CHAPTER 1

Design Research and Its Influence on the Practice of Design

AS THE PRACTICE OF DESIGN seeks to find ways to gain relevance in a changing economy, designers and design firms understand the important role design research programs will have in their future.

Today, *design excellence* is synonymous with *design knowledge.* In order to be an effective design leader, designers use vision, knowledge, understanding, and communication. They develop a clearly stated and cogent design discourse based in knowledge.

Building a research expertise can have a powerful effect on design futures. It alters the perceived value of both the products and services provided by designers. A research orientation promotes greater insight into viable practices and methods. From the profession's view, it enhances the body of knowledge that becomes the foundation from which all professionals derive solutions. Its potential is enhanced by associations to other fields of knowledge. By facilitating cross-disciplinary collaboration, the design research approach encourages greater acceptance of design as a political, economic, technological, material, and cultural activity.

Today, it's no longer viable for the discipline of design to rely on preconceived design processes. Issues of globalization, speed, technology, sustainability, and more are transforming how design is practiced. Since LEED certification has focused attention on quantifiable goals, interest in numeric objectives can be expected to increase. Designers are reexamining current design methodology with a goal of creating new processes with greater access to sources of knowledge. Nondesigners have also recognized the ways that *design thinking* can help resolve fundamental economic and social issues.

GENERALIZING DESIGN THINKING

Designers' focus on holistically resolving complex problems by integrating information from diverse fields provides them with an approach to

problem solving that is receiving increasing attention and respect as more and more business, medical, and other professionals see the benefit of applying this approach to the "wicked problems" in their own work processes.

Roger Martin, dean of the Rotman School of Management at the University of Toronto and the author of *The Design of Business: Why Design Thinking Is the Next Competitive Advantage*, feels that the thinking style that designers perfect is key to the success of businesspeople—and that businesspeople must learn to think the way that designers do.[6] He is far from alone in this sentiment. Martin believes that future economic greatness is more likely to flow from thinking about possibilities (or *abductive reasoning*) in ways that integrate new and current knowledge than from proof-based analytical thinking. Designers are masters of abductive reasoning:

> *Abductive logic.…[is] that it is not possible to prove any new thought, concept, or idea in advance: all new ideas can be validated only through the unfolding of future events. To advance knowledge, we must turn away from our standard definitions of proof—and from the false certainty of the past—and instead stare into a mystery to ask what could be. The answer…[will] come through making a 'logical leap of the mind' or an 'inference to the best explanation' to imagine a heuristic for understanding the mystery.*[7]

In the June 2008 issue of the *Harvard Business Review,* Tim Brown discussed using *design thinking* to solve nondesign problems.[8] Brown, CEO of IDEO and author of *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*, understands that while design thinking relies on empathic, intuitive, and emotional capacities, it must be balanced with rational and analytical skills to make it truly effective as an integrated thinking strategy.[9] He describes design thinking as the skill that designers possess because of their professional mission to match human needs with technical resources within practical business constraints. IDEO has even developed a complementary guide to design problem solving for leaders of social action groups.

The growing realization that the design-thinking process is valuable has, as Brown describes, much to do with the changing economic climate of the developing world. As the shift from industrial manufacturing to knowledge creation and service takes hold in the world economy, innovation is critical for success. Innovation is no longer relegated to the physical object or place alone. Now, innovation is reflected in new processes, services, experiences, ways of communicating, and working.

Design thinking is an exploratory research process. A systematic approach to design, which centers on a research-based methodology, is self-adjusting, thoughtful, analytical, integrative, and highly valued today.

DESIGN RESEARCH AS A MEANS FOR ATTRACTION AND RETENTION

When design and research are overtly linked, the practice of design becomes a laboratory of experiences that attracts the most curious and the sharpest minds to the field. Actively incorporating research into the design process provides a range of fresh, exciting design opportunities and energizing collaborations.

Design supported by a research methodology aligned with the design process becomes an active field that can inspire both its own practitioners and the general public. The information generated from research supports both the designer's and the client's needs to understand how a design strategy influences the performance of the object, place, or space. It validates a design recommendation using data, resources, and social scientific concepts.

A design research methodology is also an educational tool to mentor young designers. By establishing systems that help young designers better understand the human condition and/or how a design response may influence a user's experience or perception, for example, design research establishes a mechanism to gain better insight into unique project specific goals.

