In Sync
Environmental Behavior Research and the Design of Learning Spaces

DIGITAL VERSION | 2009

By Lennie Scott Webber
About the Author:

With 25 plus years as an interior designer, researcher, international speaker, educator, and academic administrator, “Dr. Lennie” works as a specialist in the design and planning of environments for sharing knowledge as President and CEO of In_Sync. Her philosophy incorporates the integration of research for informing design resolutions. The design focus is on environments for knowledge sharing—higher education and corporate learning centers. As an environment behaviorist her research has centered on knowledge sharing scenarios relative to adult learners. Her former roles include: Chair of The School of Interior Design at Ryerson University; the Director of Applications Research for Vecta a Steelcase Design Partnership Company; faculty member at Virginia Tech; and owning and operating her own full service interior design firms in both Canada and the United States. This book, *In Sync: Environment Behavior Research and the Design of Learning Spaces*, exemplifies her belief that research should inform design. As a researcher, she has over 70 publications to her credit, is an Associate Editor of *Planning for Higher Education* as published by the Society for College and University Planning, and is a frequent guest speaker at national and international forums.
Acknowledgements:

This publication was funded in part by the Publishing Subvention Grant from Ryerson University.

My sincere thanks to Robert MacDonald, a student at the School of Interior Design at Ryerson University. Robert has acted as my research assistant for the academic year 2002–2003. He has prepared all of the graphics from my sketches, collaborated on design ideas and provided ideas for cover designs.

Thank you also to Terry Calhoun, Sunny Beach, and all of the people at SCUP who believed, pursued, and worked on this book to help it become a reality—it's been three years.

Finally, to my husband Tom for his love and patience.

L.
Table of Contents

Chapter 1 Introduction 1
Chapter 2 Environment/Behavior Basics 9
Territorial Behavior 10
Situational Behavior 11
Personal Space Behavior 13
Chapter 3 Remnants of Agrarian and Industrial Age Models 26
Agrarian Age 27
Industrial Age 31
Chapter 4 Knowledge Age 35
Chapter 5 Archetypal Applications for Knowledge Age Settings 40
Environments for Delivering Knowledge 45
Environments for Applying Knowledge 53
Environments for Creating Knowledge 58
Environments for Communicating Knowledge 65
Environments for Using Knowledge for Decision Making 74
Chapter 6 Putting it all Together 85
Chapter 7 Conclusions and Implications 94
Glossary 97
Bibliography 99
Appendix A Tables 105
Appendix B Figures 114
Appendix A: List of Tables

Table 1  Situational Behavior—Proxemic Zone Attributes  106
Table 2  Archetypal Attributes for Knowledge Environments  107
Table 3  Environments for Delivering Knowledge—Archetypal Attributes  108
Table 4  Environments for Applying Knowledge—Archetypal Attributes  109
Table 5  Environments for Creating Knowledge—Archetypal Attributes  110
Table 6  Environments for Communicating Knowledge—Archetypal Attributes  111
Table 7  Environments for Using Knowledge for Decision Making—Archetypal Attributes  112
Table 8  Collaboration and Self-Direction Matrix  113
Appendix B: List of Figures

Figure 1  Focal Point—Public Proxemic Zone (Sociofugal Arrangement)  115
Figure 2A  Sociofugal Arrangements (Linear)  116
Example: Airport / Doctor’s Office Setting
Figure 2B  Sociofugal Arrangements (Linear)  117
Example: Boardroom Setting
Figure 3  Sociopetal Arrangement (Radial)  118
Example: Seminar or Dining Table Setting
Figure 4  Individual Proxemic Condition—Individual’s Core Needs  119
Figure 5A  Impromptu Team Conditions—Multiple Core Arrangements  120
Figure 5B  Project Team Conditions—Multiple Core Arrangements  121
Figure 5C  Individual Conditions—Multiple Core Arrangements  122
Figure 6  One-Room Schoolhouse Floor Plan (Footprint)  123
Figure 7  Typical Classroom Floor Plans  124
Figure 8  The Classroom  125
Figure 9  Assembly-Line Learning Floor Plan  126
Figure 10  The Lecture Hall—(Portrait)  127
Figure 11  Applications for Delivering Knowledge—(Portrait)  128
Example: Lecture Hall
Chapter 1

Introduction

Valuable empirical research pertinent to designers and planners of the built environment (anything built by humans) sits on shelves in the ivory halls of academe. This fact became glaring apparent to me when I was a mature graduate student. The primary reason is that the researcher has not taken the next step in the process—providing direction for applications. As a designer, I don't just rely on best practices, but look for sources that corroborate my decisions. As a researcher, I follow a similar path and find other studies supporting my investigation. Knowledge builds upon knowledge, information upon information, and informed solutions provide credibility to the decision-making process. Designers and researchers follow a similar path. However, it is much easier for the researcher to use empirically based information due to the availability of these scientifically developed studies and the use of a common language (statistics and research methodology) for understanding the information presented. Since much of the research pertaining to issues of the built environment has stopped at the empirical stage and because the language is not familiar, designers do not have access to easily translated information which may be incredibly useful in the planning and predesign stages. This book is my attempt to bring to leaders of design and planning teams some of the classical environment/behavior research and current research findings IN SYNC with formulas for application (planning archetypes), thereby taking empirical research to that next step—making the information useable.

The focus here is on synchronizing information from two phenomena: (1) the environment’s impact on behavior and (2) the situations we find ourselves in when we need to share information (knowledge sharing). Many factors not addressed here contribute to how the environment impacts behavior, including the elements and principles of design (e.g., light, color, texture), furnishings, finishes, ergonomics, culture, etc. Other important components of the physical environment, such as information technology, acoustics, aesthetics, seating, and temperature, are also not addressed here (for further information read ASID, 2001)1, 2. We will look very simply, yet very strategically, at form and the manipulation of space relative to particular intended behaviors in specific knowledge-sharing scenarios.
Where do we share knowledge? The answer is, simply, anywhere and everywhere—in residential and commercial settings, indoors and outdoors. Yet this answer is too all encompassing and hard to get a handle on. Although the tenets provided here may work in a variety of settings, we will concentrate on environments whose mission is to advance and enhance the sharing of knowledge—corporations and higher education facilities. Since 1995, my own personal research has been dedicated to the pursuit of understanding and then articulating what designers and planners need to know in order to provide settings appropriate for intended behaviors. Many books and articles focus on the macro or architectural environment and exterior conditions of these settings. Presentations are often on "pretty pictures". Rarely do we read about the reasoning/logic/theory behind the design solution. We will address that reasoning for the micro scale, or interior design of these settings where people actually "live," or work, learn, and play.

What behaviors do these settings affect? Five intended behaviors have been identified supporting knowledge-sharing environments. They are:

- Environments for Delivering Knowledge (EDK);
- Environments for Applying Knowledge (EAK);
- Environments for Creating Knowledge (ECK);
- Environments for Communicating Knowledge (ECmK); and
- Environments for Decision Making (EDM).

Throughout the book, I have provided explanations, suggested protocols, archetypal information, and planning application ideas. My hope is that designers and planners alike will be able to utilize this text and the information it presents as a guideline for the predesign and planning stages and as a quality control check in the design development phase to ensure that design decisions are not compromised and ultimately to avoid a potential negative effect on the bottom line of these “businesses”. A disconnect between the design of the setting and the intended activities can lead to a reduction in the knowledge workers’ productivity.

As we know, much has changed. Today it is not business "as usual" in corporate arenas, organizations,
or educational academies. Each struggles to keep in step with the "dance of change"3 brought about by the effort to keep organizations moving forward and the shift from an outdated industrial model to one fitting our Knowledge Age (an age where knowledge is communicated through information technology and telecommunications). Many authors have offered suggestions for altering strategic approaches, business tactics, and personnel alignments3,4,5,6. Yet none makes the case for changing the built environment to support these emerging behavioral functions. However, work environments (work in this text refers to any place where people are engaged in a sustained activity over time) have the potential to be learning environments where each worker is involved in interrelated and collaborative opportunities. Many corporations and higher educational institutions have built-in expectations for workers and that may mean an expectation for him or her to engage in life-long/perpetual learning activities throughout his or her career7. In higher education, the mission is to impart knowledge. So, why is it important for designers, planners, and management who are involved in projects for higher education and corporate America's community of learners to plan spaces differently? Because, depending on the situation, knowledge is shared differently. It is desirable then to capitalize on these situations with a match between the behavioral theories imbedded within each situation and an application supportive of each, thus synchronizing theory and planning activities.

Designers and planners have professional responsibilities for the health, safety, and welfare of the constituents who utilize these settings. It's easy to remember to build to code, use guidelines for universal and barrier-free design, and think through sustainability issues. However, we need to be reminded that the tenets of human behavior (primal actions and reactions inherent in each of us) must be included in the decision-making process so that it specifically addresses a person's well being. This book will explore ideas and theories from social anthropologists and provide archetypal attributes supporting planning processes. To begin with, some background is required for garnering an awareness of why change in business strategy is necessary and to provide illustrations of the accompanying challenges.

Seely-Brown and Solomon-Gray8 see organizations as "webs of participation"3 (p. 49). They suggest that when you change “the participation/behavior you change the organization"3 (p. 49). These webs are often described
as communities of practice. Communities of practice exist at every level of an organization, in corporate structures, academic settings, and the like. These communities are comprised of people who must rely on one another to execute their work. Evidence suggests that groups of people affiliate due to a sense of common purpose and the advantage of knowing that others bring different knowledge perspectives to any given situation. Seely-Brown and Solomon-Gray argue further that these networks, or communities, are "the critical building blocks of a knowledge-based company". Many authors have presented organizational plans suggesting that people in leadership roles should develop new strategies for maximizing performance for a Knowledge Age that will positively affect business results: from an emphasis on individual performance to team performance.

Norris indicates that as "a global, knowledge-driven economy is emerging," society as we know it is undergoing a fundamental change driven by two pervasive factors: information technology and telecommunications. As this new millennium "heralds the arrival of an age of communication, knowledge, and learning, made possible by" these advances, "we may label this phenomenon the Knowledge Age . . . This knowledge driven economy has one coin—knowledge, not information. Insight, synthesis, and judgment are the real sources of value . . . Communicating is the way of the New Economy. Hoarding information is out. Sharing and leveraging knowledge is in. The New Economy spans every political and organizational jurisdiction. Knowledge, financial capital, and other assets flow easily across borders." No organization is immune to this phenomenon. As working relationships change to meet this new global necessity, so too should the designed environment adapt to support these emerging realities.

Winston Churchill, in an address to Parliament, said, "We shape our buildings; thereafter they shape us." Designers and planners, as well as leaders of organizations, must recognize that the built environment affects behavior. Would we rather continue adapting to the built space or have the space adapt for us? Identifying and planning for intended situational behaviors may provide additional support.

Understanding of the environment/behavior relationship is needed to align business strategies with design planning.
for implementing workplace strategies. Thus, appropriate and knowledgeable design planning is the key.

Design planning is viewed as a response to a perceived need (e.g., business strategy or educational thrust). Understanding that need is critical to the development of a successful built solution. Needs are determined in strategic planning sessions. However, it is the designer/planner’s and/or the environment/behavior specialist’s responsibility to contribute knowledge of the impact of the built environment; it should be an over-arching consideration. Knowledge of, and designing for, intended behaviors facilitates an increase in successful design solutions supporting Knowledge Age requirements. Evidence supports this truth. The research initiative, co-sponsored by The American Society of Interior Designers (ASID), Ecophon, Haworth and Vista Films, indicated that "well-designed workplaces utilize solutions that integrate employees' functional needs with comfortable and pleasant surroundings." In other words, "employees who feel the physical environment supports their work and is IN SYNC with the company's goals and image are more likely to be satisfied in their jobs, to work longer hours and to stay with their current employer." Evidence supports this truth. The large body of environment/behavior research affirms the importance of the relationship between human behavior and the physical environment, enables the production of environments supporting intended behaviors, and defines major components of these behaviors. Knowledge of environment/behavior relationships and planning workplace strategies is useful for leaders, planners, and designers alike. But what is considered an environment?

An environment is described as anything and everything that surrounds an individual. This idea employs the term "physical environment" to include both built and natural at both macro and micro levels. We will use this definition as a starting point and employ the principles of environmental behavior to focus on the relationship between human behavior and the building's physical characteristics (i.e., specific settings within a building). The collective research
from environment behaviorists argues that the physical environment affects human behavior. This wisdom has significantly advanced the understanding of human behavior, and provides explanations for how the environment impacts that behavior.

It is argued in this book that understanding this co-joined effect enables designers and planners to create solutions supporting intended behaviors. Furthermore, there are cultural, environmental, and behavioral remnants from the Agrarian Age (pre-Industrial Revolution) and Industrial Age (1750–1990s) settings particularly associated with learning environments, that may affect solution development for Knowledge Age settings, especially in adult learning areas of corporate and academic arenas. Organizations, institutions, and designers should recognize the impact of design and planning decisions on the overall strategic vision and the importance of incorporating environment/behavioral tenets into solution development. Specifically, the following chapters will explore:

- The historical social anthropology, or environment behavior research, as it relates to the built environment—particularly issues of territoriality, situational behavior, and personal space;

- The planning remnants left from the Agrarian/Industrial Age models and what changes may be necessary as we move forward into the Knowledge Age;

- The theories that describe how we learn;

- An overview of knowledge-sharing attributes for learning environments; and

- A set of archetypal principles with spatial application ideas for consideration in the design and planning of Knowledge Age settings.
References


Environment/Behavior Basics

You felt it. The hair stood up on the back of your neck. You knew you had to go into that dark parking garage to retrieve your vehicle. While walking through, you heard a noise. You froze—listening. No more noises. You hurried to get into the vehicle and lock the door, breathing a sigh of relief. You started the engine, still shaking.

