and health, sense of safety and security, level and variety of sensory stimulation, degree of perceived control over environmental conditions, and the perceived aesthetics of the place. Each of these experiences, in turn, are interpretations of the place, by the individuals who occupy and work in the place.

Current Models of Environmental Assessment.

A purposive sampling of the environmental assessment literature was conducted. Looking for the most comprehensive models and programs of environmental assessment, three categories of models have emerged: academic, institutional and professional. Each category has an apparently different agenda, as evidenced by differing approaches or targeted variables.

Table 1 provides an overview of the three categories and the environmental variables of focus within each category. It also clearly distinguishes which variables are most frequently investigated and those which may be neglected, or considered irrelevant, within each category.

Academic model. The academic model, by far the largest body of literature, also investigates the largest number of variables. While some academic programs are more comprehensive than others. This model does not necessarily represent an actual
assessment instrument. These areas of research are more likely intended to inform designers, programmers and evaluators in the development of assessment theory and measures for environmental assessment.

Zimring (1989) offers by far the most comprehensive model for the process of environmental assessment. He attempts to meld the divergent qualities of post occupancy evaluation with environment and behavior research. By gathering and representing the views and requirements of occupants in exploring conceptual issues (i.e., way finding, stress), he posits that the physical attributes and occupant's perceptions of those attributes will affect the organizational decision making process. (Appendix A)

Such intense areas of focus are both the strength and the weakness of the academic model. Although some researchers such as Zimring (1989), Johnson (1994), and Preiser (1988) suggest a holistic or contextual approach to environmental quality, many more academic researchers take a more partitive position and tend to look at specific variables in more isolated conditions. For instance McLain (1985) has focused on the value of user participation in decision making. Sundstrom (1986, 19887) investigated the benefit of analyzing variables at multiple levels. Sprekelmeyer (1986) looked at the effects of change and aesthetics on productivity. Hartkopf, Loftness, & Mill (1989) have focused primarily on diagnosing building performance in relation to individual function.
Table 1. Procedure for Environmental Equality Assessment operationalized with 24 programs of research.
Johnson (1994), Preiser (1988) and McLain (1985) emphasize similar variables and reinforce Zimring's position. Other researchers as indicated in Table 1, however, differ considerably from the former authors by rarely acknowledging historical aspects of how the environment was created. Though each of these studies had significant value in contributing to the understanding of the relationship of work, workers and the building structure, these narrowly focused variables alone are insufficient for assessing the more accumulative nature of the experience of quality in a work environment.

Appendices A - J offer examples and insight into the academic models of environmental assessment.

Institutional model. Based on academic studies, their own experiences, and formal, legal regulations, broad sets of standards have been established to guide management in the strategic planning and occupation of buildings intended for government agencies and multi-site institutions. Designed to be used by in-house or inter-agency staff, this model primarily leads to economic considerations and conclusions.

As illustrated in Table 1, the focus of the institutional model is primarily on the status and performance of the building as a physical and functioning structure. Concerned with resources and objective elements of the building, the institutional model rarely considers the experiential aspects of the people who will become its occupants. When service amenities and space requirements are explored, it is frequently in the context of convenience and efficiency.

Perhaps, the most comprehensive and most flexible instrument within the institutional model is Serviceability Tools and Methods (STM) (Davis, 1995) who defines a quality environment as a "serviceable workplace ... capable of meeting occupant needs, now and in the future" (p. 2). STM is a kit of tools that promotes a participatory process between facility providers and the facility customers. As a
process it attempts to provide a link between occupant requirements and specific combinations of building features - considering the facility as a whole.

Widely used instruments such as BEPAC (1993) and BQA (1993) focus clearly on the building and its functionality as a resource for doing work. Beyond the Image It projects, no consideration is given to the environmental influence on the people who will do the work. BEPAC focuses primarily on environment as a consumer or polluter of resources. BQA concentrates on allocation of resources. NACOR (1995) similarly, focuses on assessment as a benchmarking process for comparisons of corporate headquarters based on setting, ownership, functionality, amenities image, space needs, location and costs.

Dalsh, et al (1982, 1983) post occupancy evaluation method attempts to include both building performance and behavioral issues. Outlining a fifteen page process that includes participant participation, the focus in still primarily on how the building performs, rather than how the building supports works performance -- though this may be implicit through their participation. Two strength of Dalsh's model are unique. First is the provision for recommendations of the assessment team to be translated into action. Second, the process of assessment is to be considered a continuing activity rather than an isolated event.