DESIGN RESEARCH AS A MEANS FOR SOCIAL REFORM

An effective research program supports design as a force for social good. The global issues of environment, water, energy, and food resources have significant influence on housing, commercial developments, education facilities, and public spaces all over the world. With a design research approach, design questions change from what will the object or space look like to who will use it? How will they use it, and why? How will it be used in five or ten years? Will it support the sponsoring organization's goals for the object or space?

Design as a social *and* spatial practice is experiencing a global revolution and requires an effective research base to feed and further key objectives. Large-scale cultural, social, environmental, and economic issues excite great thinkers and energize meaningful collaborations. Anecdotal evidence indicates that the primary driver for the people currently entering design schools is their ambition to have a positive effect on the world.

DESIGN RESEARCH AS A RESPONSE TO THE NEED FOR DESIGN SPEED

Design research provides design practitioners with a systematic process and an effective way to have the information they need, when they need it. As a result, the design process becomes less iterative.

Although some design firms believe this is a reason to abandon research, which is perceived as an addition to the already burdened design process, in reality, the opposite is true.

Today, when speed has become a driving force in design and a means of competitive advantage, firms that can commit to a shortened project schedule without compromising the care and knowledge that goes into the design response win.

A systematic and proven research process expedites the practice of identifying and applying needed information. Asking good questions that, when answered, provide needed information, speeds design decision making. Using a process that confirms, but does not assume, the answers to the questions being asked, and knowing how to evaluate and use the data collected, also speed and streamline the design process.

John Maeda, the president of the Rhode Island School of Design, has effectively described the influence that knowledge has on design in *The Laws of Simplicity*. As he succinctly states, "Knowledge makes everything simpler."[10] As Maeda describes, it eliminates focus on unnecessary concerns and spotlights issues that need to be carefully addressed. Far from restricting design options, knowledge keeps the designer on the right sort of general path and ensures that he or she can confidently move forward.

Staying on track leads to a situation that Maeda discusses as the ability to marry function with form to create intuitive experiences that are understood immediately:

> *Good design relies to some extent on the ability to install a sense of instant familiarity.…[T]he most successful product designs, whether simple, complex, rational, illogical, domestic, international, technophilic, or technophobic, are the ones that connect deeply to the greater context of learning and life.*[11]

A design research process establishes this context and identifies ways to simplify and effectively communicate complex issues to expedite the design decision-making process internally and externally.

DESIGN RESEARCH TO BUILD A SUSTAINABLE KNOWLEDGE BASE

Design research enables designers to become more effective stewards of natural resources, both directly and indirectly. As a profession, design consumes large amounts of both financial and natural resources. Designers have a professional responsibility that extends beyond their clients and services to consider the effect that design processes and products have on society and the

environment. This professional responsibility requires that designers be prepared for both the more subjective and more objective demands of sustainable development.

Understanding the systemic issues and lifecycle effects of the built environment is a fundamental responsibility of all designers. The evolving nature of earth-sustaining information requires designers to fuel their design thinking with the most current data. Although demanding, the challenge provides an amazing opportunity for designers and design firms to build internal research agendas to stimulate more informed and responsible design responses.

The design process is inherently a laboratory for sustainable research. By establishing a design research process to access, apply, document, and store the environmental impact of design decisions, designers are able to effectively apply this knowledge in new conditions. This information source becomes part of a designer's core knowledge and a competitive advantage.

DESIGN RESEARCH TO GAIN UNDERSTANDING OF CULTURAL DISTINCTIONS

Through design research, designers are better able to recognize and respond to demographic, economic, and social changes. As world cultures become more integrated, it assures that spaces psychologically and physically support people of different traditions, values, and experiences. Different cultures perceive and use their environments in different ways, for instance. Through research, designers access information that builds a framework of knowledge and insights to draw from when responding to culture-based challenges.

Design research identifies true cultural differences. Access to demographic, psychological, sociological, and anthropological research studies, along with the knowledge developed through life experiences such as travel, provides the core information required to create environments customized to optimize the experiences of diverse groups of people. This is especially valuable when those diverse groups will use a space concurrently.

For example, designers often develop spaces intended for the simultaneous use of several generations of workers. A body of psychological research (e.g., from the lab of David Meyer at the University of Michigan) shows that members of generation Y and the baby boomers multitask equally well, although intuition might indicate that this is not the case.[12] Although generations multitask similarly, they have differing place-based expectations and respond uniquely to nonverbal cues in their environments. In this situation, having access to grounded research information leads to the design of more effective environments—for all users.