The behavioral response depicted in this scenario is known as the "fight or flight" response\(^1\). This behavior is a result of "instinctual drift", or the "tendency for all organisms, when under pressure, to resort to and exhibit their natural tendencies. It is part of the genetic programming"\(^2\) (p. 42). Three important instinctual drift tendencies (IDT) relating to the built environment as described by psychologists’ or social anthropologists’ research will be reviewed here. For more than thirty years, researchers have been studying the relationship between a human’s behavior and his or her physical environment\(^1,3,4,5,6,7,8\). Designers and planners must understand these classic environment behavior tenets and use them to support the users’ well being. We have the ability to alleviate some stress by paying attention to this body of knowledge and skillfully applying its principles. The following IDTs were developed by the pioneers of this research area and are considered constant: territorial, situational, and personal space behavior.
Territorial Behavior

Look around you. When you sat down at this table, what did you do with your personal belongings? Is your coat on the chair beside you, your bag on the chair opposite? If so, you are doing what comes naturally—marking your territory (even if the mark is only temporary).

Human territorial behavior is a complex phenomenon. Altman1,3 as a pioneer in the field of environment/behavioral research, worked to explain this condition. He defined four basic concepts for human territorial issues: behavioral forms, situational factors, antecedent factors, and organismic and social needs.

Behavioral forms refer to the need to use environmental props to mark or defend a territory. For example, a fence marks one’s property line; a wall around a person’s office marks that individual’s ‘home base’. If these “props” are crossed without invitation, defensive or aggressive behavior can result. These types of behaviors may consist of physical, verbal, and nonverbal clues9,1. However, territory is not just about place. People display possessiveness toward objects, individual relationships, and ideas3,9. The rights to intellectual property and patents are examples.

Situational factors explain that as circumstances change, so does the amount of space required to conduct an activity. For example, a faculty member presenting material to a group of 600 students needs different spatial attributes than when he or she presents the same material to a group of 50. That illustration just makes for common sense, but some situations are more complex.

The antecedent factor argues that relationships between certain individuals or particular groups of people are influential in stimulating behavior1. This type is illustrated when leaders appeal to a known value in their constituents and that appeal stimulates a riotous response (e.g., a declaration of war and the mobilization of armed forces to carry out the orders).

Lastly, Altman1 argues that humans have basic survival needs (e.g., food, shelter, procreation) and a compulsion to associate with like social groups (e.g., tribes, gangs, clubs).

These four behaviors provide a basis for understanding territorial phenomenon. In a corporate setting, these needs are addressed through communities of practice, while in an educational setting it may be more discipline specific. The social anthropologist E. T. Hall4 added to Altman’s situational attributes, revealing details on a more micro level.
Situational Behavior

E.T. Hall’s notable research studied situational behavior, arguing that by understanding situational needs, humans may better understand how to build environments supporting those needs.\(^{10}\)

Situational behavior refers to circumstances when a personal or social distance mechanism is triggered. Personal distance refers to an "invisible bubble" surrounding each person. Hall characterized these bubbles as ever-increasing concentric circles moving away from the person, and named his discovery "Proxemic Zones.\(^{4}\) Each of these zones has both a close and far phase. The four zones are intimate, personal, social, and public. Within each zone, certain behaviors are acceptable and cause no undo stress. The social parameter provides a measurable distance that a member of the social group is allowed to stray away from the group without causing alarm or concern for safety. For broad attributes of these zones, see Table 1.

The row-by-column seating arrangements found in most traditional classrooms, lecture halls, churches, and theaters are examples of how we design settings that violate the intimate Proxemic zone. No one wants to sit next to a stranger without a protective barrier. It is stressful to keep up a protective stance for long periods of time. Even an arm on a chair is of some help, but what do we do in a movie theater when we have to share that arm? We are uncomfortable. Yet because as humans we are so incredibly adaptive, we tolerate situations that other animal types would not. These settings appear to be designed for economic gain rather than personal wellness.

Altman writes, "By moving closer to or away from other people, we change their accessibility to us. By moving away, we signal a desire for more privacy and use personal space as a mechanism to shut off certain channels of communication. By moving closer to someone, we permit greater access to our self and open up an increasing richness of communication."\(^{3}\) (p. 61). Each individual controls the regulation of other persons into any one of the zones. When another person violates the prescribed behavior, a flight or fight signal is triggered (i.e., IDT response).\(^{2}\) Thus, our personal space and how we perceive it is critical. The next researcher provides a more in-depth look at the elements of personal space and some contributing factors to the perceived success, or lack thereof, of those spaces.
Table 1: Situational Behavior—Proxemic Zone Attributes

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Proxemic Zones *</th>
<th>Personal</th>
<th>Social</th>
<th>Public</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intimate</td>
<td>0 inches–18 inches</td>
<td>18 inches–48 inches</td>
<td>48 inches–12 feet</td>
</tr>
<tr>
<td>Distance **</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensory Information</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vision is blurred</td>
<td>Normal vision</td>
<td>Reduction of:</td>
<td>Facial expressions and gestures are exaggerated</td>
<td></td>
</tr>
<tr>
<td>Smell and sense of touch are fully engaged</td>
<td>Smell is strong and touching is engaged</td>
<td>sense of smell, ability to touch, visual details</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body heat is experienced</td>
<td>Body heat is experienced</td>
<td>Voices get louder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All senses are heightened</td>
<td>All senses are heightened</td>
<td>No body heat sensed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accepted Behavior</td>
<td>Physical contact</td>
<td>Grasping to just touching</td>
<td>No physical contact</td>
<td>No physical contact</td>
</tr>
<tr>
<td>Kissing, hugging, nursing, or procreation</td>
<td>Holding hands, walking arm-in-arm</td>
<td>Impersonal business occurs</td>
<td>Formal behavior</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interaction among casual acquaintances</td>
<td>Space used to screen others out</td>
<td></td>
</tr>
</tbody>
</table>


** Distances indicate both the close and far phases for each zone.
Personal Space Behavior

Robert Sommer describes personal space as "an area with invisible boundaries surrounding a person’s body into which intruders may not come" (p. 26). He further suggests that personal space moves with a person as his or her own "portable territory" (p. 27). The maintenance and protection of personal space is accomplished through the use of a combination of gestures, postures, and environmental props. An example might be the manner in which a lecture hall or theater is designed. The hall is set up to accommodate a formal, public proxemic zone. Distance creates a barrier and often a stage is elevated and lit to emphasize that area. Learners are literally "in the dark," the presenter may maintain some anonymity, and the setting is not conducive to exchange of either verbal or nonverbal signals (see Figure 1). It does not mean the setting design in this example is good or bad, but rather demonstrates how it supports an underlying behavioral function.

Sommer presented two other situational conditions relating to the impact of personal space on communication factors. Both conditions address how humans adapt to situations relative to their ability to use their foveal or peripheral vision. He defined foveal vision as "an area of the retina containing only cones and affording acute vision" (p. 399) or as the line of sight providing clarity of an object, which may be thought of as frontal vision. Peripheral vision, he suggested, is the view from the very edges of the eyes when one is looking forward. This view is blurred and items are not clearly focused. Sommer called these visual conditions supporting visual applications "Sociofugal" and "Sociopetal." In a Sociofugal (items in a single line, or linear) scenario, the foveal, or direct line of sight, viewing range is protected, or channeled. A crowded, row-by-column classroom seating arrangement where direct eye contact is primarily maintained between learners and the faculty member in the front of the room illustrates this point. Learner-to-learner eye contact is not easily managed. Chairs arranged in rows only allow a learner sitting behind another to see the back of someone’s head or the presenter. Only by adjusting body position can a learner have direct eye contact with someone in another row. However,
moving draws attention to that learner. Other examples of this situation include side-by-side airport seating and doctor’s office side-by-side seating, or rectangular boardroom settings (see Figures 2A, 2B). In each case, the intimate proxemic zone is violated. Yet, due to the fact that direct eye contact is channeled and there is often a small physical barrier (i.e., arms and backs on chairs), people accept or tolerate the situation for short periods of time, though not necessarily without stress. We have all observed situations where one stranger positions him- or herself so as not to sit next to another unless there is no other choice (e.g., overcrowded conditions).10.

In the Sociopetal condition outlined by Sommer, direct eye contact is maximized. Eye contact is deemed important and necessary in order to maintain participatory engagement. The metaphor for Sociopetal arrangement is radial balance exemplified by a flower (i.e., petals around a center, or radial). Some examples of this type of behavioral setting may include: (1) teaching in the round, (2) dining settings, and (3) seminar areas. The important underlying principle is to maintain eye contact easily for all participants without much bodily movement. An egalitarian approach is used in this setting for sharing knowledge. When people are seated around a table, particularly a round one, the intimate zone is usually not violated as chair spacing maintains the personal zone and a comfort level for each individual. See Figure 3.
Figure 1:  
Focal Point—Public Proxemic Zone  
(Sociofugal Arrangement)

Presenter’s Space
• 1/3 of total space is dedicated to one person  
• Knowledge is from one source  
• Projection is predominately one way  
• Public Zone distance (12 ft+) is maintained

Receiver’s Space
• Row by column seating (all in a line)  
• Eye contact is at presenter or presentation
Figure 2A:
Sociofugal Arrangements (Linear)

Example: Airport / Doctor’s Office Setting

- Interruption of intimate zone (minimal territorial protection)
- Foveal vision minimized (direct eye contact)

4 feet plus
Figure 2B:
Sociofugal Arrangements (Linear)

Example: Boardroom Setting

- Interruption of intimate zone (minimal territorial protection)

- Foveal (direct eye contact) vision maintained only with those sitting directly across
Figure 3:
Sociopetal Arrangement (Radial)

Example: Seminar or Dining Table Setting

- Knowledge is from multiple sources
- Intimate zone intact
- Foveal vision opened up (due to radial arrangement)
- Minimal territorial protection
Recognition of situational behaviors and sociofugal/sociopetal elements provides designers and planners with a better understanding of how solutions may be appropriately applied.

Another important component of the environment/behavior picture should be mentioned. Michelson explains: "Man, as a thinking being, relates to his spatial environment both in his mind and in his actual presence" (p. 30). This suggests a mental and experiential congruence between people and their environment. Further definition is helpful:

- Mental congruence indicates that a person feels that his or her personal characteristics, values, and life styles are accommodated by particular spatial patterns.

- Experiential congruence is defined by how well the environment actually supports the functions, characteristics, and behaviors of people using it.

This idea proposes that people use both congruence indicators when evaluating environment/behavioral fit. Figures 4, 5A, 5B, and 5C summarize the person/environment/behavioral conditions for consideration when developing solutions for the built environment. In Figure 4, a dashed line around the individual represents the core needs of that person (i.e., the intimate zone as defined by Hall). Protective barriers should surround at least 2/3 of this core (sometimes completely, as in bathroom privacy needs), and no one should have his or her back exposed to the "door." Barriers are depicted as environmental props, or fences, suggested by the solid curved line. A view plane (shown as a triangle) should provide visual access from the individual at the core into the next area, the personal zone. The personal zone is represented by the atmospheric "bubble" or the outer semi-circle with a dashed line. This space provides opportunities for dyadic (one on one) interaction at work, or where friends gather. A partial barrier or movable screen could be used for more privacy (represented by a heavy dashed line at the bottom of the figure). A view into the social zone is also required. This view extends then from the social zone back into the personal. Traffic lanes or team spaces are planned for activities in this outermost area allowing several people to come together in a "common" space, away from the "home base" or core protection zone.
Figure 4:
Individual Proxemic Condition—Individual’s Core Needs

<table>
<thead>
<tr>
<th>Key: Core Needs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Person" /></td>
<td>Person</td>
</tr>
<tr>
<td><img src="image" alt="Fence" /></td>
<td>Fence</td>
</tr>
<tr>
<td><img src="image" alt="View Out" /></td>
<td>View Out</td>
</tr>
<tr>
<td><img src="image" alt="Zones" /></td>
<td>Zones</td>
</tr>
<tr>
<td><img src="image" alt="View Planes" /></td>
<td>View Planes</td>
</tr>
<tr>
<td><img src="image" alt="Movable Protection" /></td>
<td>Movable Protection</td>
</tr>
</tbody>
</table>

Social Zone

Personal Zone

Intimate Zone

View In

View Out

Fence

Movable Protection (fluid and may be light transparent)
Figure 5A: Impromptu Team Conditions—Multiple Core Arrangements

- Team Members

<table>
<thead>
<tr>
<th>Key: Core Needs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Person" /></td>
<td>Person</td>
</tr>
<tr>
<td><img src="image" alt="Fence" /></td>
<td>Fence</td>
</tr>
<tr>
<td><img src="image" alt="View Out" /></td>
<td>View Out</td>
</tr>
<tr>
<td><img src="image" alt="Zones" /></td>
<td>Zones</td>
</tr>
<tr>
<td><img src="image" alt="View Planes" /></td>
<td>View Planes</td>
</tr>
<tr>
<td><img src="image" alt="Movable Protection" /></td>
<td>Movable Protection</td>
</tr>
</tbody>
</table>
Figure 5B:
Project Team Conditions—
Multiple Core Arrangements

- Project Members
  (more room is required
  for artifacts and traffic flow)
  (area should be protected from public)

<table>
<thead>
<tr>
<th>Key: Core Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="Person.png" alt="Person" /></td>
</tr>
<tr>
<td><img src="Fence.png" alt="Fence" /></td>
</tr>
<tr>
<td><img src="ViewOut.png" alt="View Out" /></td>
</tr>
<tr>
<td><img src="Zones.png" alt="Zones" /></td>
</tr>
<tr>
<td><img src="ViewPlanes.png" alt="View Planes" /></td>
</tr>
<tr>
<td><img src="MovableProtection.png" alt="Movable Protection" /></td>
</tr>
<tr>
<td><img src="PathThrough.png" alt="Path Through" /></td>
</tr>
</tbody>
</table>
Figure 5C: Individual Conditions—Multiple Core Arrangements

• Groups of Separate Teams (become the new core)

<table>
<thead>
<tr>
<th>Key: Core Needs</th>
<th>Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fence</td>
<td>View Out</td>
</tr>
<tr>
<td>Zones</td>
<td>View Planes</td>
</tr>
<tr>
<td>Movable Protection</td>
<td>Path Through</td>
</tr>
</tbody>
</table>
Figures 5A and 5B show multiple individual conditions for impromptu and project teams. At a more macro level, the symbol for an individual can be substituted for a group (as in Figure 5C). The group acts as an individual in this arrangement.

