

Offices That Work

Balancing Communication, Flexibility and Cost

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Part 1 – What’s An Office For?

The Organization, Uncertainty and Agility

Organizations face unprecedented pressures to respond quickly to unpredictable and rapid changes in virtually every aspect of their business: the economy, marketplace, technology and labor. Agility has become more a matter of survival than choice. At the same time, global competition has turbocharged both the pace of change and the need to contain costs. And as if matters were not complicated enough, labor demographics have generated a conflicting set of employee expectations about the nature of work that organizations must consider as they shape their firms to meet this often bewildering onslaught of external and internal demands.

Rethinking Conventional Wisdom

The Dilemma

Balance the competing goals of reducing capital and operating costs, increasing flexibility and adaptability over time in the face of uncertain organizational change, while creating a workplace that helps attract and retain the highest quality of staff and enables them to work to their fullest potential.

The Solution

In comparison to both high-paneled cubicles and private, enclosed offices, more open small scale team-oriented environments:

- Increase the flow of information that employees view as fostering better quality work and faster decisions.
 - Do not impede the ability to work productively, even for work requiring high levels of concentration.
 - Create a positive social environment that supports tacit learning and job satisfaction.
 - Accommodate unpredictable organizational change faster and with greater flexibility.
 - Allow higher densities that reduce occupancy costs.
-

Discontinuity

In recent years we have witnessed an accumulation of discontinuities, like meteor showers across the business firmament, and every sign indicates they are going to continue and multiply. We are confronting an entirely new business landscape where our traditional assumptions and practices are no longer valid...If we are to survive and thrive, we must find new ways to think about these discontinuities, new ways to organize our enterprises to exploit them, and new ways to turn them to extraordinary advantage.

Fradette and Michaud, 1998

Wicked Problems

Wicked Problems

Wicked problems are characterized by:

- Interconnectedness
- Complexity
- Uncertainty
- Ambiguity
- Conflict
- Societal (or corporate) Constraints

Stating the business challenge is easy: Do more, faster and better, with less. Meeting the business challenge presents the kind of dilemma that, to use Horst Rittel’s term, is a “wicked problem” (30). The problems are “wicked” in the sense that they are immensely difficult to solve, in large part because a dense web of interconnected factors makes it difficult to understand how decisions in one area will affect decisions in others areas, let alone the overall situation. How a solution works out depends on events beyond the scope of the immediate problem.

Complicating matters further, these problems must be solved in a dynamic and largely uncertain environment that generates significant risk. Not surprisingly, conflict is common. It comes from competing claims, where “goods” need to be traded off against “bads” within the same value system. In the workplace arena, the “goods” may be employee preferences and the “bads” the costs of meeting these preferences. Complete consensus is more unlikely than finding a tofu burger in Texas.

Wicked problems describe the dilemma workplace strategists face as they seek to balance the competing goals of reducing capital and operating costs, increasing flexibility and adaptability over time in the face of uncertain organizational change, while creating a workplace that helps attract and retain the highest quality staff and enables them to work to their fullest potential.

Cornell University’s International Workplace Studies Program (IWSP) (<http://iwsp.human.cornell.edu>) has sliced into this dense web of interdependent relationships that Fritz Steele and Franklin Becker have called “organizational ecology” (1) by looking at the nature of workplace strategies that small, dynamic organizations have developed to help them meet the challenges of doing more, faster and better, with less.

Why small, dynamic organizations? General Electric’s recently retired CEO Jack Welch exhorted his managers—and everyone in the organization—to be big, but think small. That is, to in some sense be agile, to “workout” unnecessary bureaucracy, rules, policies and practices that contribute minimally to profitability, while slowing business decisions and impeding innovation.

For the past several years, the IWSP has been exploring ways in which workplace strategies—how one plans, designs, and manages everything from a firm’s overall real estate portfolio to how individual workspaces are designed and managed and how space is allocated and used by individuals and teams—help organizations manage uncertainty and become more agile (3). We came to realize that we really knew very little about how small firms in fast-growing industries shaped their workplace strategies in ways that helped them contain costs, attract and retain employees, and provide flexibility, all the while supporting work effectiveness in a business climate where innovation and speed to market were critical.

In the fall of 2000, we began to examine the workplace strategies of “New Economy” firms. Many of these firms have since disappeared, but the value of understanding their workplace strategies remains valid; namely, to explore whether small, fast-moving firms’ choices about how to shape their work environment provide any insights and lessons for larger firms. We think they do. One reason is that while the New Economy may be dead, the need for speed to market, agility and innovation remains very much alive.

Employee Commitment

Nearly one-third of employees are not committed to their current employer and plan to leave in the next 48 months, according to the Hudson Institute in Indianapolis. Thirty-nine percent say they are not committed but are “trapped” and plan to stick around; only one-quarter are committed and will stay with their current employer.

Sorenson, 2001

The New Economy has not disappeared. It has been co-opted by the Old Economy. What Fortune 500 or 1000 firm, let alone your local bakery or auto parts store, does not have a web site, and is not engaged in some aspect of e-commerce or eBusiness practices? What successful company today is complacent? What organization does not depend now, and increasingly in the future, on Generation Xers and Yers? While extreme casual dress may be a short-lived fad stimulated by Silicon Valley dot.coms, innovation and the need to leverage every ounce of intellectual capital a firm can muster have never been more important. For the past 100 years, the “office” has been the epicenter of this intellectual vortex.

“If history is any gauge, the current period of turmoil and consolidation will leave a few dominant companies at the top—for a while. Leaders will emerge in niche markets profitable enough to sustain competition. Meanwhile, the next generation of innovators will be toiling away in stealth mode somewhere, dreaming their own dreams of glory and success.”

Paul Saffo
Director of the Institute for the Future

The Office as a Social Setting

What goes on in the office—why we have offices—is not terribly different from offices as we have known them over the past 100 years or so. The work is similar: people work individually and in groups, they store and access files, they use technology, they socialize, they have formal meetings. The office is a place where people come together to engage in activities that help the enterprise persevere and prosper.

The primary difference from early offices and those today is that over a hundred years the idea of the office as a social setting got lost, or at least diminished. We can thank Frederick Taylor and the *Principles of Scientific Management* (1911) for that. It was Taylor who, in the name of efficiency, broke down complex tasks into discrete, repetitive activities that could be done quickly by people with little training or skill (and because of that, at lower wages). It was also Taylor who, reflecting the values and views of his time, saw most workers as inherently lazy, thereby generating the need for constant surveillance and strict management control.