DESIGN RESEARCH AS A SOURCE OF VALUE

Design research also helps designers qualify and quantify design's value. There is increasing focus in the client world on the return on investments in design, and research provides a way to establish that value.

Design research can support the process of creating a project-specific design agenda that is aligned with an organization's stated and perceived goals. This process can then be used to identify the appropriate performance measures or benchmarks to establish for a project and a framework that allows the design and client team to later assess whether those objectives have been attained.

Integrating pre- and post-occupancy analyses into a design research process is key for validating the design product. The research process and the information obtained through that analysis not only increase the designers' knowledge base with data about outcomes, measures, and performance but also give stakeholders an opportunity to evaluate their investment and the value of the services provided. Publicizing the value to be gained through effective design transforms increased client value into increased firm earnings.

CORE CONCEPTS

Design generates and applies knowledge, culminating in a contextually appropriate, physical embodiment of those accumulated insights. Accessing, augmenting, and preserving the knowledge underlying design is an important core competency for designers and design firms and is a significant way to competitively differentiate firms.

Designers need information that helps them lead cross-disciplinary teams working to resolve wicked problems. Using their accumulated knowledge of previous design solutions and design research tools, they can tap into important pools of tacit and explicit knowledge. Designers have access to an array of more qualitative or more quantitative research tools, ranging from surveys to interviews to discussion groups to observations (among others) that they can apply to most effectively leverage the information already available and obtain the data that can best inform the design decisions to be made. The insights designers can generate through the research process inform the design of effective spaces—with the definition of effective also flowing from the design and research process.

The support for design decisions that flows from the design research process increases your comfort (as well as your client's) in design recommendations made. Insights generated, however, do not direct or define decisions—instead, they simplify them.

The following chapters will identify the information generated by the design process as research. The chapters will also demonstrate how to

analyze, apply, and store information generated through the design process in a way that follows the basic scope of services for most design firms dealing with the built environment. They establish a pragmatic approach to design research that conforms to the basic scope of design services.

ENDNOTES

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11. Ibid.
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A Story of Practice: Making the Implicit Explicit

Information contributed through interview by: Perkins + Will, Chicago, Illinois

Context
Joseph T. Connell, Principal

Project [Name Withheld] Corporate Office Facilities for a Distribution Company

Scope: Programming and planning requirements for a new multi-storey 500 employee corporate facility

Date: 2005–2007

Square Footage: 120,000 square feet

Location: Midwest, USA

PROBLEM DEFINITION

In 2005 when Joe Connell, principal of the Chicago-based The Environments Group (now a principal of Perkins + Will, Chicago) was hired by a Midwest distributor to design a new workplace facility, it appeared to be business as usual. The client was looking to build a replacement corporate office facility adjacent to their current distribution center and hired Connell's team to conduct programming through design development services as a way to create an "inside-out" analysis of the new building's footprint.

Early into the programming phase of the project, the client asked a simple question that turned into a game-changer. "How can you know what we really do here without spending time to do it with us?" That question, and the rest of the question "How do we know your suggestions are right?" caused Connell and his design team to rethink the programming through design development processes. Personal opinion and implicit knowledge from having spent 25 years in workplace strategy wasn't going to be sufficient. The project required the design team to retool and learn how to expose its process to explicitly demonstrate and prove what informs each design recommendation.

OBJECTIVES

It should be noted that this project never moved beyond the schematic design phase because of an economic downturn that put the company's new building plan on hold. Connell's team at Perkins + Will is continuing to work with this client, applying some of the research and recommendations to its existing facility.

The objective of this case study is to present Connell's project process. Although the project included a broader scope of responsibility, this case will focus specifically on the workplace portion of the client's building analysis and how this team was able to take the implied knowledge that is the basis for much of workplace design strategy and expose it to become an instrument for developing, presenting, and evaluating design recommendations.

PROGRAMMING AND OBSERVATION

Beyond a typical workplace programming process where the team received headcounts and questioned key personnel about workplace needs and wants, the design team also conducted a multiple-week study, sitting alongside or shadowing approximately 36 different job types for a one- or two-hour duration to physically observe or participate in different aspects of the organization's work processes. This observation and participation moved through the entire organizational structure from senior management to warehouse operations. Moving from one department to another, Connell and his team set out to examine behavioral issues, environmental factors, and ergonomic conditions in an effort to know the unique conditions and skill sets of each department.