This brief explanation of environment/behavior research may help designers and planners recognize IDTs\textsuperscript{2} and situational behavior patterns\textsuperscript{1,3,4,5}, and plan accordingly. The message is clear. People react predictably to environmental conditions. Englich and Remmers\textsuperscript{13} summarize this phenomenon.

The obvious conclusion that people, as creatures who think and behave in instinctively territorial terms, and have hardly changed with regard to their fundamental needs and patterns of behavior for thousands of years, is underpinned by anthropological theses; they assume that it takes 600 generations until learned behavior becomes hereditary, instinctive behavior.(p. 5)

A summary of environment/behavioral research crystallizes several key points. First, that the built environment impacts behavior. Second, behavioral responses are primal and thus, humans' basic situational responses are deemed predictable. Finally, evidence suggests that proper planning can support intended behavioral outcomes.

Therefore, designers and planners should become familiar with and understand this research discipline's contribution in order to plan spaces supporting basic human requirements both at the macro and micro levels. This context provides an understanding of the challenges of moving from the models of the Agrarian and Industrial Ages into the Knowledge Age. Initially, it is necessary to explain the remnants inherited from the models of the previous ages.
References


Remnants of Agrarian and Industrial Age Models

The two previous ages from which we are emerging continue to affect certain behavioral patterns due to the design of floor plans and educational or learning protocols. In order to move forward, we must determine what elements from these eras are useful and what ones we should consciously drop, and then understand the new needs of the knowledge worker and learner.

Learning in these eras had different meanings.

. . . 'learning' means 'training.' . . . learning is seen as a frill, with no link to business results (or other desired results). At worst, learning means 'taking in information'—listening to a lecture or reading an assigned text, with no relevance to the future you are creating.

This view may come from the passive style of rote learning that many people associate with school. The word "training" originally meant "directing the course of a plant": to be trained is to be controlled.

But the word "learning" derives from the Indo-European leis, a noun meaning "track" or "furrow." To "learn" means to enhance capacity through experience gained by following a track or discipline.1 (p. 24)

In the late 1960s, Robert Sommer2 observed that the interface between design, learning experience, and environmental psychology was relatively unexplored. For the most part, this observation still holds. Ittleson, Proshansky, Rivlin, and Winkel3 have stated, "There is no physical environment that is not embedded in and inextricably related to a social system" (p. 13). Thus, individuals are not responding to an environment independent of their respective social roles within society. The nature of the environment affects the functioning of groups, regardless of the setting (office or classroom), and certain seating arrangements affect predictable behaviors. Planners should be aware of predictable behaviors and design consistently with Knowledge Age requirements. Again, many factors such as curriculum, pedagogical issues, or specific strategic directions, contribute to the "health" of the classroom but in this book, we are discussing form and space. Next, a look at some specifics related to the Agrarian Age.
Agrarian Age

The Agrarian Age (described as anytime prior to the Industrial Revolution of 1750) was based on generating a livelihood from agriculture, where "life was organized around the individual and the family farm or business" and "feudal aristocracy derived its power and identity from its hereditary control of land and people". Thus, the acquisition of wealth was linked to property ownership. Distinct components are evident in the educational marketplace: class time frames and classroom shape and set-up. The seasonal arrangement of hours and time was in direct response to agrarian life: helping with chores, end of harvest, and beginning of planting and birthing seasons. For example, K–12 classes let out in early afternoon. Children went home and helped with chores before dark. The school year began in early fall (end of the harvest season) and ended in late spring (beginning of the planting and birthing season). Because "many hands made light work," children were expected to contribute to the success and survival needs of the family unit. These attributes are still in place, but the reasons no longer exist.

The one-room schoolhouse is another remnant from this age. The footprint or setting is rectangular, with windows usually on one side, a flat floor, row-by-column seating, and a teacher’s desk at one end of the rectangle. Lights (if available) were either on or off and the seating arrangement accommodated approximately 30 students. The interactive teaching and learning elements, or open teaching style, is not apparent in the Industrial Age and unfortunately, just the floor plan is moving forward in time. Figure 6 illustrates the typical plan of a one-room schoolhouse. Look familiar? The layout supports the same public/formal behavior illustrated in Figure 1. Some of this formal behavior could be a cultural transference from the hierarchical method of governance. One person "at the top" had the knowledge and power, and delivered information to subjects, with the expectation that any requests would be carried out. Currently, the majority of K–12 and higher educational facilities still display some form of this configuration and teaching mode (i.e., formal delivery of information). The Industrial Age also used this footprint, but in a different way.
Figure 6:
One-Room Schoolhouse Floor Plan
(Footprint)

Teaching Space
• At least 1/3 of total area is devoted to one person
• Knowledge is from one source

Learner’s Space
• Row-by-column seating
• 2/3 of space used for the majority of people
Figure 7: Typical Classroom Floor Plans
Figure 8:
The Classroom

East Kerr Hall (front)  East Kerr Hall (rear)
Industrial Age

The Industrial Age (approximately 1750–1990) model reflects an assembly-line learning pattern, where a one-room schoolhouse configuration was replicated on a larger (seating capacity 45–65), more repetitive scale. The "sage on the stage" presentation approach (or formal delivery) was evident, along with the notion that institutions needed to "stack 'em deep to teach 'em cheap." Learners, teachers, or both, moved from one rectangular space to another at each scheduled change while faculty poured information into the students' heads. High schools and higher educational facilities are current examples of this situation (see Figures 7 and 8). In the Industrial era, the bourgeoisie derived its power and identity from the members' roles as merchants and factory owners. "The focus shifted from the family farm to the city factory. Workers mass produced products on assembly lines. The valued skill was no longer a hard worker, but a skilled manager who could plan, organize, direct, control and supervise the work force and mass production process." Thus, the Industrial Age appears to emphasize efficiency relative to delivery methods.

Perhaps this model was generated from the efficiencies understood by the assembly-line production methods.

Similarly, during the two world wars, men had to be trained efficiently and quickly. It made sense to incorporate efficiency into educational learning environments. Once again the formal delivery method was used, but this time on a grander scale. An example of this scenario is one most educators are familiar with—the double-sided corridor. Efficient rectangular spaces are lined up next to each other with one corridor connecting another row of the same elements. Maximum numbers of people are placed in these rooms (usually 10 to 15 square feet per person), and learners are required to move from one space to another on a pretimed schedule. Knowledge is delivered from the knowledge source, learners fill their heads, leave, move to the next space, knowledge is delivered from the knowledge source, learners fill their heads, leave, move to the next space; the cycle is repeated over and over. Figure 9 illustrates this type of assembly-line learning.
Figure 9: Assembly-Line Learning Floor Plan
Assembly-line learning spaces also have an aesthetic matching the efficiency mentality. These educational spaces are devoid of sensory information, having the same shape, the same height, the same neutral color scheme on all surfaces and the same seating arrangement. Many have no views to nature and no natural light. All solutions suggest the ease of maintenance as the driving agent for spatial set up; what I call "maintenance-driven design." Thousands of these environments currently dot the educational landscape, and continue to be the workplaces for teachers and learners. Efficient "learning" spaces have an equivalent in the corporate arena—the "bull-pen" and the Dilbert cubicle of "6 packs" or "8 packs" (6 or 8 work stations in a row)—where one desk is lined up next to another. Recently, the corporate world experimented with different arrangements to better fit the new knowledge worker, and a variety of solutions have evolved (e.g., hubs, clubs, team spaces, etc.).

However, the understanding of how spaces can support specific behavioral needs is still not well defined in these solutions.

In summary, the influence of the Agrarian Age is suggested by two primary elements: the scheduling issue and the "one-room school house" footprint, which are still common attributes in today's planning models. The Industrial Age introduced a hierarchical management structure and assembly-line procedures and efficiencies. From a planning perspective, this model translated to either rotating people into and out of fixed spaces to perform their duties on a specific timetable, or seating them in open "bull-pen" offices for maximizing communication and efficiency.

How do we move from Agrarian/Industrial Age models into environments supporting the Knowledge Age? What attributes of these previous models do we want or need to keep and what issues do new models address? What is the Knowledge Age exactly? These questions are addressed in the next chapter.
References


Chapter 4

Knowledge Age

In this age, the personal computer was introduced and information and the access to it exploded. The computer helped to further automate and facilitate the mass production processes. It also impacted individuals in their daily lives. The commodities we now value are information, time, and convenience.

The workplace was no longer co-located but moved into the home. The hierarchical organization structure began to flatten out and develop more layers of networks of people and work patterns went from individual to team processes. "These teams rather than supervise, direct the work . . . and team leaders coordinate the process and empower the teams to succeed". If the Knowledge Age is the age of learning and we understand that knowledge is constructed over time through experiential opportunities, then how a person learns, or retains knowledge, is just as important as how information is delivered. "This type of learning may be difficult to control, but it generates knowledge that lasts: enhanced capacity for effective action in settings that matter to the learner". It is suggested that learning is fused with work and play, occurs anytime and anywhere, and may be characterized as apprentice-style. Further, in this age, knowledge is considered power and the wielding of that power becomes the generator for wealth, not just information (e.g., Bill Gates and Microsoft).

Learning requires both development of new knowledge and the sharing of that knowledge. Understanding how knowledge is created facilitates our ability to determine behaviors and how to design for intended behaviors. "All organizations learn—in the sense of adapting as the world around them changes. But some organizations are faster and more effective learners. The key is to see learning as inseparable from everyday work. (Training, by contrast, is typically episodic and detached from the context in which results are produced)". Perhaps a brief, but somewhat more technical, overview of how knowledge is created is necessary.

Nonaka and Konnon give insight into this situation. They explain the relationship between explicit and tacit knowledge. Explicit knowledge is impersonal (e.g., quantitative), and therefore is more easily shared in objective forms like data files or furniture specifications. By contrast, tacit knowledge includes not only skills but also intangible cognitive dimensions from life experiences that define our world view (e.g., qualitative). Tacit knowledge (things you just know) is
exchanged in a social, experiential setting. Nonaka and Konnon go on to say that both explicit and tacit knowledge areas are employed to convert the knowledge of an individual or collective into a source of creation. This transformation only occurs when the mental, virtual, and physical space of environment/behavioral elements are present.

Goleman\(^6\) argues that "the neocortex, the thinking brain that learns technical skills and purely cognitive abilities, gains knowledge very quickly, but the emotional brain does not. To master a new behavior, the emotional centers need repetition and practice. Improving your emotional intelligence, then, is akin to changing your habits" (p. 89). He further says that emotional intelligence is, "the ability to manage ourselves and our relationships effectively [and] consists of four fundamental capabilities: self-awareness, self-management, social awareness, and social skill" (p. 80). It would appear that place is the link between people, their work processes, and the necessary technology for supporting both.

Reber\(^7\) provides another perspective for implicit learning and explicit knowledge. "Implicit learning is the acquisition of knowledge that takes place largely independently of conscious attempts to learn and largely in the absence of explicit knowledge about what was acquired . . . [a] fundamental, 'root' process of the adaptive behavioral repertoire" (p. 5). He adds that "it is assumed that the processes studied under the rubric \textit{implicit learning}, operating independently of consciousness, are more primitive and basic than those that are dependent, in some measure, on consciousness and conscious control" (p. 7). In the area of education, he contends that the "programs and theories of instruction that dominate pedagogic practice in our society concentrate almost entirely on the explicit and overt functions" (p. 8).

Once knowledge is created it must be located and shared. Located knowledge is shared when memory can be retrieved. How knowledge is created is important, but transferring knowledge is critical. Thornton\(^8\) explains.

Whatever thoughts, memories, and emotions are triggered by the event, they are quickly relayed back to the Grand Central Station (the brain), where an executive decision is made: Does this memory deserve to be saved? This answer is left to a kind of neuronal democracy. Interestingly, it appears that different kinds of long-term memories may be stored in different
specific cortical areas. For example, episodic memory refers to personal experiences. Semantic memory refers to your stores of general knowledge, such as vocabulary or geography. There is also explicit memory (where, for instance, you must consciously recall the name of a person or event), and implicit memory (a kind of autopilot system that allows you to drive your car without remembering the process step by step). All of these are variants of so-called retrospective memory because they deal with information you’ve already learned. But there’s also prospective memory, or your ability to do something in the future, such as taking medication on schedule. (pp. 58–60)

Now that we better understand how knowledge is created, retrieved, and transferred, it is important to review the ten principles about learning as presented in a joint report (1998) by the American Association for Higher Education, the American College Personnel Association, and the National Association of Student Personnel Administrators.

The 10 principles of learning are informative.

- Learning is fundamentally about making and maintaining connections: biologically through neural networks; mentally among concepts, ideas, and meanings; and experientially through interaction between the mind and the environment, self and other, generality and context, deliberation and action.

- Learning is enhanced by taking place in the context of a compelling situation that balances challenge and opportunity, stimulating and utilizing the brain’s ability to conceptualize quickly and its capacity and need for contemplation and reflection upon experiences.

- Learning is an active search for meaning by the learner—constructing knowledge rather than passively receiving it, shaping as well as being shaped by experiences.

- Learning is developmental, a cumulative process involving the whole person, relating past and present, integrating the new with the old, starting from but transcending personal concerns and interests.

- Learning is done by individuals who are intrinsically tied to others as social beings,
interacting as competitors or collaborators, constraining or supporting the learning process, and able to enhance learning through cooperation and sharing.

- Learning is strongly affected by the educational climate in which it takes place: the settings and surroundings, the influences of others, and the values accorded to the life of the mind and to learning achievements.

- Learning requires frequent feedback if it is to be sustained, practice if it is to be nourished, and opportunities to use what has been learned.