Out of this climate emerged a management view that socializing was a waste (of the corporation’s) time. Being “on task” was what counted. Yet if you look at pictures of offices in the early part of this century what you see are people interacting: partners across their double-wide desk; managers in their shared closed office; supervisors and staff together in a large room without dividing panels or barriers. In effect, what you see are in many ways the kinds of team-oriented offices we strive for today, albeit far less tidy and comfortable and with far more paper.



Early offices valued social interaction.

People came together, especially as the 20th century wore on, because that was where specialized equipment was (initially typewriters, telephones and mimeograph machines, and then computers, copiers, printers and fax machines). But they also continued to come together to meet, share information and socialize—and to be supervised, to make sure they were really working. It was only in the late 1950s and early 1960s that one began to see the widespread use of panels to create private (one person) environments for staff up and down the organizational hierarchy. For the first time, organizations created places where rank and file staff was expected to work alone, to be productive by being “on task.” In effect, the panels replaced supervisors, since the physical barrier

made it harder to socialize. It also, of course, made it harder to get to know your co-workers or your boss, and to share information and ideas serendipitously.

The panels provided minimal acoustic privacy, but they did—and could—define rather precisely one’s own turf. And as has been the case in human history, the size and location of one’s territory began to serve not just the goals of limiting distractions and interaction, but the desire to mark distinctions in status and rank. Higher-ranking people got larger cubicles and higher panels. The highest-ranking people got “real” walls and doors, with the size of the office reflecting their relative ranking among the corporation’s elite.

In an evolutionary process, what began largely as a social setting evolved into one that more closely resembled a rabbit warren. Enclosure and office size became associated less with the key activities needed to be performed in the office to enable the enterprise to persevere and prosper, and more on conveying status and rank. The emphasis had also shifted over the course of a hundred years from the early focus in offices to groups of people working together (not always as a team, but rarely physically separated as individuals), to a focus on individual productivity and performance and an environment designed to support and reinforce the individual.



High-paneled cubicles justified on the basis of their flexibility and communication potential, created a rabbit warren of cells that perfectly reflected the focus on the individual, and the low value accorded social interaction. Nor were they particularly cheap or inexpensive to reconfigure.

That individual focus and the associated physical model have increasingly come into question over the last decade as firms in industries ranging from insurance and banking to technology and pharmaceuticals have come to rely on teams to grapple with complex problems whose solutions depend on expertise from more than one discipline or department. Interaction and communication have once again emerged as a primary purpose for coming together into a place called an “office.”

Decision Speed

Decision speed varies industry-by-industry (speed for Boeing may be a new product in several years; for Hewlett Packard speed is measured in months). Fast decision makers use more, rather than less, information than slow decision makers. They also develop more rather than fewer alternatives, and consider them simultaneously rather than sequentially.

Eisenhardt, 1989

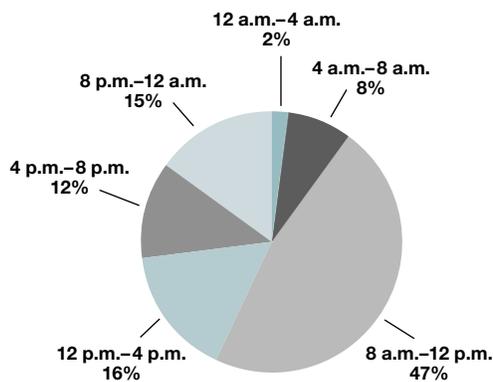
The need for ever more communication and interaction is the oil that enables information to flow fast and smoothly throughout an organization. Without such information flow, decision-speed and the ability to quickly exploit market opportunities dramatically decline. Even job functions like financial analyst, which we have historically viewed as requiring high levels of concentration (and the associated private, closed office), are beginning to change. The luxury of retreating to a private enclave to reflect on data for days, and then write a considered report, has given way to the need to share information continuously, and to use that information flow to make rapid judgments that exploit fast-changing and unpredictable events.

Part 1 – What’s An Office For?

Unfathomable advances in technology have further shifted the focus of the office. We can access information from virtually anywhere, anytime with modems and other high-speed connections. We are not absolutely dependent, and will be even less so by the end of the first decade of the 21st century, on information stored in file cabinets or desk drawers in a place called the “office” to be able to carry out our individual daily tasks.

Our homes are, on the whole, larger; more of us own rather than rent; and today’s homes are increasingly wired for email and surfing the Internet. All of these changes make the home office more feasible than it was a hundred, fifty, or even five years ago. This is not to say everyone wants to or should work at home. It is simply a feasible option for many.

Most Productive Work Hours



Source: Becker, F., et al., 1995

In fact, most research shows that few people want to work at home full time, five days a week. They want to come in to the office at least several times a week, not because it has specialized equipment or they have insufficient space at home, but because they miss the camaraderie and social interaction at the office. They miss the opportunities for tacit learning, and for mentoring; the opportunities to get clear direction about the projects they are working on, and timely feedback about the progress they are making. They miss the energy that motivates them, and makes work tolerable, if not fun and exciting. People also come to the office to concentrate.

But workers do not necessarily all show up or leave at exactly the same time. The work day has lengthened, but not all of it is in the office. Some people get up early and do their email at home, missing the traffic jams. Others get up at the crack of dawn and arrive at work by 7 a.m. Some are night people, and work past midnight, but get up and come into the office later in the morning (2). Perhaps one of the most significant changes in the workplace over the past century has been the shift to a greater emphasis on what one does and what one accomplishes, not on where or when one does it.

I’ve always thought of this as how as faculty we work with students on projects. I don’t want to know where or when my students are working on their projects, or what they are wearing, eating, drinking, smoking, or listening to. It would make me nervous. What I care about is how good a job they do on a project, and whether they get the assignment

Organizational Agility

Organizational agility depends on the creation, distribution, and use of information and knowledge. In fact, “the process by which knowledge is created and utilized in organizations may be the key inimitable resource managers need to appreciate if not understand.”

Hitt 2000, Schendel 1996

Structural Capital

The web of core value-creating activities, along with the organization’s structure, systems, processes and culture constitutes “structural capital.” Structural capital, together with intellectual and human capital, is the foundation of organizations today.