"Our team observed important processes that weren't expressed in the original programming exercises," explains Connell. One example is that the catalog copywriters place each catalog item on his or her desk while writing copy (to accurately describe the product's operation as well as its physical appearance). "This was an insight that was missed when interviewing the copywriting team," notes Connell. No one stated that object placement was integral to the process during the programming interviews, yet all the copywriters work precisely the same way, and it is critical to their process.

The design team uncovered similar discoveries throughout the organization. The safety team's description of work processes was very thin compared to the information that came from observation. Experiencing the speed and weight of the fork truck and the products that move through the warehouse floor was a useful discovery. This experience informed the team's understanding about the need to limit visual distraction in the warehouse facility, maintain clear circulation zones, and look at ways of instilling greater sensitivity to the issue of safety for these multitasking warehouse workers.

Because the organization has high employee retention, there is greater generational diversity within the workplace. "Unlike many other corporations who have a young workforce, this organization has as many employees near retirement as they do new hires," says Connell. This diversity results in more extreme ergonomic considerations—well beyond universal design standards—to provide suitable space for employees who are very overweight, some with

missing limbs and in wheelchairs, or blind. "Again, if we just looked at headcounts from the programming phase, we would have missed this observation," he adds.

The information also guided the team's discovery into how the workstations can better support individual work processes, as well as considerations in issues of safety, lighting, thermal comfort, and access to daylighting—all things, Connell acknowledges, that designers think about but seldom get the time or opportunity to delve into in this level of detail.

However, more than anything, explains Connell, the participatory process gave his team insight into the organization's culture that would have normally gone unrecognized. For example, notes Connell, the people working throughout the entire organization are highly educated, intensely curious, non–status–minded, and amazing problem solvers. Even a forklift operator holds a PhD. "We totally missed this insight when we interviewed the employees," adds Connell, explaining that the organization has a culture of doing things better, continually improving processes, and being truly empathetic to fellow workers and customers. "Mostly," he says, "the organization's culture is about adding value everywhere—from thinking about how to shave a fraction of a second from an assembly process to the sense of pride that goes into packaging items for distribution and the way product is presented to the customer."

ADJACENCY AND STACKING

At the conclusion of the programming and observation phase of the project, the design team applied these new insights to departmental adjacency and stacking concepts. This second phase advanced the ideal core-to-perimeter-glass dimensions for the new building. In addition, the team assessed how to best site the building as a way to optimize the facility's access to daylight and developed a three-dimensional massing diagram for the building.

From there, the team began more detailed investigations. It developed a strategy of zoning the perimeter for circulation. By employing this strategy, the design team was confident it could simultaneously address daylight penetration and obtain better thermal comfort in the interior environment, as well as reduce computer glare.

In presenting these more detailed recommendations to the client, the team hit the second roadblock. It's here that the client asked: "How do we know your solutions are right?" Connell said, "We realized the planning strategies we were recommending were common practice in the design world, but for the client, they lacked the benefit of knowing what was behind these proposals."

INSTINCTS ARE GOOD, EVIDENCE IS BETTER

In a relatively short period of time, Connell's team came back to the client with a process for moving forward. The team adopted a working model that broke the knowledge sources—the-what-they-know—into digestible bites. They delivered the information and/or research on one day following up one week later with a workshop to demonstrate how the collective information is transformed into design recommendations. The team filtered the information through three factors: the effectiveness of the use of space, the effectiveness of the dollars, and the effectiveness of the employee experience/organizational performance.

"If it didn't meet the three-part criteria," says Connell, "The idea was dismissed." As an example, Connell recalls how multiple consultants presented the idea of a green roof to the client. First, it was presented as a means to mediate rainwater on the site and later as a way to introduce native plant materials to the location. Although the client agreed that a green roof had advantages, they weren't sold on it for their own facility. Finally, when the collective consulting teams pooled their knowledge sources and demonstrated how a green roof could accomplish the first two measures but also lower energy costs, improve the longevity of the roof structure, and instill a positive sustainable corporate culture, the client was able to then fully realize the value of the investment.

PLANNING FOR THE EMPLOYEE EXPERIENCE

With the basic massing of the building described, Connell's team began the process of introducing this same three-part strategy for the interior workplace environment. As an organization strategy for all of the information and research, his team established the following list of questions to drive the project's development.