- Much learning takes place informally and incidentally, beyond explicit teaching or the classroom, in casual contacts with faculty and staff, peers, campus life, active social and community involvements, and unplanned by fertile and complex situations.

- Learning is grounded in particular contexts and individual experiences, requiring effort to transfer specific knowledge and skills to other circumstances or to more general understandings and to unlearn personal views and approaches when confronted by new information.

- Learning involves the ability of individuals to monitor their own learning, to understand how knowledge is acquired, to develop strategies for learning based on discerning their capacities and imitations, and to be aware of their own ways of knowing in approaching new bodies of knowledge and disciplinary frameworks. (pp. 4–14)

Reviewing these ten principles helps us put learning and knowledge-sharing in context.

In summary, this section advances the notion that this time will be known as the Knowledge Age², and that learning requires both the development of new knowledge and the sharing of that knowledge. Clearly, understanding how memory works illustrates how complex the development and transference of knowledge is, and suggests that sharing knowledge takes several types of environments reflecting specific intended behaviors. Our brief review of the learning principles has placed knowledge and learning in context. The following argument and archetypal applications are provided as planning considerations for the Knowledge Age.
References


Chapter 5

Archetypal Applications for Knowledge Age Settings

It is now time to apply what we have learned from all of these separate sources: environment/behavior theories; remnants of past ages; how we learn. The following represents a synchronization of these ideas and provides some application ideas for that convergence.

"Today's workers are expected to master a higher order of learning ... one that depends on interaction and collaboration with other workers"¹. Teknion, Inc., Gensler, and The La Jolla Institute² research partners, affirming that space matters, suggest that, "Far from being overshadowed by technology, place plays a critical role for the 'new economy' ... the concept of place is described as a physical environment in which ideas are expressed by the individual and advanced through discussion" (p. 81).

Jan Johnson³ in an article written for Interiors & Sources provides this perspective:

All of the hype about the Internet made it sound as if everything were up for grabs. Every fundamental was in flux, and life was never going to be the same. Well, now that the bubble has burst, and we have the advantage that hindsight is 20/20, it's obvious that while many things have changed significantly, not everything is different. The components of work are not changing. ... Our jobs still have many facets—collaboration, concentration and process tasks.

What the Internet and new technologies have changed is where, when, and how we do things. We no longer need to be tethered to a particular physical location to do our work. ... Taken a step further, wireless technology has already removed the requirement of being where there is a phone or data line. (p. 80)

However, Johnson³,⁷ goes on to say these changes, although revolutionary, apply to people and not organizations. Space, and its ability to support social/cultural needs, is still important. In the corporate world (as well as in the educational arena) a "broad array of space types that support both individual and group work"³ (p. 81) will be desirable ⁴,²,⁵.

"Technology has enabled people to work from anywhere, yet the 'new economy' is proving to be about human relationships and networks that are also
strengthened by physical proximity. If anything, the ‘Internet Age’ continues to reinforce what we have known, and sometimes forgotten, for centuries: Humans survive in a communal beings context.” (p. 81)

Others explain that the "climate" of a setting is important.

“‘Climate’ is not an amorphous term. First defined by psychologists George Litwin and Richard Stringer and later refined by McClelland and his colleagues, it refers to six key factors that influence an organization’s working environment:

• Its flexibility—that is, how free employees feel to innovate unencumbered by red tape; their sense of responsibility to the organization;

• The level of standards that people set;

• The level of commitment to a common purpose”. (p. 81)

Several other authors have developed models for explaining the person/place needs: autonomy versus collaboration, one-to-one versus one-to-group, and silo versus repertory (meaning working alone versus working as diverse disciplines together), to name a few. Yet, the issue is still as Lewin explained in his now famous 1951 formula \( B = f \left( P, E \right) \), or, behavior is a function of a person and his or her environmental fit. Therefore, in order to develop a working model, we must first determine the intended behaviors (e.g., knowledge-sharing activity) in order to plan environments supporting those behavioral requirements.

Let’s get practical. The notion that environment impacts behavior is a given, and as designers and planners, we want to provide the best designs for the most appropriate solutions. It’s time then to put the components together where sharing knowledge is critical. Archetypes are useful tools to help explain the specific applications. The archetypal list that follows includes five intended behavioral conditions with primary functions defined for planning purposes. Examples of application elements have been developed

---

**Place is a physical environment in which ideas are expressed and advanced through discussion.**

• The sense of accuracy about performance feedback and aptness of rewards;

• The clarity people have about mission and values; and finally,
specifically for adult learning environments in both the corporate and academic arenas, and may be used in other setting types. As Aring and Brand\textsuperscript{10} stated, "the long-term employability and flexibility of American workers depends on employees' ability to learn on the job" (p. 9). Learning and learning organizations, where learning communities or communities of practice are valued and integral to the mission, play a key role in the Knowledge Age. Knowledge becomes a social commodity. As stated earlier, many authors agree that learning organizations are important, and many offer a myriad of business strategies advocating behavioral changes\textsuperscript{11,12,13}. However, no reference is provided as to what characteristics the physical environment should contain to enable people to adapt to these new approaches. The following discussion will fill in this gap, presenting archetypal attributes supporting intended behavioral outcomes. These settings are:

- **Environments for Delivering Knowledge (EDK)**—"describes an environment where information is imparted in a formal method so that others may learn"\textsuperscript{14} (pp. 1063 & 318);

- **Environments for Applying Knowledge (EAK)**—describes places where an organization puts knowledge into practice\textsuperscript{14};

- **Environments for Creating Knowledge (ECK)**—addresses where organizations create, innovate, and implement new ideas\textsuperscript{13};

- **Environments for Communicating Knowledge (ECmK)**—indicates where people go about exchanging information, formally and informally, verbally and non verbally\textsuperscript{14}; and

- **Environments where Knowledge is used for Decision making (EDM)**—indicates the place where information is distilled and judgments are made and acted upon\textsuperscript{14}.

Each environment requires a prime example demonstrating its unique attributes, and does not preclude the combination of more than one archetype.

**Space, and its ability to support social/cultural needs, is still important.**

The following sections offer a series of over-arching attributes: icons, basic behavioral premises, process steps, protocols, attributes, and application sketches providing a more complete understanding of these models (see Table 2). Examples for each archetype
follow. In no way are the examples provided exhaustive in type or style of layout, but rather reflect the behavioral intentions defined in this study.
### Table 2: Archetypal Attributes for Knowledge Environments

<table>
<thead>
<tr>
<th>ENVIRONMENTS</th>
<th>ARCHETYPAL ATTRIBUTES*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Icon</td>
</tr>
<tr>
<td>Delivering</td>
<td><img src="image" alt="Icon" /></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Applying</td>
<td><img src="image" alt="Icon" /></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Creating</td>
<td><img src="image" alt="Icon" /></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Communicating</td>
<td><img src="image" alt="Icon" /></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Decision Making</td>
<td><img src="image" alt="Icon" /></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Portions adapted from:
Environments for Delivering Knowledge

The basic behavioral premise in an Environment for Delivering Knowledge (EDK) is to bring information before an audience. The delivery method is instructor led; knowledge is in one source. Space is optimized for presentation so there is a singular focus to the room (see Figure 1). Barr and Tagge indicate that this type of presentation mode will be important for some time to come. General examples may include the pulpit in a church, an auditorium, a traditional classroom, distance learning settings, and a lecture hall. Three steps define the process: (1) prepare/organize ideas or generate a presentation format, (2) broadcast information to an audience, and (3) assess the level of understanding. A formal behavior protocol is dictated by this archetype. The instructor controls all aspects of the presentation. Attention is focused towards the front of the space. Varied activities are rare. There is little or no audience participation and reconfiguration is not possible. Information sessions are preplanned and scheduled (see Table 3).

Two distinct user areas comprise this setting: one for the presenter (i.e., deliverer of information/knowledge) and one for the receiver (see Figure 10). Sight lines are critical and should be calculated carefully. Large-scale areas may be designed for one activity and smaller, supplemental rooms may support more interactive activities. Direct eye contact (foveal vision) is channeled—all eyes are forward. A person delivering knowledge may want to use several presentation areas, which could include two screens and a writing surface, used when the screens are down or up. Two lighting levels are needed—one a dimmable source over the presentation area, the other providing a light level applicable for taking notes. I describe this type of setting as the "portrait" layout. With the presentation area on the short side of the rectangle, it is the optimal layout of this scenario (see Figure 11), particularly for seating more than 65 persons. Entry doors should be located at the back of the space. Tables that are 22 inches wide or tablet-arm chairs are more appropriate for small presentation areas and theater-style seating is more appropriate in large spaces (see Figures 12 and 13). To support the need for direct eye contact between the instructor and the audience, a center aisle section should be left open to enable the presenter to advance at least three rows into that space. In a larger space, increasing the aisle section to allow presenters to walk further into that space and gain eye contact is important, as visual accessibility helps the instructor to engage more of the audience. As audience size
increases, the shape of the space becomes more critical. Hauf, Koppes, Green, Gassman, and Haviland\textsuperscript{22}, were among the first (as early as the 1960’s) to argue for alternatives to the traditional, “portrait-style” learning arrangement that still have merit today. They indicated that,

Traditional learning spaces, with no particular concern with conditions for viewing and hearing, were square or rectangular in shape. The use of projected media, however, requires that the designer give more thought to the shape and proportions appropriate for large-group spaces. Since the visual source of information—the image—is in one place, learners must be located to see it adequately. When instruction is taking place by lecture, the learners must focus on the instructor or the demonstration area at the front of the room. Furthermore, the requirements for good hearing in these large-group spaces mitigate against the use of parallel side walls. These points all suggest that the rectangle is a very poor shape for large-group learning”. (p. 35–36)

For more detailed ideas for large-group spaces, refer to McVey\textsuperscript{21}, and Blackett and Stanfield\textsuperscript{23}.
Table 3: Environments for Delivering Knowledge—Archetypal Attributes*

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Room Size</th>
<th>Number of Participants</th>
<th>Architecture</th>
<th>Protocol</th>
<th>Utilization</th>
<th>Intent</th>
<th>Time Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture Hall</td>
<td>4000 ft² plus</td>
<td>400–600</td>
<td>Fixed</td>
<td>Formal</td>
<td>Group</td>
<td>Deliver Knowledge</td>
<td>Scheduled</td>
</tr>
<tr>
<td>Fixed Classroom</td>
<td>1200–2000 ft²</td>
<td>55–70</td>
<td>Fixed</td>
<td>Formal</td>
<td>Group</td>
<td>Deliver Knowledge</td>
<td>Scheduled</td>
</tr>
<tr>
<td>Distance Learning</td>
<td>1000–1200 ft²</td>
<td>15–25</td>
<td>Fixed</td>
<td>Formal</td>
<td>Group</td>
<td>Deliver Knowledge</td>
<td>Scheduled</td>
</tr>
</tbody>
</table>

Figure 10: The Lecture Hall—(Portrait)
Figure 11: Applications for Delivering Knowledge—(Portrait)

Example: Lecture Hall

Presenter’s Area
- Walk into learner’s area
- Three presentation areas (2 screens and 1 writing board)
- Dimmable lights for presentation area

Learner’s Area
- Viewplanes appropriate to see all presentation areas

Behavioral Attributes:
- Sociofugal arrangement
- Focal point delivery
- Foveal vision channeled
- Intimate zone violated

Setting Attributes:
- Zoned light levels
- High / low technology
- Fixed Furnishings (over certain size)

Focal Point Layout–Large Spaces (alternative layouts)

Presenter’s Area or Focal Point

Figure 12: Typical Medium-Sized Lecture Hall Floor Plans—(Landscape)

- Setting allows for more of a "landscaped" layout
Figure 13:
Typical Large Lecture Hall Floor Plan—
(Portrait)
In summary, the size of the audience critically impacts the shape of the space and complicates the ability to see and hear. Research indicates that learners want to see, to hear, to be comfortable, and to be connected for the effective transference of information. The focus is towards the front of the space, knowledge is delivered from one source, and requirements are specific for both user areas. This traditional format is not going away, but it no longer stands alone. Alternative learning spaces are necessary, and should be used in combination with the traditional mode. Several alternates are presented in the following sections.

The next environments rely on collaborative efforts for sharing knowledge and as such become more complex.

The collaborative approach looks at work as a social activity. In general, collaboration is assumed to take place when more than one person works on the same task. More specifically, it involves the coordinated and synchronous efforts of several people to accomplish whatever they set out to do. This implies more than just a division of the task into sub-tasks, which can be solved individually and asynchronously, and later pieced together. Collaboration happens in a communal space, ideally through face-to-face interaction (or via some pseudo face-to-face in distant collaboration), and with shared artifacts.

The first of these collaborative settings involves the application of knowledge in an apprentice-to-master or learner-centered model as a contrast to the EDK instructor- or teacher-centered model.
Environments for Applying Knowledge

The EAK archetype advocates the application of knowledge in a learner-centered space. The basic premise is that the learner needs to own his or her own knowledge. Even though knowledge may be presented in a delivery setting, learners should be given opportunities to experiment and move knowledge from a level of awareness to one of understanding. Examples of a learner-centered setting may include a design studio, research laboratory, shoulder-to-shoulder presentation, or computer tutorial. Size requirements can vary widely from two people sitting side-by-side overlooking a laptop presentation to a training center with hands-on learning. In all cases, learners have opportunities for giving meaning to information. The process of discovery is important in these settings. Spaces may include a setup with fixed laboratory equipment in a research facility or mobile desks in a design studio (see Table 4). Hands-on learning is the critical factor; the ability for an immediate transfer of knowledge from the "master" to the learner through discovery and practice (see Figure 14).

The applied learning environment illustrates the combination of formal and informal learning. Again, there are two user types—master and learner. Often there is a need for knowledge to be demonstrated prior to the learner's application or discovery. At times, an area may be set aside for presentation (landscape layout) and/or demonstration with the rest of the space dedicated to learner work areas, as in a training room. The master may provide the presentation, or delivery of material, and the learner immediately begins to apply that knowledge, experiment with the process, and knowledge grows from awareness to understanding to competency. A small number of people is ideal when face-to-face interaction is necessary (see Figures 15A and 15B).