Dess and Picken, 1999

New Economy Drivers

Driven by the globalization of markets and enabled by the rapid diffusion of information and communication technologies, the developed economies of the world are coming to depend increasingly on the creation, distribution, and use of information and knowledge.

Dess and Picken, 1999

in on time. In simple terms, I care only about their performance, not their citizenship. Spending long hours in the library does not, by itself, win any brownie points or generate a high grade.

In this context, the major reason for an office today is to bring people together: to socialize and share information; to inspire and inform each other; to provide guidance and feedback. Relatively little of the work of most office workers requires deep, individual concentration for hours at a time. As the literature on computer engineers shows, this is true even for the prototypical job function requiring deep concentration. There do need to be times and places for such work in the office, but whether such places need to be assigned to one person for his or her exclusive use, or requires complete physical separation from others doing the same work, has been challenged by many corporations over the past decade.

Interaction in the Workplace

A recent study of computer engineers indicates that workplace interaction is highly valued:

- Interaction is important during the initial stages of a software development project cycle.
 - Interaction is valued by CEs because it improves social relations, creates a consistent product, facilitates learning, helps in behavioral cue identification and creates a sense of team.
 - CEs in open setting predominantly realize that they are sacrificing their individual needs for the good of the team, and they feel the benefits really outweigh anything they were initially worried about.
 - CEs in closed settings realize that they are missing out on interaction and team collaboration and that a greater effort is required to interact, but they still would not leave their current workspace because their privacy and concentration are more important to them.
-

Source: Dallas, 2001

The challenge has come from trying to solve the organizational dilemma with which we began: How does an enterprise use its scarce resources of people, space, time and technology—all of which equate to money—to their highest and best potential? Can the large organization afford to provide thousands of its professionals and middle-level managers with closed offices, because that is what they prefer and in some cases expect? Does the time spent in highly concentrative and individual activities justify the cost of such offices, whose lower density and higher construction costs and reduced flexibility make them expensive to both build and operate? Can more open environments be better places to work as well as less expensive to build and manage over time?

Even if money were no object, would organizations that rely on rapid, frequent communication within and across teams and departments want to provide individual, assigned, closed offices across the organization as a whole? And if money is an object, as it most certainly is for almost all organizations, can one simply jam as many employees as possible into as cheap space as possible, and tell the employees to “get a grip” or “love it or leave it”? Can any organization afford to tell its employees that the only thing that counts is communication and interaction, and that we don't care if you are able to concentrate and work without interruption or disruption?

The answer to these questions must be “no.” Therein lies the dilemma organizations face, the wicked problem.

Reframed positively, the question becomes: What workplace strategies can organizations adopt that help attract and retain high-quality staff; that have the flexibility to support unpredictable organizational changes in staffing, structure and teams; that facilitate the rapid exchange of information and ideas; support the development of social relations on which the trust is built that characterize high performance teams; create sufficient opportunities to work without interruption or disruption; and do all of this at as low a cost as possible? This is the question our IWSP research sets out to examine.

Research on managerial activity found that lower and middle managers spend 27 to 87 percent of their time in oral communication. This figure is even higher for upper-level managers. Most of this communication involved face-to-face interaction.

Yukl, 1998

Part 2—Organizational Challenges and Workplace Strategies

Work Effectiveness, Communication and Office Type

The Open vs. Closed Office Debate

Fifty years after the introduction of panel-based open plan office systems, we still vigorously debate the value of open vs. closed offices. The reasons vary. They range from personal preferences (most people prefer closed offices in the United States), to cost considerations and flexibility. Organizations like open plan offices because they tend to be smaller and thus cost less on a per employee basis (because density is higher). They may also be more flexible, though this is questionable, especially if some form of “universal” plan offices are employed that reduces the costs of “churn.”

The problem is that the question itself is wrong. Both open and closed serve useful purposes. The meaningful question is, “What’s the right balance between open and closed offices?” Close on its heels is, “What do we mean by ‘open’ office, anyway?” Is it a high-paneled cubicle (one cannot see over the panel when seated)? Is it a low-paneled cubicle (one can see over the panel when seated)? Is it a cluster or “pod” of low-paneled workstations separated from another pod by higher panels? Is it a shared enclosed office (2-12 people in an enclosed space)? Is it a team-oriented bullpen, with a small group of desks in a completely open area?

The Open vs. Closed Office Debate

- Office Type and Interaction
- The Case for the Closed Office
- Controlling Interactions and Interruptions
- Communication’s Subtleties
- Building Trust
- Visual Access and Behavioral Cues
- Managers and Interactions
- Tacit Learning
- Decision Speed
- Age Demographics
- Age and Change



Closed Office



High-paneled cubicle



Low-paneled cubicle



Team-oriented workstation/pod



Shared enclosed office



Team-oriented bullpen

It is, of course, all of the above. Which is precisely why describing a work environment as “open” serves so little purpose. It is like using “meat” to describe everything from hot dogs to filet mignon, or “car” for everything from Ford Escort to Rolls Royce. It is correct, but learning that some people hated “meat” or “cars,” and others loved them, would not be terribly edifying without knowing which kind of meat or car each group had experienced. The same holds true for understanding people’s reactions to “open” office environments.

Finding the right balance of open and closed offices requires understanding the purpose of the office, and even more so, the nature of the work being done. We don’t buy a Porsche to haul pianos. We buy (or rent or borrow) a pickup truck. We consider the purpose, the intended activities. One vehicle cannot serve every purpose equally well, but it can serve several purposes, hopefully the primary one, to the highest level. Why not look at the office environment in the same way?

That could mean having several types of offices, just as many people own a sedan and a pickup, or an SUV and a sports car. It can also mean designing the most robust, all round vehicle possible; hence, vehicles like the Volvo Cross Country wagon (fast, capacious, efficient, safe, rugged). It is not a true sports car or an SUV, its primary purpose is hauling kids, dogs and groceries around town and on the highway. That, it does extremely well.

As the first chapter argued, today’s office’s primary (not only) value is as a place for face-to-face interaction: a place to meet coworkers and managers, to inspire, coach, be motivated, share information, debate goals and objectives, socialize, make friends, and so on. It is as much or more a social setting as it is a refuge or technical or information center.

Given this way of thinking about what an “office” is, the first question for organizational leaders struggling with how to use the corporation’s scarce resources to their fullest potential, is how different forms of office design, from closed offices to a variety of forms of open plan offices, affect communication and interaction. More particularly, it is to understand how communication and interaction affect valued organizational outcomes such as decision speed, organizational learning, and employee job satisfaction and commitment.