Because of their proprietary nature, examples of most institutional models were not available for this article. We have, however, included an overview of Dalsh's (19882, 1983) model as Appendix K.

Professional model. Informed by academic research and practical experience, the professional model is intended for application by independent designers, programmers and practitioners. This model is explicitly open to creating connections between people and environments. It seeks to justify expenditures for the human-environment experience.
Becker (1990) proposes two basic systems as required for reaching the essence of environmental quality: user based and expert based. The user basis elicits responses from building occupants to evaluate the adequacy of a building in terms of user satisfaction. The expert basis calls on a much wider range of informants to develop a holistic picture of the organizational environment. The expert based approach can provide an overview of changing technological needs, evolving organizational patterns, work profile and expectations and efficiency of resource use. (Appendix M)

As a group, those who apply the professional model, have produced the most comprehensive criteria for environmental assessment of quality. But, like the academic and institutional models describe previously, the professional model is heavily weighted to measure physical attributes of the building. And, they frequently overlook qualities of individual workers, as well as their distinctive collective attributes.

Brill, et al (1985) in a comprehensive two-volume “how to” explanation explicitly ties performance of the structure to human performance and equates them to economic value (Appendix L). Goodrich (1986) explains the mediating influences between user needs and the physical system of work environment (Appendix N). Farbstein & Wener (1982) illustrate that although the environment may be highly specialized (e.g., correctional institutions) the comprehensiveness and multiplicity of measures is still valid. Parshall (1988) draws on the Vitruvian metaphor of utility, commodity and delight to bind costs, function and aesthetics (Appendix O). Other assessment tools such as building commissioning and Real Estate Network (Appendix P) clearly connect building function and economic considerations from planning through post occupancy.

Methodology. Methods employed for environmental Assessment (Bechtel & Srivastava, 1978) vary across the models (Table 2). While all rely heavily on the survey or questionnaire instruments and observation, most tend to utilize a form of
methodological triangulation, which is important for providing trustworthiness to the
data analysis.

The general weakness easily seen in the methods are a reluctance to treat the
workers as individuals. As reflected in the few instruments that investigate the age,
gender, culture and socioeconomic conditions of employees. There are also very few
research programs or instruments that are designed to understand the individual's
goals and purposes for working in the organization.

Conclusions. Differences within categories are as interesting as differences
between categories of the environmental assessment models. Consistently the three
models emphasize evaluation of the objective physical elements of the environment.
How well the core mechanical system and the conditions of the objective physical
elements work is assessed in every analytic tool. Similarly operations and
maintenance are frequently referred to as variables that indicate and measure of
quality. Likewise indicators of the individual comfort, health, safety, security, and
control are frequently variables of investigation. This level of assessment clearly
gives us an indication of building functioning, but it overlooks the function of the
person within the buildings.

By focusing on building function and overlooking building management and
service, an important component of morale and unity of the social climate may be
negated. Or, by focusing on features of comfort, health, safety, security and control, an
understanding of the role of age, gender or culture may be misunderstood, or missed
entirely. Likewise by not understanding the organizational mission, how can
recognition, reward, image or aesthetics be evaluated?
Table 2. Methodology Common to Environmental Assessment.
Future research directions. Clearly there are four areas of environmental assessment that require further development.

1. **Building management and services.** What are the lines of responsibility, and what are the accepted definitions of responsibility in managing and maintaining the environment? Likewise, does the physical environment facilitate that level of communication? Environments in which there is no clear line of responsibility may see decisions made through default - which is unacceptable at any other level of the organization and probably inadvisable at this level as well.

2. **Design and development.** How important is the experience and expertise the design team brings to the project? Certainly a new design team fresh to a new building or organizational type may bring a refreshing approach to the task. Likewise, experience and expertise requirements may have varying degrees of importance. The more highly specialized the work environment, the more experience and expertise may be necessary. Conversely experience and expertise less may be important if the organization can clearly communicate and evaluate its environmental requirement. What role does environment and behavior research play in the phase?

3. **Personal profiles.** Employees may vary greatly by age, gender, culture, and socioeconomic conditions, and have greatly diverse requirements for working. And, how do we design for individuals, rather than for statistics?

4. **Societal, organizational and individual goals and purpose frame the motivation and context of work.** Available workforce, organizational motives, and the individual need for advancement may have a strong influence and reciprocal effects on work produced.

By emphasizing the mechanical systems and ambient environment, but overlooking the people who work within the organization, generalizable standards of quality have been difficult to develop. If we are to bring definition to quality work environments, we must also define quality of work, match the research methods to the application and design methods that assess an environment relative to its own definition of quality.