In summary, a focal point could be set up for the demonstration/presentation area, as necessary. The direct transfer of knowledge is evident as learners practice and process new information. Typically, these settings hold small groups and rely on hands-on application, face-to-face interaction, and collaboration.

Environments for creating knowledge, discussed next, are the most complex. Because diverse behaviors are important for this process, only core requirements are presented.
Table 4: Environments for Applying Knowledge—Archetypal Attributes*

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Room Size</th>
<th>Number of Participants</th>
<th>Architecture</th>
<th>Protocol</th>
<th>Utilization</th>
<th>Intent</th>
<th>Time Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Studio</td>
<td>Variable</td>
<td>2–20</td>
<td>Flexible</td>
<td>Casual</td>
<td>Group /</td>
<td>Apply Knowledge</td>
<td>Dedicated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Individual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training Room /</td>
<td>500–1000 ft²</td>
<td>10–25</td>
<td>Flexible</td>
<td>Informal</td>
<td>Group /</td>
<td>Apply Knowledge</td>
<td>Hourly /</td>
</tr>
<tr>
<td>Computer Lab</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Individual</td>
<td></td>
<td>Weekly</td>
</tr>
<tr>
<td>Apprentice Workshop</td>
<td>Variable</td>
<td>2–20</td>
<td>Fixed &amp;</td>
<td>Informal</td>
<td>Dyadic</td>
<td>Apply Knowledge</td>
<td>Dedicated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Flexible</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Lab</td>
<td>Variable</td>
<td>2–6</td>
<td>Fixed &amp;</td>
<td>Semi-formal</td>
<td>Dyadic</td>
<td>Apply Knowledge</td>
<td>Dedicated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Flexible</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 14:
The Computer Lab and The 3-D Workshop and Materials Lab

Computer Aided Design (CAD) Lab

3-D Workshop and Materials Lab
Figure 15A: Applications for Applying Knowledge—(Landscape)

Example: Training Room

Behavioral Attributes:
- Sociofugal arrangement; opportunity for sociopetal
- Changeable delivery focus from instructor to learner

Setting Attributes:
- "Landscape" layout
- Mobile furnishings
- Information persistence
- High technology
- Zoned light levels
- "Landscape" style layouts allow more integration / penetration for the master
- 12' screen and 6' screen
- White board
Figure 15B:  
Applications for Applying Knowledge—
(Landscape)

Example: Training Room
- Spaces encourage different shared-learning experiences

Behavioral Attributes:
- Sociofugal and sociopetal arrangement
- Changing leader patterns
- Intimate zone protected

Setting Attributes:
- Multiple patterns for use
- "Landscape" layout
- Zoned light levels
- High technology
- Flexible and fluid furnishings
Environments for Creating Knowledge

Creating knowledge means we move through a highly creative, often messy, repetitive process that culminates in an innovation (a product of some sort). Trial and error and keeping the process transparent and open to others in the team is critical (information persistence). In knowledge-creating, collaborative settings, employees'/learners' individual tools and specific expertise form an integrated network of expertise. "The exchange among collaborators is seen as interaction rather than feedback, because they equally participate in the construction of shared knowledge. Knowledge is neither located in, nor owned by, single individuals, but distributed in the network... The cognitive processes in their group depend on the total knowledge distributed across the group, its environment and artifacts, resulting in what in the literature is referred to as 'distributed cognition' (p. 17). People who work/learn in these scenarios are often referred to as "high-performance workers" (p. 12). This type of work/learning dynamic requires people to have greater control over the physical adaptation and transformation of the setting. A more fluid, or easily transfigured furniture solution is required for people to "work" the way they need to while reinforcing the organization’s or corporation’s values. Yet, what do we know about the creative person's needs?

Leonard and Swap have this to say about creativity.

Creativity is a process of developing and expressing novel ideas that are likely to be useful. Four important features of this definition include:

- Creativity involves divergent thinking, breaking away from the familiar, establishing ways of seeing and doing. Divergent thinking produces ideas that are novel.
- Novel ideas must be expressed or communicated to others.
- Creativity must also include convergent thinking, some agreement that one or more of the novel ideas is worth pursuing.
- The agreed-on option must have the potential of being useful, for addressing the problem that invited the development of options.

The end result of the creative process is an innovation.
The end result of the creative process is an innovation. Innovation is the embodiment, combination, and/or synthesis of knowledge in novel, relevant, valued new products, processes, or services. (pp. 6–7).

The behavioral premise in such an environment is to move knowledge from the abstract to reality; from an idea to a product—the act of innovation. Several steps support this endeavor:

- Research to become knowledgeable about the problem under study;
- Define the innovation opportunity or problem;
- Generate options and recognize the need for a new solution;
- Incubate—let the job rest and distill over time in order to process and digest information; and
- Select an option and interpret into a product idea26.

Since groups have "the potential advantage over an individual because multiple reservoirs of deep expertise can be tapped"25 (p. 10), the archetypes presented here are based on group efforts. The creation of knowledge (intellectual capital) and ultimately a product is very important for moving an organization forward. Therefore, the creative contingent is often protected from public view (e.g., research lab, project room, "idea central"). Parts, pieces, artifacts, and graphics are left exposed for the group to use, remember, and stay stimulated (information persistence). As the process indicates, there is a need to collaborate and delve socially into the act of creating, as well as the need for thoughtful reflection or mindless activity (e.g., a ping pong table area). Tom Peters27 uses Tom Allen’s28 study at MIT where Allen found that people need to be within 30 feet of one another in order to communicate effectively. If not, they might just as well be on another planet. Thus, proximity is critical to a team’s success. This ECK-setting type requires more holistic thinking in order to provide guidelines for planning. Two distinct areas must be included and yet interrelated: (1) a place of refuge to think and incubate, and (2) a place to collaborate and share information. Steelcase Inc.29 used this more European characteristic of collocating private areas and group spaces as one workplace need and this combination is often referred to as the "caves and commons" areas. Examples of these settings may include project rooms, team spaces, and group/project offices19. Even though there is one
type of user, two distinct locales are protected from public view—a place to think and incubate and a place to collaborate where information is persistent (see Table 5).

As illustrated in the graphic, (see Figure 16) space is provided for the individual for research, thinking, reflecting—a hangout or individual retreat. Total privacy should be available to the individual, with the possibility that a portion of the retreat may be opened onto the collective area. These retreats can be grouped together, with the collective area forming a common space. Ideally, this central zone will be fluid for easily reconfiguration (i.e., perhaps a group of circular tables), and have numerous areas for artifacts and graphic-thinking displays (i.e., white boards).
Table 5: Environments for Creating Knowledge—Archetypal Attributes*

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Room Size</th>
<th>Number of Participants</th>
<th>Architecture</th>
<th>Protocol</th>
<th>Utilization</th>
<th>Intent</th>
<th>Time Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Room</td>
<td>600–1500 ft²</td>
<td>5–25</td>
<td>Fixed</td>
<td>Casual</td>
<td>Group</td>
<td>Creating a product</td>
<td>Project duration</td>
</tr>
<tr>
<td>Team Space</td>
<td>80–600 ft²</td>
<td>4–15</td>
<td>Flexible / Fluid</td>
<td>Casual</td>
<td>Group / Individual</td>
<td>Creating a product</td>
<td>Indefinite</td>
</tr>
<tr>
<td>Group / Project Office</td>
<td>1000–15000ft²</td>
<td>5–15</td>
<td>Flexible / Fluid</td>
<td>Casual</td>
<td>Group / Individual</td>
<td>Creating a product</td>
<td>Dedicated</td>
</tr>
</tbody>
</table>

Figure 16: Applications for Creating Knowledge—("Caves and Commons")

Example: Project Room

Behavioral Attributes:
- Individual private spaces
- Sociopetal arrangements
- Focal point delivery
- Foveal vision is not blocked

Setting Attributes:
- "Landscape" layout
- Flexible or "wrenchable" furnishings
- Information persistence
- High technology
- Zoned light levels

Individual retreat area
Group interaction area
Artifact storage
Information persistence
Privacy from public
Figure 17: The Studio

Studio 1

Studio 2
"In the 'caves and commons' concept . . . caves and commons settings allows a team to cluster in a relatively small footprint, forming both private and communal work areas. For privacy, several Personal Harbors (from Steelcase) act like a 48-square-foot phone booth with all the amenities of a private office and can be closed off by a sliding door. When it’s time to come out of your booth for teamwork, reconfigurable and lightweight tables offer plug and play capabilities". There should also be an area for storage. To protect the information being processed, all of these spaces should be encapsulated from public view (see Figure 16). "A dedicated group learning environment, however, can effectively function as a mediator . . . promoting interaction, channeling dialogue, leveraging individual and group performance. Moveable tables and adjustable chairs allow extemporaneous breakouts. Whiteboards or flip charts enable more effective facilitation of discussion. The ability to keep group notes posted and readily available boosts memory and performance".

Group boundaries do exist and have effects. This means that the group is not just an artificial entity, but a real higher-level unit which has to be reckoned with" (p. 50) (see Figure 16). For an example of team spaces or group offices, see Figures 16 and 17.

Protocol suggests a multidisciplinary group with egalitarian leadership. The need for both individual and group privacy and a common meeting place for collaboration is referred to as “distributed attention”. This atmosphere is casual but intense, as deadlines rule the timetable.

In summary, this dynamic is complex and necessitates multiple settings within the one. Two levels of privacy are required, one for the group and one for the individual. A common zone is needed for collaboration and information persistence (e.g., writing surfaces, artifacts, and areas that enable the creative process to stay evident and where other team members may add or subtract at will). Attention is distributed between individual and group members in a casual manner.

The next setting, the environment for communicating knowledge (ECmK), also relies on collaboration, but in a different context.
Environments for Communicating Knowledge

Communication is a social, two-way process. It happens through face-to-face, e-mail, telephone, and video conferencing interaction. Bromberg provides us with a more formal reference and suggests that communicating knowledge refers to "how people exchange information both formally and informally during work" (p. 114), play, or in everyday exchanges. The process of communication requires an audience, a language, sharing information, and interaction. The passing of information, or the act of communicating, is an interaction between at least two persons. A mutually acceptable language—graphic, written, or verbal (or any combination)—is necessary for two primary conditions to happen: expression or delivery of knowledge and listening to or receiving of knowledge. The act of communicating may take place in different formats but, the main objective is the need to share information and then to receive a response. The flow of information may be formal or informal. In the Knowledge Age, leveraging the flow of information and supporting the need for access to the source and the information in a time-sensitive manner is critical. In this case, the behavioral premise requires the ability to share information and provide for a quick exchange of ideas. Several steps in this process have been identified: organize information, deliver information, receive and then interpret ideas sent, and confirm or reply to the sender. The protocols for communicating knowledge suggest that knowledge is dispersed among colleagues (see Table 6).

Communicating knowledge in an ECmK setting demands that informal learning occur, and it is a strategic component in the place of learning. Cornell states, "The quantity of informal learning is surprising: The U.S. Department of Labor estimates 70% or more of work-related learning occurs outside formal training. While the percentage is less in colleges and universities, it is an important part of the educational experience. If our goal is to support learning, or knowledge sharing (italics by author) then we need to understand the impact of the environment on both formal and informal processes" (p.5). Actually, this statement verifies the entire premise of this text: BUILT ENVIRONMENTS IMPACT BEHAVIOR AND WE MUST KNOW FOR WHICH INTENDED BEHAVIOR WE ARE DESIGNING.

Airing and Brand offer the following observations regarding informal learning processes and why it is
important to plan for these opportunities. First, informal learning occurs because of the need for "employees to meet larger organizational as well as individual goals" (p. 10). Second, the majority of informal workplace learning sessions take place during "teaming, meetings, customer interactions, supervision, mentoring, shift change, peer-to-peer communication (goal- and non-goal directed), cross-training, exploration, on-the-job training, documentation, execution of one's job and site visits" (p. 10). In other words, in the "workplace," informal learning is reflected anytime the process is not determined or directed (formal) by the organization. Airing and Brand go on to say that there are direct factors affecting both the quality and the amount of informal learning occurring in these activities:

- Contextual factors. These affect informal workplace learning in amount and quality. Organizations wanting to introduce more informal learning opportunities should understand the context "within which the informal learning activities are embedded" (p. 11).

- What is learned? The content of informal learning ranges from "information that is more task-specific to that which is broad-based—intrapersonal (e.g., critical thinking and integrating feedback), interpersonal (e.g., providing constructive feedback, working as a member of a team), and cultural (e.g., understanding important business goals, [the big picture])" (p. 11).

- Development of informal learning. This is due to inexperienced employees learning from competent ones.

- Informal and formal workplace learning relationships. "Informal learning is ubiquitous and fulfills many learning needs. However, when both informal and formal learning occur, employees have richer opportunities for development" (p. 11). Both of these learning experiences exist along a continuum.

- School- and work-based learning. "School-to-career programs inform educators, teachers and students of the value of informal learning in the ‘workplace’ " (p. 11). Gaps identified by educators between school- and work-based learning can
motivate educators to change curricula to reflect these needs.