Office Type and Interaction

Work Activities of Computer Programmers

McCue (1978)

- Work alone—30% of work activities
- Work with 1 other person—50% of work activities
- Work with 2 other people—20% of work activities

Zelkowitz, Shaw & Gannon (1979)

- Coding, solo work—20% of software development cycle
- Collaboration—35% of software development cycle

Brill (2000)

- Quiet work—64% of work activities
- Interactions—19% of work activities

Our research (see Appendix B: Research Methods), involving employees in job functions ranging from software development to marketing and business development, indicates that the more open the “open” plan office environment, the more conducive it is to overall work effectiveness, when communication and interaction are critical elements of the work process. Few jobs or professions don’t qualify.

Office Type and Interaction

	Private versus...			Shared versus...			Cubicle versus...			Bullpen versus...		
	C	S	B	C	B	P	B	S	P	C	S	P
Individual Factors												
Auditory Privacy	■	■	■	■	■		■	■	■	■	■	■
Visual Privacy	■	■	■	■	■		■	■	■	■	■	■
Satisfaction	■	■	■	■	■		■	■	■	■	■	■
Productivity	■	■	■	■	■		■	■	■	■	■	■
Concentration	■	■	■	■	■		■	■	■	■	■	■
Isolation	■	■	■	■	■		■	■	■	■	■	■
Team Factors												
Learning from Colleagues	■	■	■	■	■		■	■	■	■	■	■
Solving Problems	■	■	■	■	■		■	■	■	■	■	■
Spontaneous Conversations	■	■	■	■	■		■	■	■	■	■	■
Initiating Conversations	■	■	■	■	■		■	■	■	■	■	■
Team Communication	■	■	■	■	■		■	■	■	■	■	■
Team Collaboration	■	■	■	■	■		■	■	■	■	■	■

Higher Rating ■
 No Difference ■
 Private Office P
 Shared Office S
 Cubicle C
 Bullpen B

No Perfect Solution
 This summary chart for computer engineers captures the key differences between office types.

- **Closed offices** are viewed, overall, as being more satisfactory than cubicles, bullpens, and shared offices, and better for visual and auditory privacy and concentration.
- **Bullpens** are better on most communication and team factors.
- **Cubicles** are generally the worst performers on every measure.
- As the in-depth interviews indicate, however, the trade-off between interaction and concentration often favors interaction, especially for younger workers.

Source: Dallas, 2001

More specifically, observations, surveys and interviews all indicated that more open plan environments like team-oriented bullpens and pods, with minimal barriers between employees, facilitated more effective communication than did closed offices or high-paneled cubicles. This, in itself, is not surprising. The in-depth interviews do, however, provide insights into why and how this greater communication contributes to overall work effectiveness.

The Case for the Closed Office

Our research, as already noted, suggests that more open office environments, like team-oriented bullpens and workstation pods, significantly benefit communication that speeds the overall work process while contributing to high-quality work and employee satisfaction with their job. This is not to say, however, that all employees preferred open type work environments. It is worth beginning by stating the case for the closed office since this is, for most employees, the preferred office type.

With few exceptions, it is easier to control unwanted distractions and interruptions, and noise is typically less of an issue. In reviewing the case for the closed office, it is worth keeping in mind that the comparison those in closed offices typically make is with a high-paneled cubicle, not team-oriented bullpens or pods. The age profile of those in closed offices was also older, ranging from the late thirties into the forties and fifties, compared to the twenties and early thirties for most of our respondents in the open type environments. As becomes evident below, distinguishing between the different types of “open” environments, and considering age, is critical.

Controlling Interactions and Interruptions

Clearly, more opportunity to control unwanted interactions is a major attraction of closed offices.

Software Work as an Individual Activity

“Several forces conspire to keep software work an individual activity, including; desire for autonomy; a culture that rewards individual efforts far more than team efforts; concentration of crucial application knowledge by a few individuals; desire for privacy regarding individual development efforts; the Not Invented Here syndrome and its more personal form (not invented by me); large productivity differences between individuals; political considerations of powerful individuals and of managers.”

Kellner, 1991

Software Developer: *In a cubicle I spent more time working on tasks that I needed to get done outside of the workspace because it wasn’t conducive to that kind of thing. People come up to you all the time and ask questions. There were a lot more spontaneous meetings where people wanted to drag you into things and talk about stuff. Here (in a private office) we tend to focus more on making decisions, getting information exchanged and taken care of... then we go off individually and get our tasks done and we reconvene at an appropriate time... the walls and the doors help set boundaries with other people that you don’t want interrupting at the time that you’re working.*

Software Engineer: *We spend a lot more time actually getting things done because we’re not always working on how to control our communications...*

Software Engineer: *I think cubicles are quite distracting. To get spontaneous response from the other side of the wall, sometimes (generates) responses that are not called for.*

While the value of closed offices is typically justified in terms of how disruptions interrupt the “flow” of work, a less-often stated justification is the culture and celebration of the individual, even if that slows the overall project.

Engineering Manager, Closed Office Environment: *I wouldn’t want any of my people in cubicles. Period. Because I want their concentration totally on their work. And I think in a cubicle space you have so much distraction, input, and all those things that people don’t necessarily get to solve their own problems.*

Software Engineer: *For me personally, if I'm focused on the given task at hand, peripheral noise is really distracting. It takes away from the thought process. There's sort of a momentum that builds up that, with constant interruptions, it's like stop and go traffic. You never quite get up to that cruising speed where you feel like you're being productive.*

Software Engineer: *I find I work better as well when I'm alone. I find I code better... I think better when I'm in a closed office, especially in the design stage when I'm thinking about the program. If there are people continuously interrupting you, the process is much slower.*

Few would argue that most employees, whether software developer, web designer, business strategist, or human resource professional, need time to think, concentrate and reflect, as well as to communicate, share information and interact socially. The Holy Grail is finding the right balance. What is surprising about our data is that the more open type office environment, what we are calling team-oriented bullpens and pods, as well as shared closed offices, may come closer to achieving this balance than either closed offices or high-paneled cubicles.

Communication certainly occurs in closed offices, but as the comments from engineers in closed offices, below, suggest, the pace, frequency and nature of that communication are significantly different than what occurs in more open settings such as team-oriented bullpens and pods.