What makes people effective at work?

What prevents people from being effective at work?

What makes people satisfied with their work?

What makes people satisfied with their workplace?

What is the distinction/correlation between employee productivity, effectiveness, and satisfaction in office work?

What features and qualities of the work environment may lead to people being more effective and satisfied with their workplace?

SOURCES OF KNOWLEDGE

To demonstrate the scope of influence and knowledge that goes into his design team's inquiry surrounding workplace design, the team aggregated each member's source(s) of knowledge—where the individual members of the team go to get smart about the subject of workplace design. The list of sources ranged from environmental behavior research, organizational development, industrial psychology, human resources, facility management, from precedent studies of successful architecture and design projects and research emanating from the medical community and neurosciences.

From this cataloging, the design team's research identified three clusters or groups of factors that influence job satisfaction: (1) management practices, (2) environmental satisfaction, and (3) pay/benefit satisfaction.[1]

Since management practices and pay/benefits are beyond the role and capacity of a build out, the scope of the Perkins + Will assignment focused on environmental satisfaction.

ENVIRONMENTAL SATISFACTION

The Perkins + Will team presented its amassed research, knowledge, and professional expertise relative to environmental satisfaction. It drilled down into the role that lighting and HVAC and acoustics play in environmental satisfaction. From there, the information turned more finite. The team presented qualitative and quantitative research regarding how thermal comfort (being neither too cold nor, too hot) impacted employee satisfaction. For acoustics, the team identified that satisfaction required distraction reduction, specifically in open workstation areas where telephone calls, team meetings, and impromptu conversations often disturb fellow workers.

Research also supported the adoption of a lighting strategy that matches the work process versus a universal or standardized layout that is generally considered more efficient. The team demonstrated how different functions require lighting strategies that support the different requirements of computer and paper-based work activities.

As the team drilled further into the subject of satisfaction, it identified the knowledge sources that explore other qualities of a workplace that rank high on employee preferences. These qualities include the ability to reduce distraction, spaces that support impromptu interactions, and spaces that promote meetings and group work.

PROGRESSIVE SCALE OF SPACES

Using this research, Connell's team adapted a working model that addressed the research and recommendations through a progressive scale of spaces. Connell presented the notion of a hierarchy of space— space that ranges from individual space good for solitary work to team and conference spaces, large and small, to satisfy a variety of activities, collaborative or otherwise (see Figure 1.1).

The Perkins + Will's team maintained this progression of space as a consistent format when presenting information to the client. The research, knowledge, and recommendations advanced in the same way, from individual work to team, departmental zones, and circulation. This, in turn, informed the layout and interior massing of the floor plate, and it further defined the massing of the building and its position on the site.

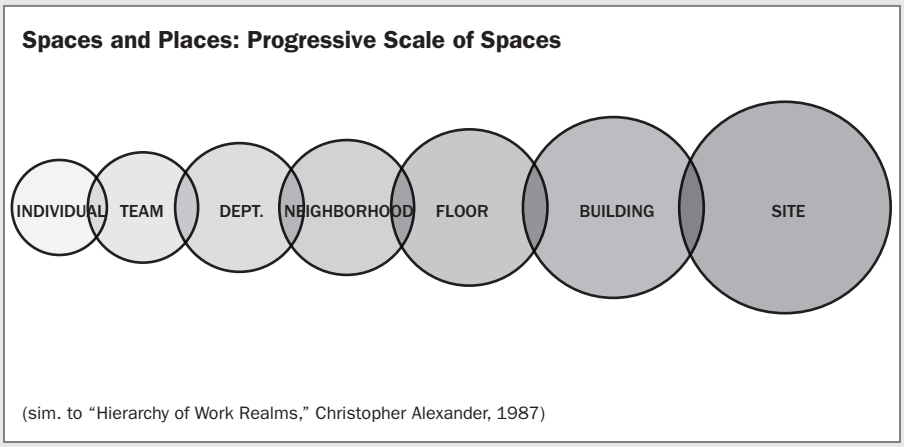


FIGURE 1.1
Spaces and Places: Progressive scale of spaces.

WHERE AND HOW INDIVIDUALS WORK

The earlier programming analysis Connell's team performed on behalf of the client set up the next step of the process. From the analysis of the programming and observation information, the team created a series of diagrams that clustered the client's specific departmental functions and work styles to establish the conditions that distinguish requirements for when spaces should promote concentration, collaboration, training, and leadership (see Figure 1.2).