- Physical space. "Researchers found that the layout and design of work spaces can have an impact on learning by influencing the number and quality of contacts between employees. Firms that were very large and noisy had generally fewer interactions between workers, whereas firms that designed central spaces encouraged interaction and meetings among employees and resulted in a greater sharing of information" (p.11) (see Figure 19).
Table 6: Environments for Communicating Knowledge—Archetypal Attributes*

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Room Size</th>
<th>Number of Participants</th>
<th>Architecture</th>
<th>Protocol</th>
<th>Utilization</th>
<th>Intent</th>
<th>Time Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commons Area</td>
<td>80–800 ft²</td>
<td>2–10</td>
<td>Fluid</td>
<td>Casual</td>
<td>Group</td>
<td>Communicating Knowledge</td>
<td>Ad Hoc</td>
</tr>
<tr>
<td>Hub / Learner Union</td>
<td>100–1000 ft²</td>
<td>6–15</td>
<td>Flexible / Fluid</td>
<td>Casual</td>
<td>Group / Individual</td>
<td>Communicating Knowledge</td>
<td>Ad Hoc</td>
</tr>
<tr>
<td>Casual Meeting Area</td>
<td>80–200 ft²</td>
<td>2–6</td>
<td>Flexible / Fluid</td>
<td>Casual</td>
<td>Group</td>
<td>Communicating Knowledge</td>
<td>Ad Hoc</td>
</tr>
<tr>
<td>Cyber Cafés</td>
<td>50–3500 ft²</td>
<td>2–300</td>
<td>Flexible / Fluid</td>
<td>Casual</td>
<td>Group / Individual</td>
<td>Communicating Knowledge</td>
<td>Ad Hoc</td>
</tr>
</tbody>
</table>

Figure 18: Study Nook

The Bahen Centre for Information Technology, University of Toronto, Diamond and Schmitt Architects
Figure 19:
The Impact of Informal Learning*

So the question becomes, what types of environments support informal learning? Several examples are: pre-conference areas, lobbies, student union areas, eating establishments, corridors/pathways, common areas, casual gathering places, libraries, cyber cafés, on-line chat rooms, etc. What physical attributes are typical among these? All are spaces where spontaneous interaction can occur and be maintained for at least a short time-frame, with the ability to establish eye contact, and a surface on which to work (e.g., jot down ideas, trade information). Spaces designed for this purpose could be classified as "niches" scooped out of other areas for the specific purpose of providing magnet/gathering opportunities (see Figure 20).
Figure 20: Applications for Communicating Knowledge

Example: Niche Seating
Behavioral Attributes:
• Sociopetal arrangement
• Leaderless
• Intimate zone protected
• On-the-fly / impromptu gatherings

Setting Attributes:
• Plug and play capability
• Fluid and fixed furnishings
• Niche application
An example of this spatial type was the cyber café popular in the 1990s. "The original intention of the cyber café was to provide an oasis of socialization for the digeratti who tend to spend their time alone in front of a computer"30 (p. 9). Cybersmith, in Boston, was a café that attempted to be more than just a room full of computers. The brainchild of retailer Marshal Smith, it combined the store/alternative and office/videoarcade. It opened as an indoor-outdoor 3500-square-foot facility to accommodate "kids who surf the net, business people who drop in to check e-mail . . . and companies in need of computer training and videoconferencing"30 (p. 10). The environment was designed to be safe and cozy, yet stimulating.

A second example is the "living room," or space often adjacent to open-plan office areas where spontaneous and comfortable meetings may take place. Seating in this type of setting is often club-like with small writing surfaces attached. Writing surfaces are important—tables, walls, etc. All elements should be highly mobile so rearrangement is easy30. It is also common to include access to food, as people tend to gravitate to a food depot and magnet opportunities abound in such places.

In summary, communicating knowledge requires both formal and informal places where direct eye contact and face-to-face (dyadic) interactions may occur. Often, the need for impromptu exchange is planned for with niches, or gathering zones, with the expectation that exchange may involve two to six persons.

The final environment under consideration is one of sharing knowledge for the purpose of decision making.
Environments for Using Knowledge for Decision Making

The act of making a decision is ubiquitous and happens at any level of an organization. Yet many times we design spaces for the specific purpose of facilitating decision making and often the lead decision makers are the upper administration of a company, organization, or institution; leaders that others look up to. The physical needs of this hierarchy will be addressed here. Goleman6 found that regardless of leadership style, the setting for decision making was relevant. Leadership appears "to have a direct and unique impact on the working atmosphere of a company, division, or team, and in turn, on its financial performance . . . most important, the research indicates that leaders with the best results do not rely on only one leadership style"(p. 78). Goleman goes on to say that each leadership style has "a measurable effect on each aspect of climate, . . . or working atmosphere"(p. 81). A description of these spatial, or climactic, attributes follows.

Several attributes describe executive management areas. Often they are zoned separately from other functional groups. This aspect is necessary as items under discussion may be sensitive and require privacy. There are marked "gate-keepers" (e.g., executive assistants) to this "inner sanctum," and normally a higher square footage per person is allotted to the executive personnel (see Table 7). Many businesses have tried to flatten the organizational structure, but there continues to be a hierarchy in most organizations. This hierarchy is easier to spot in the executive section of the facility. These environments often focus on image and interior architectural elements, and finishes and furnishings will likely be some of the most expensive for the project—image selling. One room that stands out in this setting typifies and supports the privacy needs for this functional group: the board room or executive conference room (see Figure 21A). This room also sells the brand image and exudes power, and may at times be open to a public (clientele). Another model is the "war" room, a different but comparable setting. The war room focuses on strategic planning and is most like a group project room but on a larger, grander scale (see Figure 21B). This space merges high technology and security. Process is revealed for the select membership and all are able to contribute in the planning process. The discussion of the archetypal attributes offers additional information regarding these types of spaces.
This executive, or decision makers' environment is often a hybrid of other intended behavioral spaces (i.e., spaces for the individual, collaboratory, and private meeting areas)\textsuperscript{15}. However, here, the private meeting spaces will be addressed. As explained, the environment's focus is to support decision making. The delivery method, or leadership style, is more authoritative and democratic\textsuperscript{6}—establishing vision and building consensus. Four process steps explain how decisions take place: data is reviewed, strategies are generated either collectively or individually, a strategic plan is prepared, and steps are outlined to implement one course of action. The protocol attributes suggest that knowledge is dispersed among disciplines, and yet information is shared, at least between executive members. A collective plan may emerge, but it is the leader that is responsible for indicating how the group will reach the final direction. Most often the situation under discussion is protected from other functional groups until it is appropriate to go public. The actual interaction between executive members may range from semi-formal to formal to impromptu (e.g., a stand-up conferencing situation) (see Figure 21C). Protocols may be different when clients are a part of the decision-making team (perhaps a more formal stance is taken), and when members are assembled in the executive conference room, as opposed to general executive work areas. However, here their private meeting spaces will be addressed (see Figures 21A, 21B, 21C, and 22). Examples following describe the features of an executive conference room, a "war room," and a stand-up conference area.
Table 7: Environments for Using Knowledge for Decision Making—Archetypal Attributes*

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Room Size</th>
<th>Number of Participants</th>
<th>Architecture</th>
<th>Protocol</th>
<th>Utilization</th>
<th>Intent</th>
<th>Time Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive</td>
<td>450 ft²</td>
<td>8–25</td>
<td>Fixed / Flexible</td>
<td>Formal</td>
<td>Group</td>
<td>Making Decisions</td>
<td>Scheduled</td>
</tr>
<tr>
<td>Conference</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>War Room</td>
<td>500–1000 ft²</td>
<td>8–25</td>
<td>Fluid / Flexible</td>
<td>Casual</td>
<td>Group</td>
<td>Making Decisions</td>
<td>Dedicated</td>
</tr>
<tr>
<td>Stand-Up</td>
<td>25–30 ft²</td>
<td>2–3</td>
<td>Fluid</td>
<td>Casual</td>
<td>Group</td>
<td>Making Decisions</td>
<td>Impromptu</td>
</tr>
<tr>
<td>Conferencing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 21A:
Applications for Using Knowledge for Decision Making

Example: Executive Conference Room

Behavioral Attributes:
• Sociofugal arrangement
• Leader at head of table
• Information persistence encouraged with wall surface writing capabilities
• Focal point delivery
• Foveal vision is channeled
• Intimate zone is violated

Setting Attributes:
• Special architectural detailing, finishes and accessories
• High technology
• Private access
• Items are primarily fixed
• Protection from others
Figure 21B:
Applications for Using Knowledge for Decision Making

Example: War Room*

Behavioral Attributes:
• Sociopetal arrangement
• Distributed leadership
• Space to review materials shoulder-to-shoulder
• Wireless connection
• White boards

Setting Attributes:
• Flexible and fluid furnishings
• High technology
• Private access
• Protection from others

Figure 21C: Applications for Using Knowledge for Decision Making

Example: Stand-Up Conferencing

Behavioral Attributes:
- Sociopetal arrangement
- Leaderless
- Information persistence encouraged with wall surface writing capabilities
- On-the-fly / impromptu gathering

Setting Attributes:
- Stand-up conferencing
- White boards
- Fluid furnishings
Figure 22:
Typical Meeting Room Floor Plans
There are some fundamental differences between an executive conference room and a war room. The executive conference room establishes a brand image; a private area for discussing sensitive issues; furnishings, not fixed, but not easily rearranged; a sociofugal set up; a scheduling procedure; a more formal protocol. An intended stress level is designed into this layout because the intimate zone is violated. People are not allowed to relax, and so stay on guard. By contrast, the war room is arranged in a sociopetal layout and furnishings are very fluid. Privacy is still an issue, but the room is set up so that information, and artifacts may be evident until this phase/project is finished. Specific projects, dedicated time frames, and specific users typify this space.

In summary, the decision-making environment is intended for a relatively small group of individuals who are part of the decision-making circle of executives. Two private areas, the executive conference room and the war room, are examples showcasing this functional group’s privacy needs, while the stand-up conferencing areas provide for quick, impromptu meetings.

Archetypal attributes planned for the support of intended behaviors were summarized in this chapter.

Five different planning approaches supporting specific intended behavioral patterns, or archetypes, were presented, along with the five specific behaviors (i.e., environments for delivering, applying, creating, and communicating knowledge, and using knowledge for decision making), their basic behavioral premises, process steps, and protocols. An example illustrating how all of these archetypal patterns may be placed in conjunction with one another may be beneficial. The next chapter provides a matrix which can be used as a decision-making structure illustrating how all the archetypes fit together, as well as a planning diagram.
References


Chapter 6

Putting It All Together

We have talked about the basics in environment/behavior theory, how the environment impacts that behavior, and provided examples of archetypes that support certain knowledge-sharing characteristics. Now, how can we make sense of this information in the planning process? This chapter will attempt to put all the puzzle pieces together.

A matrix illustrating one view of "putting it all together" helps put this information in sync. It explains the environments along "two axes—collaboration and self-direction. Self-direction distinguished learning directed by instructors from that directed by the student" (p. 5). Collaboration means the degree of interaction between at least two individuals. It "relates to the degree to which learners interact as part of the learning process" (p. 1). "A third category is added—learning directed by serendipity. When one is alone, this could be virtually anywhere, but when collaboration is important, there is a need to provide opportunities for people to interact and run into one another. We also want to provide spaces that are attractive, that draw people in" (p. 5). Many organizations, corporate entities, and higher educational institutions recognize the value of multiple types of spaces for supporting different kinds of learning. Because learning can "occur anytime, anywhere," people will find those environments more "conducive to learning, but provide community and human interaction" (p. 5) (see Table 8). The intended behaviors are imbedded into the matrix's structure to further clarify setting types.

This matrix provides a structure for designers, planners, and decision makers to begin the process of assessing what types of environments are important for a particular organization. A combination of the matrices' types of learning along with the archetypal applications for intended behaviors is briefly described next.

The "Directed by Others/Collaboration" setting types primarily reflect alternative layouts from the Knowledge Delivery archetype; a more formal protocol. For example, the other-directed/low-collaboration environment illustrates a typical traditional learning environment (e.g., classrooms and lecture halls) with fixed seating where visual access is critical. The other-directed/medium-collaboration environment suggests spaces like case rooms, or rooms with a U-shape so the instructor may enter the learning space and become part of the exchange. An
other-directed/high-collaboration learning setting is reconfigurable, allowing for a lecture and then for learners to rearrange furnishings for discussion purposes. Other illustrations may include a typical, traditional classroom with access to breakout areas, or seminar rooms combining communication situations with delivery modes. The behaviors exhibited in these latter settings (as well as the discussion areas) fit the Communicating Knowledge archetype, and protocols tend to be less formal.

Environments that are "Directed by Self/Collaboration" relate primarily to two archetypes–Applying Knowledge and Creating Knowledge. Examples showing the transition from low- to high-collaboration follow. Applying knowledge often occurs one-to-one in a self-direction/low-collaboration scenario. An example is when one learner is using a tutorial program on a computer. Dyadic settings, or two-person workspaces, where individuals collaborate, yet each person controls his or her privacy, represent the middle where perhaps only two people are involved in a discussion. A multipurpose room is another example where space is reconfigurable and users may change how information is delivered and shared. In the self-direction/high-collaboration setting, the Creating Knowledge model, and to some degree, the Knowledge for Decision making type are apparent. These spaces are designed for interaction and collaboration. Team or project spaces are examples, where furnishings are highly reconfigurable and information persistence opportunities abound. Yet, depending on the spatial attributes, a conference room may also reflect either the Communicating Knowledge type (if more informal) or the Decision-making archetype (if in an executive suite scenario).