Software Engineer: *We definitely schedule meetings. We rarely have ad hoc meetings here. Usually we'll pick some times to meet.*

Software Engineer: *Email and phone... we're really collaborative that way.*

Software Engineer: *Communication with colleagues... I think my door is open all the time if I don't have meetings. So, anybody could stop in for a chat or whatever.*

Software Engineer: *I think it is important in an enclosed office you are able to do conference calls more easily with the speaker phone on.*

Conference calls, email, and scheduled meetings are viewed by those in closed offices as providing sufficient communication. The same types of communications occur in open plan environments. The difference is the value attributed by those in closed vs. more open environments to short, frequent and fast communication. In more open environments, such communication patterns are viewed as contributing to one's own and the team's (project's) productivity—both quality and speed. In closed offices, respondents focused on the perceived benefit of not having to interact with others serendipitously, and the benefit to their own concentration. Yet some of those in closed offices recognized that their privacy came with a price, in terms of reduced communication with colleagues that weakened the project or team's performance, not just their own individual effort.

Software Engineer, currently in a closed office, talking about his experience in an open environment: *I was at a start-up... When something critical happened, people swarmed and gathered around it as a team. They worked to solve it as a team. Here (closed offices), if something critical happens and we need to solve something, usually what you'll find are three different factions of people working on it from different perspectives... So, now we've got this project that we're supposed to go live with in March and we've got one part of it nailed down and two other parts that never even got looked at.*

Office Sharing

"The case against enclosed offices sooner or later gets around to the 'sterility' of working alone. But enclosed offices need not be one-person offices. The two- or three- or four-person offices make a lot of sense, particularly if office groupings can be made to align with work groups. The worker who needs to spend fifty percent of his time with one other person will spend most of that time with a particular person. These are natural candidates to share an office. Even in open-plan offices, coworkers should be encouraged to modify the grid to put their areas together into small suites. When this is allowed, people become positively ingenious in laying out the area to serve all their needs: work space, meeting space, and social space. Since they tend to be in interaction mode together or simultaneously in flow mode, they have less noise clash with each other than they would with randomly selected neighbors. The space has a vital quality because interaction is easy and natural. A degree of control over their space is viewed as an additional benefit."

DeMarco and Lister, 1987

Software Engineer: ... you do tend to—regardless of whether you're in your office or cubicle—shut the world out. It's too easy to do. (Social contact) nurtures the accidental collision of two people crossing in a hallway, "Oh by the way, you might know this too. Can I check with you first?" So there's a value in that.

Though infrequently mentioned, the issue of status also surfaced.

Software Engineer: An office does make me feel good... like an achievement or indication of "success"...

More often, engineers talked about how more closed environments inhibited communication, and how that affected their ability to work productively, either individually or as a team.

Software Engineer: For my first 8 months at (this firm), I shared an office with 5 people. That helped me learn the processes, etc. It would have been much harder if I had my own private office when I started. Now that I know the processes, I really enjoy my privacy.

Software Engineer: We suffer because we don't have much of a sense of team. And I don't think people understand the relationship of their work to others and how if they don't execute well it will impact others. Or if they're negligent and not getting their job done right, it has impact and consequences to others. Because they don't have this fabric of a team, they don't understand when they're not performing well that they're impacting somebody else... I don't think people are as committed to getting things done and helping their teammates, because they often may not even know who they are.

The surprise, discussed in more detail below, is not that the nature of communication patterns were different in closed and open offices; it was that the greater visual cues in more open type offices helped reduce unwanted distractions and facilitated fast, quality work requiring concentration. In other words, our research indicates that physical separation and visual isolation are not a necessary condition for concentration.

Communication's Subtleties

Had we relied only on our survey data, we might well have concluded that there were no differences among open plan offices of various sorts in terms of how they influenced employees' communication and interaction patterns. That is because few differences in communication frequency or effectiveness were found in our survey data among different types of open plan offices and closed offices. Almost all respondents, regardless of the type of office they were in, reported that they had high levels of communication and interaction. The focused interviews and systematic observation data painted a different picture.

When we looked at transcribed interviews, we found, as described above, that respondents in closed office said something to the effect that "Yes, I communicate a lot. I often email or talk with coworkers by phone, and whenever I need to see someone, I can easily drop in on them or arrange a meeting." In effect, "frequent" communication for those in closed offices meant interacting, several times a week in a scheduled meeting, but not often on the fly. For those in workstation "pods" and small scale, team-oriented bullpens, "frequent" communication and interaction meant literally dozens of quite short communications throughout the day. Without understanding the employees' underlying internal metric, relying on the survey data alone is a bit like asking an obese and an anorexic person

whether they ate a lot, and if they both said “yes,” assuming the amount of food consumed was comparable.

The interviews revealed more than just differences in frequency of communication. They revealed subtleties in the communication process itself. Respondents in high-paneled cubes described what they called “pseudo-privacy.” The high panel supposedly created privacy, yet you can overhear all your cube neighbors’ conversations.

Design Manager: *When we were in cubicles we still sat very close to each other and I would overhear bits and pieces and I would either have to interrupt by standing on my desk and peering over a cubicle wall or running around the corner. And it felt invasive. I felt like I was stepping on a conversation that I wasn’t invited into. And my choice was I could either be obnoxious or I could sit there and pretend I didn’t hear it. And that was problematic. Whereas, I feel with the open desks people know that they’re having the conversation right in front of you. And between my ability to tune things out and other people inviting me in just by a look, not even by speaking, but by glancing. I think it’s better.*

What do you do when you overhear a telephone conversation and you realize you have information that could help resolve a problem, but you don’t want to admit that you overheard the conversation? Is this eavesdropping or just the unfortunate by-product of minimal acoustic separation? What does being “civilized” mean in this kind of situation? If you cannot see over a panel, how do you know if your neighbor is there or not, and therefore whether you need to modulate your speaking voice, or just not have certain kinds of conversations? High-paneled cubicles exacerbate these kinds of problems, while more open team-oriented bullpens and pods, with their unobstructed visibility from a seated position, provide useful cues that govern interaction and reduce unwanted interruptions.

The more open the environment, the more frequent the communication and the shorter the duration. Rather than being viewed as “interruptions,” these short, frequent interactions provided very fast feedback and response times, allowing work to move forward overall.