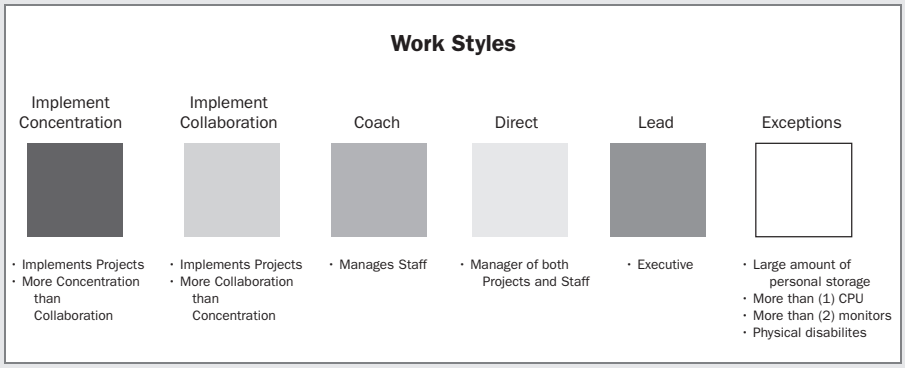


FIGURE 1.2
Adapted from Christopher Alexander's "Hierarch of Work Realms," the Perkins + Will team maintained a progression of space as a consistent format when presenting information to the client.

Connell and his team modeled this work style framework over the client's organizational chart, enabling them to visualize the framework's application in each individual department (see Figure 1.3).

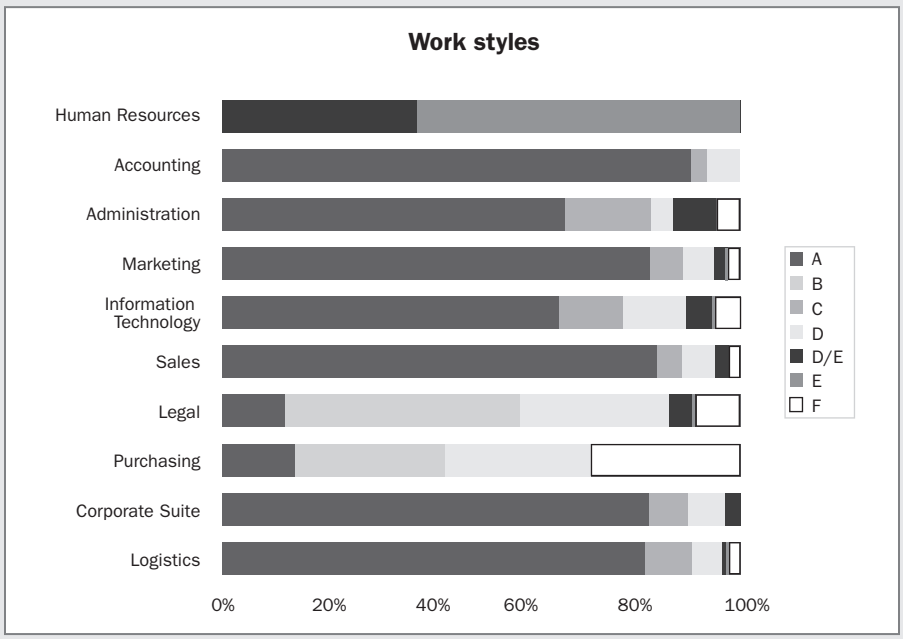


FIGURE 1.3
The work style framework is modeled over the organizational chart, enabling the client to visualize the framework in each department.

PROXIMITY AND ADJACENCY

As a next step, the design team presented the research and knowledge that informs modes of workplace communication, specifically how it relates to

proximity and adjacency within the organization. "We were able to find research that established the distances office workers are most likely to travel to speak to fellow office workers," explains Connell.