The Serendipitous-situation/Collaborative quadrant is reflected in several situations. Serendipitous/low-collaboration relates to a component of the Knowledge Creating archetype. One aspect of this behavior requires incubation time in order for ideas to develop. A private space supporting this need may be designed; however, when an idea occurs, a person could be in his or her car, playing a game, in the shower, or participating in a mundane task. So, even though it is important to recognize that some private spaces should be provided (either for the individual or to be accessible to individuals), the serendipitous moment may occur anywhere and anytime (the “cave” as in the ECK model). A serendipitous/medium-collaboration setting may include "practice fields," or the archetype of Applying Knowledge. These settings include science labs or design studios—anywhere learners may
practice what they need to learn. Another example is an immersive learning environment such as virtual reality. The serendipitous/high-collaboration setting suggests the Communicating Knowledge archetype be applied. Settings like atriums, lobbies, pre-conference rooms, student unions, niches (particularly in corridors), and cafés (when designed as magnets or gathering spaces) provide community centers and spaces for recognition and spontaneous interaction. "A well-used center enhances employees' awareness and identification with each other and the company—a bonding takes place," says Fritz Steele3 (p. 14). Similar thinking applies to "the strategic design of pathways that provide more interesting routes from place to place helping to break down communication barriers . . . non-linear corridors increase the possibility of interpersonal interactions," says Mosby3 (p. 14).
### Table 8: Collaboration and Self-Direction Matrix*

<table>
<thead>
<tr>
<th><strong>HIGH</strong></th>
<th><strong>INCREASING</strong></th>
<th><strong>LOW</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INFORMAL</strong></td>
<td>** Directed by Others**</td>
<td>** Directed by Self**</td>
</tr>
<tr>
<td>Seminar Rooms</td>
<td>Project Space</td>
<td>Atriums</td>
</tr>
<tr>
<td>Break-Outs</td>
<td>Team Space</td>
<td>Cafés</td>
</tr>
<tr>
<td>&quot;War Rooms&quot;</td>
<td>Conference</td>
<td>Lobbies</td>
</tr>
<tr>
<td>Case Rooms</td>
<td>Dyadic</td>
<td>Student Unions</td>
</tr>
<tr>
<td>U-Shaped Rooms</td>
<td>Multi-Purpose Rooms</td>
<td>Science Labs</td>
</tr>
<tr>
<td>Reconfigurable Conference Rooms</td>
<td>Media Centers</td>
<td>Design Studios</td>
</tr>
<tr>
<td>Multi-Purpose Rooms</td>
<td>Internet</td>
<td>&quot;Practice fields&quot;</td>
</tr>
<tr>
<td>Traditional Classrooms</td>
<td>Telecast</td>
<td>Libraries</td>
</tr>
<tr>
<td>Lecture Halls</td>
<td>Tutorial</td>
<td>&quot;Practice fields&quot;</td>
</tr>
</tbody>
</table>


---

88 Society for College and University Planning
Figure 23A:
An Archetypal Campus for a Community of Learners—Interaction Blocking
(Privacy Zoning)
1st level of planning—blocking for interaction functions (from public to private at a micro or macro level)
Figure 23B: An Archetypal Campus for a Community of Learners—Functional Fit

(Bubble Diagram) 2nd level of planning—use blocking to generate functional needs to fit each sector
Figure 23C: An Archetypal Campus for a Community of Learners—Details

(Typical Planning Configuration) 3rd level of planning—focus on the details

Public:
- Hub
- Magnet
- Gathering Space
- Views In and Out

Semi-Public:
- Cyber Café
- Food Court
- Welcome Center
- Study Niches
- Resource Bank

Semi-Private:
- Faculty Offices
- Classrooms
- Labs
- Studios
- Research Areas
- Administration

Private:
- Enclaves
- Meeting Spaces
- Breakout Spaces
- Offices
The matrix for archetypal applications includes only one component for the decision-making process. A master planning diagram for a community of learners is illustrated. In this diagram, information from both the collaboration and self-direction matrices, as well as all of the archetypes, are included (see Figures 23A, 23B, and 23C). This planning diagram only suggests how the different applications modules might be developed. As an example it is not prescriptive, but rather a place to start.

In summary, matrixes and planning diagrams help pull together many of the complex issues related to spatial needs and configurations. They illustrate how learners learn and offer both a tool and a language for planners of learning communities. Yet, even though these visual tools and a new language may prove helpful, they depict how complex the planning issues are that relate to developing appropriate spaces for a community of learners.

The next chapter offers some design and planning ideas that may be helpful in developing appropriate, thoughtful, and well-designed learning environments.
References


Conclusions and Implications

Learning is perpetual and lifelong. We don’t just stop because we have ended one phase in the learning process by receiving a degree. Learning is a part of our daily lives—“a fundamental rule of business, a critical element of success” (p. 15). Not only is learning a critical component for all work forces, but, together with knowledge transference, it is the social commodity, or the new “coin of the realm,” for the Knowledge Age.

Martha O’Mara, in her article “Strategy and Place,” offers this insight: “Research in the social sciences has shown that people require the presence of others to interpret complex information . . . people need to be in the same place at the same time to aid the speed and quality of transforming information into knowledge” (p. 14). Jay Brand, Ph.D., in the article “Physical Space and Social Interaction,” states that “physical distance represents a major determinant . . . there is little doubt that proximity, ease and availability of social exchange can be affected by the structure of the environment” (p. 15). Social interaction is impacted by those who make design decisions. Hamilton writes, “Design professionals are trained to make useable spaces in tangible forms called architecture and interior design. These forms effect significant change in the organizations with which we work, altering their structure, performance, culture and behavior. But these changes are poorly understood by design professionals and rarely described as an intended part of the project brief” (p. 94).

Clearly, space affects behavior, yet time and again, planners, designers, and end-users resort to spatial solutions reflecting a familiar model, whether right or wrong (e.g., Agrarian and Industrial models). Even as researchers have worked to share information studying performance and workplace issues, learning principles, learning needs, and social relationships, spatial design as a whole repeats past solutions and tends to suggest planning principles based on economics, not on well being. “What architects and designers need are tools and language to better describe desired organizational results” (p. 94).

The Knowledge Age demands a new focus. One way to determine what is required for this era is to understand intended behaviors. Five intended behaviors and ideas for supportive environments have been shared:

Social interaction is impacted by those who make design decisions.
Delivering Knowledge, Applying Knowledge, Creating Knowledge, Communicating Knowledge, and Using Knowledge for Decision making. Archetypal applications have been developed for each of these intended behaviors, along with a behavioral premise, process steps, and protocols illustrating the uniqueness of each. Further, it has been suggested by the decision-making matrix and planning diagrams that when an environment combines more than one archetype, a rich and interactive setting emerges. "Workplaces need to accommodate space for both alone-work and group interaction. Access to a variety of spaces has become important. Is there a space where workers can retreat, reflect and recover from stress? Are there enough conference spaces and project rooms to accommodate six to twelve people? Are there spaces for spontaneous interactions? . . . or spaces for 'becoming' when they are needed. These spaces are protected from a defined purpose . . . "2 (p. 16).

Whether the built environment to be designed is for a corporate or for an educational client, generating spaces that support intended behaviors provides architects, interior designers, and planners with a set of tools and a language that can result in innovative spatial solutions offering knowledge workers and communities of learners settings that are sensitive to behavioral and work-context needs.

Arguments developed in this book suggest that designers and planners must make use of existing environment/behavior research and recognize that because the built environments impact behavior, knowing what the intended behaviors are provides a premise for which to plan appropriately. If we want to share knowledge, we must first define it and then plan accordingly.
References


Glossary

The following definitions provide context for this paper and/or items relating to the "ownership" of space which may be in need of further explanation (see Tables 3–7).

**Ad Hoc**
Use of whatever space is available; "just in time" use

**Archetype**
The original pattern or model of which all things of the same type are representations or copies

**Archetypal Attributes**
A model’s inherent characteristics

**Built Environment**
Anything built by human hand

**Caves and Commons**
Cave = a quiet place
Commons = a gathering place

**Convergent Thinking**
Ideas that lead to one point

**Dedicated**
Spaces assigned to a person or group on a fairly permanent basis

**Distributed Cognition**
The knowledge that is distributed across a group through its environment and artifacts

**Divergent Thinking**
Ideas moving away from one point to many

**Fixed**
Furnishing items (seating, etc.) that are bolted to the floor or structural walls

**Flexible**
Elements that are "wrench-able" (e.g. systems furnishings that are reconfigurable but take some expertise to move)

**Fluid**
Furnishings that allow for an individual to freely reposition at will

**Foveal Vision**
Direct eye contact

**Hourly/Weekly**
Spaces available for specifically scheduled durations as indicated
Landscape Layout
A rectangular-shaped room where the furnishings are organized so that the "front" of the room is on one of the long sides of the rectangle

Portrait Layout
A rectangular-shaped room where the furnishings are organized so that the "front" of the room is on one of the short sides of the rectangle

Project Duration
Team areas dedicated for the length of a temporary or ongoing project

Scheduled
Spaces where a formal scheduling process is in effect, available by appointment

Sociofugal
An arrangement where items are lined up in a row

Sociopetal
An arrangement where items are organized in a circular arrangement

War Room
A space that is used for private strategic planning purposes
Bibliography


Appendix A
Tables suitable for photocopying
### Table 1: Situational Behavior—Proxemic Zone Attributes

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Proxemic Zones *</th>
<th>Personal</th>
<th>Social</th>
<th>Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>**Distance **</td>
<td>0 inches–18 inches</td>
<td>18 inches–48 inches</td>
<td>48 inches–12 feet</td>
<td>12 feet–25 feet plus</td>
</tr>
<tr>
<td>Sensory</td>
<td>Vision is blurred</td>
<td>Normal vision</td>
<td>Reduction of:</td>
<td>Facial expressions and gestures are exaggerated</td>
</tr>
<tr>
<td>Information</td>
<td>Smell and sense of touch</td>
<td>Smell is strong and</td>
<td>Sense of smell, ability to</td>
<td>Considered a formal</td>
</tr>
<tr>
<td></td>
<td>are fully engaged</td>
<td>touching is engaged</td>
<td>touch, visual details</td>
<td>distance</td>
</tr>
<tr>
<td></td>
<td>Body heat is experienced</td>
<td>Body heat is experienced</td>
<td>Voices get louder</td>
<td></td>
</tr>
<tr>
<td></td>
<td>All senses are heightened</td>
<td></td>
<td>No body heat sensed</td>
<td></td>
</tr>
<tr>
<td>Accepted</td>
<td>Physical contact</td>
<td>Grasping to just touching</td>
<td>No physical contact</td>
<td>No physical contact</td>
</tr>
<tr>
<td>Behavior</td>
<td>Kissing, hugging, nursing,</td>
<td>Holding hands, walking</td>
<td>Impersonal business occurs</td>
<td>Formal behavior</td>
</tr>
<tr>
<td></td>
<td>or procreation</td>
<td>arm-in-arm</td>
<td>Interaction among casual</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>acquaintances</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Space used to screen others</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>out</td>
<td></td>
</tr>
</tbody>
</table>


** Distances indicate both the close and far phases for each zone
<table>
<thead>
<tr>
<th>ENVIRONMENTS</th>
<th>ARCHETYPAL ATTRIBUTES*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Icon</td>
</tr>
<tr>
<td>Delivering</td>
<td>![Diagram]</td>
</tr>
<tr>
<td>Applying</td>
<td>![Diagram]</td>
</tr>
<tr>
<td>Creating</td>
<td>![Diagram]</td>
</tr>
<tr>
<td>Communicating</td>
<td>![Diagram]</td>
</tr>
<tr>
<td>Decision Making</td>
<td>![Diagram]</td>
</tr>
</tbody>
</table>

* Portions adapted from:
### Table 3: Environments for Delivering Knowledge—Archetypal Attributes*

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Room Size</th>
<th>Number of Participants</th>
<th>Architecture</th>
<th>Protocol</th>
<th>Utilization</th>
<th>Intent</th>
<th>Time Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture Hall</td>
<td>4000 ft² plus</td>
<td>400–600</td>
<td>Fixed</td>
<td>Formal</td>
<td>Group</td>
<td>Deliver Knowledge</td>
<td>Scheduled</td>
</tr>
<tr>
<td>Fixed Classroom</td>
<td>1200–2000 ft²</td>
<td>55–70</td>
<td>Fixed</td>
<td>Formal</td>
<td>Group</td>
<td>Deliver Knowledge</td>
<td>Scheduled</td>
</tr>
<tr>
<td>Distance Learning</td>
<td>1000–1200 ft²</td>
<td>15–25</td>
<td>Fixed</td>
<td>Formal</td>
<td>Group</td>
<td>Deliver Knowledge</td>
<td>Scheduled</td>
</tr>
</tbody>
</table>

Table 4: Environments for Applying Knowledge—Archetypal Attributes*

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Room Size</th>
<th>Number of Participants</th>
<th>Architecture</th>
<th>Protocol</th>
<th>Utilization</th>
<th>Intent</th>
<th>Time Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Studio</td>
<td>Variable</td>
<td>2–20</td>
<td>Flexible</td>
<td>Casual</td>
<td>Group / Individual</td>
<td>Apply Knowledge</td>
<td>Dedicated</td>
</tr>
<tr>
<td>Training Room /</td>
<td>500–1000 ft²</td>
<td>10–25</td>
<td>Flexible</td>
<td>Informal</td>
<td>Group / Individual</td>
<td>Apply Knowledge</td>
<td>Hourly / Weekly</td>
</tr>
<tr>
<td>Computer Lab</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apprentice Workshop</td>
<td>Variable</td>
<td>2–20</td>
<td>Fixed &amp; Flexible</td>
<td>Informal</td>
<td>Dyadic</td>
<td>Apply Knowledge</td>
<td>Dedicated</td>
</tr>
<tr>
<td>Research Lab</td>
<td>Variable</td>
<td>2–6</td>
<td>Fixed &amp; Flexible</td>
<td>Semi-formal</td>
<td>Dyadic</td>
<td>Apply Knowledge</td>
<td>Dedicated</td>
</tr>
</tbody>
</table>