Building Trust

Trust and comfort among team members are a theme that came up repeatedly in interviews with employees in team-oriented bullpens and pods. It mirrors the recent interest in the concept of “social capital”(28). The work on social capital, on how social and emotional relationships affect everything from work output to organizational commitment, suggests that effectiveness cannot be defined by individual talent, effort or output, despite the fact that for most of the last 100 years or longer most firms in this country conceive, evaluate and reward performance on an individual basis. In a world dependent on the constant flow of information, and the need to attract and retain the best workers possible in a sellers market, the connection between social relationships and performance takes on new meaning.

VP: *I think we all like each other. I think we all laugh at each other and we also respect each other. Like I know my strengths and weaknesses, but I think Beth and Nancy [pseudonyms] know them better than I do. And I know their strengths and weaknesses probably better than they do. It’s cool. We play off of each other very well. You consider you may be taking 20 minutes out of your workday to get to know somebody, but it’s worth it.*

Software Engineers and Concentration

Software engineers took less time to communicate when they were familiar with one another and when they worked in close proximity.

Seaman and Basili, 1997

People are about five times more likely to turn to friends or colleagues for answers than to other sources of information such as databases or policy and procedures manuals.

Cross and Baird, 2000

Perhaps no group is more closely associated with the need for deep and extended levels of concentration than software developers. Frequently cited is the “fact” that if a software engineer is interrupted it takes twenty minutes for her to get back in the “flow.” Yet our research suggests that even in this prototypically concentrative discipline, communication and the social fabric of work are key.

Others commented:

Engineering Manager: *It helps build a stronger team, having an open area. They interact with each other a lot more, so they know each other a lot better. I think that helps them be more productive and to have a better attitude.*

Web Designer: *I’m more involved in people’s lives around me and I feel like they’re more involved in mine in an open space, and I like that.*

Web Designer: *Being able to establish social relationships definitely helps me work better. I feel like it’s much less of an imposition to ask questions and I can save time. And I feel more comfortable asking for help or getting input.*

QA Engineer: *I think a productive work environment includes being able to take little breaks and just turn around and talk to your neighbor and check in and see what’s going on. So, I think that helps with productivity because you develop a relationship with that person. It’s easier when you know someone and you have a relationship with them and you see them all the time. “Hey I need some help with this. Do you know how to do this?”*

A strong social fabric contributes not just to productive work, but also to good job satisfaction: feeling good about work, colleagues and the company.

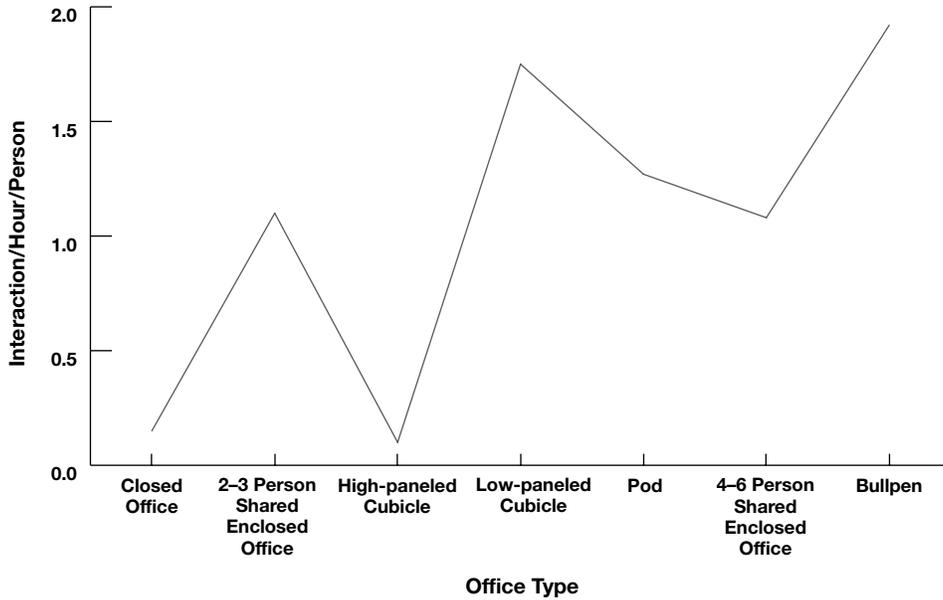
Product Designer: *I think my satisfaction with coming to work is much higher now, because I feel like I’m working with a group of people who are interested in the same topics of quality of work that I’m interested in. I have more social interaction, so I’m just happier coming to work. So, therefore I’m much more likely to stay at (this company).*

Design Manager: *There’s a lot more joking. And a lot more just casual conversation, “New shoes? Where’d you get those shoes?” Or somebody’s getting up and going to lunch and somebody else is fumbling through their purse at the same time and they say, “Do you want to go with me?” So, definitely more sociability in the open environment.*

Design Manager: *Everyday somebody says to me that they stay because they’ve got friends here or because they like so and so’s sense of humor. It’s a big deal—a big part of the job.*

QA Engineer: *I’m more shy asking people for help. If I don’t know them that well and I don’t interact with them, it is harder. It’s easier for me to approach somebody if I know them.*

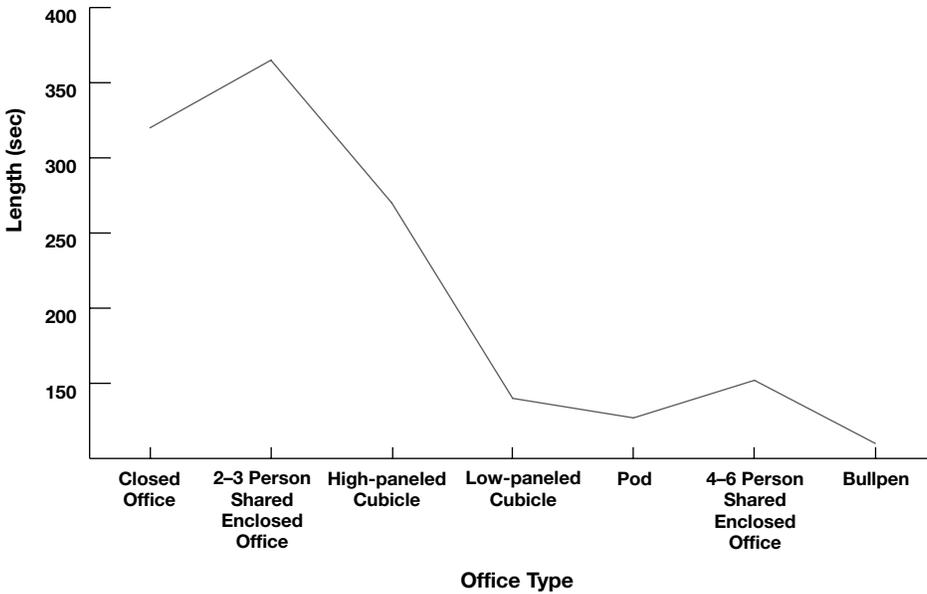
Interactions/Hour/Person by Workstation Type



Observed frequency of interactions is higher in more open office types.