From a MIT study, the team documented how communication reached its lowest point after the first 75 to 90 feet of travel distance.[2] Another Cornell study indicated that researchers and engineers from different departments, but located on the same floor, were six times more likely to work together on projects than employees who were on different floors or in different buildings.[3] Armed with these insights, Connell's team adapted what it refers to as a "field of action," workplace neighborhoods that are zoned to accommodate distances that promote communication and collaboration.[4]

"Equipped with this research, we were able to demonstrate to the client through drawings and simulations the different attributes associated to where and how individuals work and work together," explains Connell. By clustering these groups together in zones of a predetermined size, the team was able to bring together employee workspaces, open meeting spaces, meeting rooms, and accommodation for shared tools and technology, storage and supplies. Special areas were provided for access to a higher degree of privacy, when needed. Like a good urban neighborhood, these workplace neighborhoods were each self-sufficient and were designed to promote a variety of activities and work styles.

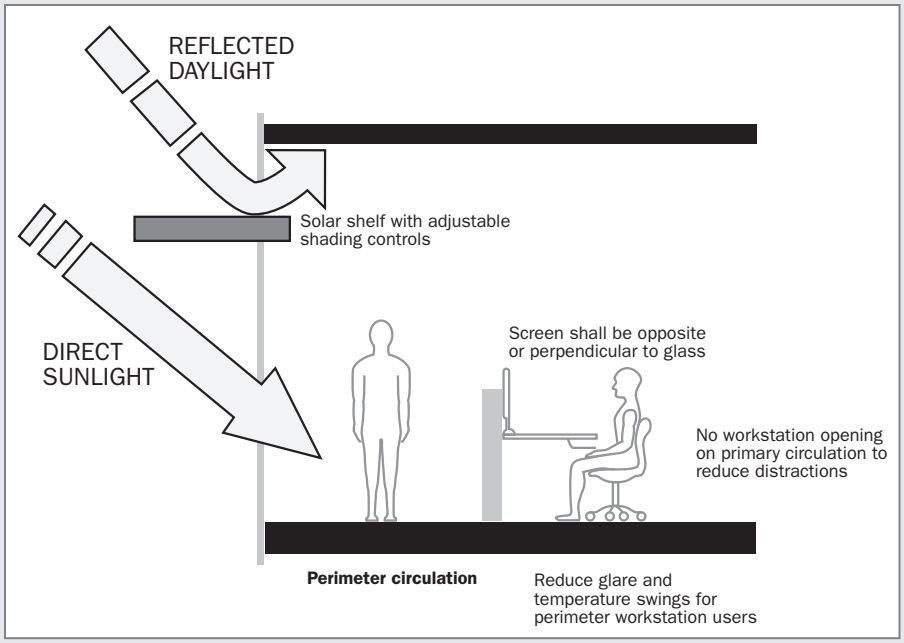
CIRCULATION AND THE FIELD OF ACTION

The "field of action," or "neighborhood" was then further defined by the circulation strategy. The team conducted time studies to see how far the average office worker walks in five seconds (22 feet) to one minute (264 feet). This information informed Connell's strategy for the placement of circulation routes and the width for each:

- Primary, 6 to 8 feet
- Secondary, 5 to 6 feet
- Tertiary, 4 to 5 feet

Understanding the site conditions and position of the sun over the course of the day, the team revisited earlier research presented to the client regarding thermal comfort, daylight harvesting, and ergonomics of computer-based work. Here, the Perkins + Will team diagramed how the collective research and knowledge instructs the perimeter circulation strategy evaluating it and the entire planning strategy on the three-part system of behavior, effectiveness, and economics (see Figure 1.4).

FIGURE 1.4
Diagram illustrating how the collective research informs the perimeter circulation strategy.



CONCLUSION

"This was an atypical process," admits Connell. "Explicating our process wasn't part of our scope of services. But, it became apparent early in the project that the client was unable to make or manage any recommendations based on say-so, alone. Therefore, we had to find ways to take our implicit knowledge and make it explicit," he adds.

Since the new building project was put on indefinite hold, many of the large planning concepts went on hold, too. The client team, however, has retained Connell and the Perkins + Will design team to address many of the workplace concepts presented in the original scope of work into its current facility. "The value of the recommendations, when presented as valid sources of knowledge, is difficult to ignore," notes Connell. "Once they saw the influence these recommendations had on things they valued—effectiveness of their employees and their organizational performance—they were committed to implementing the proposals."

LESSONS LEARNED

"Fundamentally, our clients want to know our recommendations are right. They want to believe us," says Connell, noting that credibility is easier to achieve with third-party validation. "As designers, we skip over a lot of the meaningful learning and principles because it's so obvious to us," adds Connell. But, he notes, these principles are unknown to others, and designers gain reliability by making it overt to their clients.

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