### Table 5: Environments for Creating Knowledge—Archetypal Attributes*

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Room Size</th>
<th>Number of Participants</th>
<th>Architecture</th>
<th>Protocol</th>
<th>Utilization</th>
<th>Intent</th>
<th>Time Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Room</td>
<td>600–1500 ft²</td>
<td>5–25</td>
<td>Fixed</td>
<td>Casual</td>
<td>Group</td>
<td>Creating a product</td>
<td></td>
</tr>
<tr>
<td>Team Space</td>
<td>80–600 ft²</td>
<td>4–15</td>
<td>Flexible / Fluid</td>
<td>Casual</td>
<td>Group / Individual</td>
<td>Creating a product</td>
<td>Indefinite</td>
</tr>
<tr>
<td>Group / Project Office</td>
<td>1000–1500 ft²</td>
<td>5–15</td>
<td>Flexible / Fluid</td>
<td>Casual</td>
<td>Group / Individual</td>
<td>Creating a product</td>
<td>Dedicated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Room Size</th>
<th>Number of Participants</th>
<th>Architecture</th>
<th>Protocol</th>
<th>Utilization</th>
<th>Intent</th>
<th>Time Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commons Area</td>
<td>80–800 ft²</td>
<td>2–10</td>
<td>Fluid</td>
<td>Casual</td>
<td>Group</td>
<td>Communicating Knowledge</td>
<td>Ad Hoc</td>
</tr>
<tr>
<td>Hub</td>
<td>100–1000 ft²</td>
<td>6–15</td>
<td>Flexible / Fluid</td>
<td>Casual</td>
<td>Group / Individual</td>
<td>Communicating Knowledge</td>
<td>Ad Hoc</td>
</tr>
<tr>
<td>Learner Union</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casual Meeting Area</td>
<td>80–200 ft²</td>
<td>2–6</td>
<td>Flexible / Fluid</td>
<td>Casual</td>
<td>Group</td>
<td>Communicating Knowledge</td>
<td>Ad Hoc</td>
</tr>
<tr>
<td>Cyber cafés</td>
<td>50–3500 ft²</td>
<td>2–300</td>
<td>Flexible / Fluid</td>
<td>Casual</td>
<td>Group / Individual</td>
<td>Communicating Knowledge</td>
<td>Ad Hoc</td>
</tr>
</tbody>
</table>

Table 7: Environments for Using Knowledge for Decision Making—Archetypal Attributes*

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Room Size</th>
<th>Number of Participants</th>
<th>Architecture</th>
<th>Protocol</th>
<th>Utilization</th>
<th>Intent</th>
<th>Time Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive</td>
<td>450 ft²</td>
<td>8–25</td>
<td>Fixed / Flexible</td>
<td>Formal</td>
<td>Group</td>
<td>Making Decisions</td>
<td>Scheduled</td>
</tr>
<tr>
<td>Conference</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>War Room</td>
<td>500–1000 ft²</td>
<td>8–25</td>
<td>Fluid / Flexible</td>
<td>Casual</td>
<td>Group</td>
<td>Making Decisions</td>
<td>Dedicated</td>
</tr>
<tr>
<td>Stand-Up Conferencing</td>
<td>25–30 ft²</td>
<td>2–3</td>
<td>Fluid</td>
<td>Casual</td>
<td>Group</td>
<td>Making Decisions</td>
<td>Impromptu</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 8: Collaboration and Self-Direction Matrix*

<table>
<thead>
<tr>
<th>FORMAL</th>
<th>INFORMAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Directed by Others</strong></td>
<td><strong>Directed by Self</strong></td>
</tr>
<tr>
<td><img src="image" alt="Diagram of FORMAL collaboration" /></td>
<td><img src="image" alt="Diagram of INFORMAL collaboration" /></td>
</tr>
<tr>
<td><strong>HIGH</strong></td>
<td><strong>INCREASING</strong></td>
</tr>
<tr>
<td><strong>COLLABORATION</strong></td>
<td></td>
</tr>
<tr>
<td>• Seminar Rooms</td>
<td>• Project Space</td>
</tr>
<tr>
<td>• Break-Outs</td>
<td>• Team Space</td>
</tr>
<tr>
<td>• &quot;War Rooms&quot;</td>
<td>• Conference</td>
</tr>
<tr>
<td>• Case Rooms</td>
<td>• Dyadic</td>
</tr>
<tr>
<td>• U-Shaped Rooms</td>
<td></td>
</tr>
<tr>
<td>• Reconfigurable Conference Rooms</td>
<td></td>
</tr>
<tr>
<td>• Multi-Purpose Rooms</td>
<td></td>
</tr>
<tr>
<td>• Traditional Classrooms</td>
<td>• Media Centers</td>
</tr>
<tr>
<td>• Lecture Halls</td>
<td>• Internet</td>
</tr>
<tr>
<td></td>
<td>• Telecast</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Appendix B
Figures suitable for photocopying
Figure 1: Focal Point—Public Proxemic Zone (Sociofugal Arrangement)

Presenter’s Space
- 1/3 of total space is dedicated to one person
- Knowledge is from one source
- Projection is predominantly one way
- Public Zone distance (12 ft+) is maintained

Receiver’s Space
- Row by column seating (all in a line)
- Eye contact is at presenter or presentation
Figure 2A: Sociofugal Arrangements (Linear)

Example: Airport / Doctor’s Office Setting

- Interruption of intimate zone (minimal territorial protection)
- Foveal vision minimized (direct eye contact)

4 feet plus
Figure 2B:
Sociofugal Arrangements
(Linear)

Example: Boardroom Setting

- Interruption of intimate zone (minimal territorial protection)
- Foveal (direct eye contact) vision maintained only with those sitting directly across
Figure 3:
Sociopetal Arrangement (Radial)
Example: Seminar or Dining Table Setting

- Knowledge is from multiple sources
- Intimate zone intact
- Foveal vision opened up (due to radial arrangement)
- Minimal territorial protection
Figure 4: Individual Proxemic Condition—Individual’s Core Needs

Key: Core Needs

<table>
<thead>
<tr>
<th>Icon</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person</td>
<td>Person</td>
</tr>
<tr>
<td>Fence</td>
<td>Fence</td>
</tr>
<tr>
<td>View Out</td>
<td>View Out</td>
</tr>
<tr>
<td>Zones</td>
<td>Zones</td>
</tr>
<tr>
<td>View Planes</td>
<td>View Planes</td>
</tr>
<tr>
<td>Movable</td>
<td>Movable Protection</td>
</tr>
<tr>
<td>Protection</td>
<td>(fluid and may be light transparent)</td>
</tr>
</tbody>
</table>

Lennie Scott-Webber
Figure 5A: Impromptu Team Conditions—Multiple Core Arrangements
• Team Members

Key: Core Needs

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Person" /></td>
<td>Person</td>
</tr>
<tr>
<td><img src="image" alt="Fence" /></td>
<td>Fence</td>
</tr>
<tr>
<td><img src="image" alt="View Out" /></td>
<td>View Out</td>
</tr>
<tr>
<td><img src="image" alt="Zones" /></td>
<td>Zones</td>
</tr>
<tr>
<td><img src="image" alt="View Planes" /></td>
<td>View Planes</td>
</tr>
<tr>
<td><img src="image" alt="Movable Protection" /></td>
<td>Movable Protection</td>
</tr>
</tbody>
</table>
Figure 5B: Project Team Conditions—Multiple Core Arrangements

- Project Members
  (more room is required for artifacts and traffic flow)
  (area should be protected from public)

<table>
<thead>
<tr>
<th>Key: Core Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Person" /></td>
</tr>
<tr>
<td><img src="image" alt="Fence" /></td>
</tr>
<tr>
<td><img src="image" alt="View Out" /></td>
</tr>
<tr>
<td><img src="image" alt="Zones" /></td>
</tr>
<tr>
<td><img src="image" alt="View Planes" /></td>
</tr>
<tr>
<td><img src="image" alt="Movable Protection" /></td>
</tr>
<tr>
<td><img src="image" alt="Path Through" /></td>
</tr>
</tbody>
</table>

Lennie Scott-Webber
**Figure 5C:**
**Individual Conditions—Multiple Core Arrangements**
- Groups of Separate Teams
  (become the new core)

**Key: Core Needs**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![person_symbol]</td>
<td>Person</td>
</tr>
<tr>
<td>![fence_symbol]</td>
<td>Fence</td>
</tr>
<tr>
<td>![view_out_symbol]</td>
<td>View Out</td>
</tr>
<tr>
<td>![zone_symbol]</td>
<td>Zones</td>
</tr>
<tr>
<td>![view_planes_symbol]</td>
<td>View Planes</td>
</tr>
<tr>
<td>![movable_protection_symbol]</td>
<td>Movable Protection</td>
</tr>
<tr>
<td>![path_through_symbol]</td>
<td>Path Through</td>
</tr>
</tbody>
</table>

Lennie Scott-Webber
Figure 6: 
One-Room Schoolhouse 
Floor Plan (Footprint) 

Teaching Space 
• At least 1/3 of total 
area is devoted to 
one person 
• Knowledge is from 
one source 

Learner’s Space 
• Row-by-column seating 
• 2/3 of space used for 
the majority of people
Figure 7: Typical Classroom Floor Plans
Figure 8:
The Classroom

East Kerr Hall (front)  East Kerr Hall (rear)
Figure 9: Assembly-Line Learning Floor Plan
Figure 10:  
The Lecture Hall—(Portrait)
Figure 11: Applications for Delivering Knowledge—(Portrait)

Example: Lecture Hall

Presenter’s Area
- Walk into learner’s area
- Three presentation areas (2 screens and 1 writing board)
- Dimmable lights for presentation area

Learner’s Area
- Viewplanes appropriate to see all presentation areas

Behavioral Attributes:
- Sociofugal arrangement
- Focal point delivery
- Foveal vision channeled
- Intimate zone violated

Setting Attributes:
- Zoned light levels
- High / low technology
- Fixed Furnishings (over certain size)

Focal Point Layout—Large Spaces (alternative layouts)

Presenter’s Area or Focal Point

Figure 12: Typical Medium-Sized Lecture Hall Floor Plans—(Landscape)

- Setting allows for more of a "landscaped" layout
Figure 13: Typical Large Lecture Hall Floor Plan—(Portrait)
Figure 14: The Computer Lab and The 3D Workshop and Materials Lab

Computer Aided Design (CAD) Lab

3-D Workshop and Materials Lab
Figure 15A: Applications for Applying Knowledge—(Landscape)
Example: Training Room

Behavioral Attributes:
- Sociofugal arrangement; opportunity for sociopetal
- Changeable delivery focus from instructor to learner

Setting Attributes:
- "Landscape" layout
- Mobile furnishings
- Information persistence
- High technology
- Zoned light levels
- "Landscape" style layouts allow more integration / penetration for the master
- 12’ screen and 6’ screen
- White board
Figure 15B: Applications for Applying Knowledge—(Landscape)

Example: Training Room
- Spaces encourage different shared-learning experiences

Behavioral Attributes:
- Sociofugal and sociopetal arrangement
- Changing leader patterns
- Intimate zone protected

Setting Attributes:
- Multiple patterns for use
- "Landscape" layout
- Zoned light levels
- High technology
- Flexible and fluid furnishings
**Figure 16:**
Applications for Creating Knowledge—(“Caves and Commons”)
Example: Project Room

**Behavioral Attributes:**
- Individual private spaces
- Sociopetal arrangements
- Focal point delivery
- Foveal vision is not blocked

**Setting Attributes:**
- "Landscape" layout
- Flexible or “wrenchable” furnishings
- Information persistence
- High technology
- Zoned light levels

---

*IN SYNC: Environmental Behavior Research and the Design of Learning Spaces (2004) MI: SCUP*
Lennie Scott-Webber
Figure 17:
The Studio

Studio 1

Studio 2
Figure 18:
Study Nook

The Bahen Centre for Information Technology, University of Toronto, Diamond and Schmitt Architects
Figure 19:
The Impact of Informal Learning*

Contextual Factors Influence Informal Learning

**Why**
Informal learning occurs.
- To meet larger organizational goals
- To meet larger individual goals

**How**
Informal learning occurs.
- In the course of work activities

**What**
Is learned informally.
Skills and knowledge:
- Intrapersonal
- Interpersonal
- Cultural
- Pragmatic

Figure 20: Applications for Communicating Knowledge
Example: Niche Seating

Behavioral Attributes:
- Sociopetal arrangement
- Leaderless
- Intimate zone protected
- On-the-fly / impromptu gatherings

Setting Attributes:
- Plug and play capability
- Fluid and fixed furnishings
- Niche application
Figure 21A: Applications for Using Knowledge for Decision Making
Example: Executive Conference Room

Behavioral Attributes:
- Sociofugal arrangement
- Leader at head of table
- Information persistence encouraged with wall surface writing capabilities
- Focal point delivery
- Foveal vision is channeled
- Intimate zone is violated

Setting Attributes:
- Special architectural detailing, finishes and accessories
- High technology
- Private access
- Items are primarily fixed
- Protection from others
Figure 21B: Applications for Using Knowledge for Decision Making

Example: War Room*

Behavioral Attributes:
• Sociopetal arrangement
• Distributed leadership
• Space to review materials shoulder-to-shoulder
• Wireless connection
• White boards

Setting Attributes:
• Flexible and fluid furnishings
• High technology
• Private access
• Protection from others

Figure 21C:
Applications for Using Knowledge for Decision Making
Example: Stand-Up Conferencing

Behavioral Attributes:
• Sociopetal arrangement
• Leaderless
• Information persistence encouraged with wall surface writing capabilities
• On-the-fly / impromptu gathering

Setting Attributes:
• Stand-up conferencing
• White boards
• Fluid furnishings

Lennie Scott-Webber
Figure 22:
Typical Meeting Room Floor Plans

[Diagram of typical meeting room floor plans]
Figure 23A:
An Archetypal Campus for a Community of Learners—Interaction Blocking (Privacy Zoning)

1st level of planning—blocking for interaction functions (from public to private at a micro or macro level)
Figure 23B:  
An Archetypal Campus for a Community of Learners—Functional Fit  
(Bubble Diagram) 2nd level of planning—uses blocking to generate functional needs to fit each sector
Figure 23C:
An Archetypal Campus for a Community of Learners—Details

(Typical Planning Configuration) 3rd level of planning—focus on the details

Public:
- Hub
- Magnet
- Gathering Space
- Views In and Out

Semi-Public:
- Cyber Café
- Food Court
- Welcome Center
- Study Niches
- Resource Bank

Semi-Private:
- Faculty Offices
- Classrooms
- Labs
- Studios
- Research Areas
- Administration

Private:
- Enclaves
- Meeting Spaces
- Breakout Spaces
- Offices

Lennie Scott-Webber