Source: Scott, 2001

Mean Duration of Interactions by Office Type



Observed duration of interactions was shorter in open office types.

Source: Scott, 2001

Other people commented on the trust, honesty and team building generated in their team-oriented bullpen, and how that created a climate in which it was easier to think and act critically without offending others.

Software Developer: *There is this idea of ruthless honesty. When something is wrong or if you said something stupid ... you normally hear ... "That was the stupidest thing I've ever heard." Being able to remove yourself personally from that, and just be able to say, "Oh. That was stupid." Maybe it diverts you to a new path. Your design affects everybody. And if you come up with a bad design you literally screw everyone on your team. And so you straighten everything up with a lot of honesty. So it's good.*

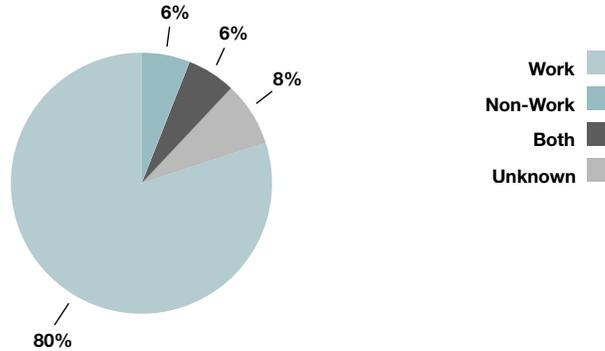
Product Manager: *I think because I know people fairly well and they know me fairly well I do tend to throw out an idea that I might have been scared to before or sometimes be more honest. Whether it's throwing out an idea or whether it's saying I think you're crazy or whether saying in all honesty I have no idea what you're talking about, I think I do because I know them on a level that's beyond just the professional.*

Within a scientific management framework, socializing at work has been viewed as "wasted" time because it is "off task." In organizations where teamwork and collaboration are critical, socializing is the glue that binds a team together. It builds the trust that is absolutely essential to effective collaboration. The more open, team-oriented bullpens and pods, in comparison to high-paneled cubes, had significantly higher levels of social communication.

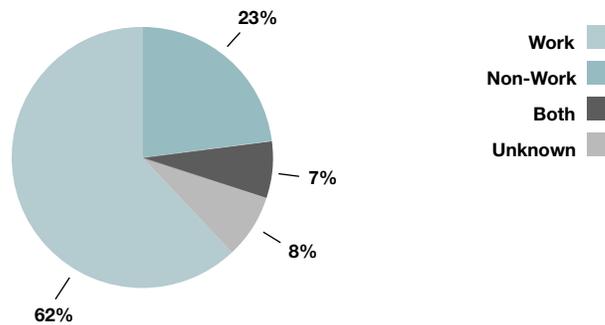
Visual Access and Behavioral Cues

Think about how we learn to "read" family members' or roommates' behavior and moods when we share a house or apartment. One glance at "Dad" and you know this is not a good time to interrupt. We learn to interpret facial expressions and body language, to understand the flow and pattern of different activities. Conflict is avoided by understanding the subtleties of nonverbal behavior.

Nature of Observed Interactions in High-Paneled Cubicles



Nature of Observed Interactions in Pods and Bullpens



The percentage of social and combined social/work-related communication was higher in team-oriented office types. Social interaction was related to job satisfaction.

Source: Scott, 2001

The same process operates in office environments that make visual access of others possible without leaving one’s workstation or standing up. In speaking with professionals of all job functions about comfort levels with team members, those who worked in team-oriented bullpens, pods and shared closed offices repeatedly mentioned the importance of visual access and behavioral cues. Being able to just look up and see what teammates were doing made it possible to avoid interruptions and maintain concentration.

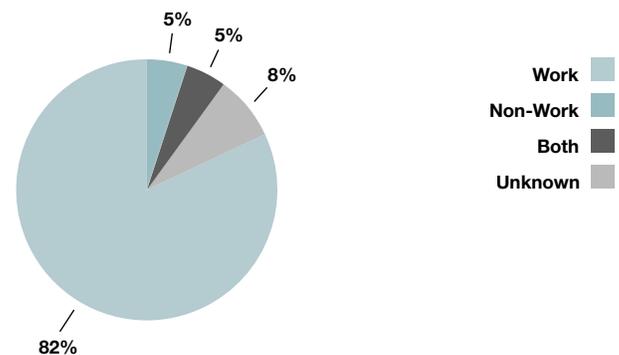
Managers, in particular, described how visual cues influenced interaction patterns.

Engineering Manager: *Most people approach me, I think, with less awkwardness, because I can see them and I can see them coming. So, I can look up and acknowledge them and acknowledge their humanity. Whereas when you’re approaching somebody in a cube and their back is to you, you don’t know what they’re looking at on the screen. You don’t want to interrupt if they’re writing code. Whereas if I walk by somebody I know and they look like they’re really busy and intently studying or doing something, then I can just pass by and come back later. Where, in the cubes, you walk all the way over there, and you think if you’re there you may as well interrupt them.*

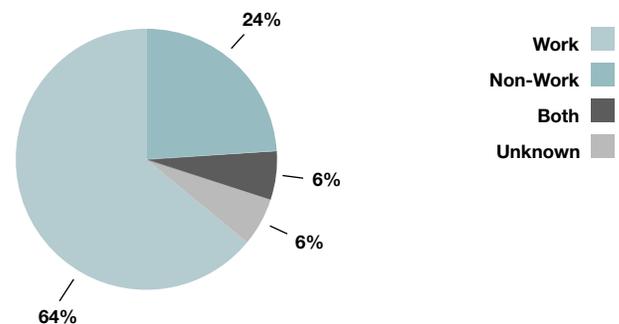
The more open team-oriented offices and the visual cues they provided helped managers time their interactions so they were less likely to be viewed as interruptions.

Engineering Manager: *Probably productivity would go down if my whole team were in closed offices. Even though you get a lot of distractions when you're in an open area, you can ask questions so quickly. And you're not as tentative to go over and ask somebody a question when it's an open area. If somebody has an office and the door is closed you kind of think, "Should I be knocking on this door or not." In this case (open layout) I can just see if they're there and kind of see if they're busy. You can see whether they're in a bad mood and know when to approach them. It makes productivity a lot higher.*

Managers' Interactions with Teams (High-Paneled Cubicles)



Managers' Interactions with Teams (Bullpen and Pods)



Percentage of social and combined social/work-related communication between manager and teams was higher in team-oriented office types.

Source: Scott, 2001

Manager of QA: *I turned around and waited for eye contact making sure that it was okay to enter there.*

Developer: *[You] can see when someone's working. You can just look at them. I could be sitting at my desk and I can see everyone in the company. You can tell if someone's working very hard. And it's a nice gauge. It's a nice indicator to know when it's okay to go to that*

person. If I were in a cubicle all day I would never see their daily routines. I might try to initiate some sort of dialogue or conversation at a really bad time. But the way this is set up, I can look at them all day and be like, “Okay, this looks like a good time. I’ll walk over there right now.”

Unexpectedly, as these data suggest, more visual contact actually contributes to fewer unwanted interactions, not more, by changing not so much the frequency as the timing of serendipitous communication.

Managers and Interactions

So far, we’ve focused mostly on rank and file computer engineers. Our research suggests that managers also find working with their team in a team-oriented bullpen and pod setting beneficial. As it does for staff, the greater visual access allows managers to read the behavioral cues of their staff and to use their own behavioral cues to forge stronger and better relationships with them. It also allows managers to get more accomplished in a face-to-face manner, in contrast to sending email that can more easily be misinterpreted.

Engineering Manager: *I think that having my engineers in the open space and close together has made it a lot easier. I actually have a mix. I have some developers in cubicles and some in open space. And I think the communication is a lot better among the engineers themselves. And it’s also easier for me to go over there and talk with my whole team at once. And people over hear things. And you have sudden meetings.*

Manager of QA: *Email makes things pretty quick and I relied on that more heavily when I was in a cubicle separated from people—even with people who are pretty close by in cubicles, because I wouldn’t know if they were on the phone or not. So, speed wise I think it’s slow for me to have to walk down to the end of the wing and talk to people in cubicles. So, email made it faster. Now I can rely more on what I think is more effective communication, which is going over and talking to them... I think from what I’ve learned being in management for one year is that people can misconstrue things on email all the time. So, it’s (walking up and talking to them) conveying more of the emotional side. If it’s easy to approach people and to roll up next to people in the open environment, then it makes it easier to just talk and communicate verbally. I think that’s more effective.*

For managers, more frequent face-to-face communication serves the additional purpose of supporting effective mentoring, which requires knowing the person, not just his or her formal skills or demonstrated abilities. It also helps reduce some of the psychological distance between managers and their staff.

Manager of QA: *I feel like I’m getting more interrupted now. It’s easier for people to come up to me. I think there’s give and take. I think it absolutely benefits my relationship with people. I feel as though I’m not viewed so much as the manager who’s coming into their space.*

Design Manager: *And I know from meeting with my staff it’s a lot easier just to catch somebody’s eye and say, “Where are we on that?” And it’s a lot less loaded, because I’m not sending an email saying, “Can you update me on the status of this project?” and having somebody panic on the other side of that email.*

Engineering Manager: *I don’t generally like scheduled meetings (with the people I manage). I like to talk to them individually and the open space has made it easier for me to do that.*

The Value of Feedback

Research on effective leadership has found that leaders who collected performance information or gave feedback were more likely to be successful than those who did not. Leaders who let their teams know when they were doing right or wrong things were also more likely to succeed. In fact, the frequency with which leaders monitored and provided consequences was a basis on which to predict their success.

Komaki and Desselles, 1989

Design Manager: *It helps me build relationships with each of the people who report to me versus having big meetings where each person says what they're doing. And I think having that relationship with me is actually very important, because I can also let them know what's going on. So, I think it works pretty well.*

Engineering Manager: *I think the open desks are really good for managers coming to just talk... As a manager I felt like I was walking down to the little houses (and interrupting).*

Tacit Learning

Tacit knowledge constitutes the majority of human knowledge. As Mascitelli (22) describes it, “tacit knowledge lies below the surface of conscious thought and is accumulated through a lifetime of experience, experimentation, perception, and learning by doing. It is rooted in personal experience, and is often filtered through one’s own perspective, beliefs, and value structure.” It is also more difficult for organizations to grasp and transmit because it is shared only with the consent and participation of the individual who possesses it (12, 21, 26). In short, the propagation of tacit knowledge, which is absolutely essential to innovation, and the flow of information is dependent on relationships and communication among individuals.”

Tacit learning occurs in a serendipitous, unplanned way, as a by-product of our routine, daily activities. It is learning that depends on being able to see and hear and observe how others handle different situations. How does your supervisor handle upset staff, or respond to difficult questions? How does the crack programmer on your team tackle difficult problems? We learn by watching and hearing, not just by being formally “instructed.” Not many parents hold “seminars” for their children on manners! Important knowledge about how to be “civilized” in a family context is passed on dozens of times a day to children, without parents thinking about “teaching” or children thinking about “learning.” This same form of tacit learning occurs in, and is critical to the success of organizations. Work environments that are more open create more opportunities for observing and learning from those with more experience and different skills.

Computer Engineer: *I knew right from the second when I walked in there that “this is a pretty cool (team-oriented bullpen).” I could hear people talking. As you are learning, you are picking things up from hopefully everybody you’re working with. You’re working with them because they bring other talents and so forth to the table. So when I’m listening to how other people are working on deals or business negotiations, not only am I working on mine, but I’m learning how they’re doing it. You still pick up the knowledge that other people have that you don’t have.*

In most companies, keeping everyone apprised of what is happening throughout the firm, let alone one’s own and others’ departments, takes considerable energy. Yet like a fifty horsepower engine in a two-ton truck, no amount of gas makes climbing hills simple. Easy, visual access is like adding a turbo to an engine; with little additional energy, it is easy to learn what is going on in one’s own department or the firm as a whole.

Web Designer: *I hope to never leave the technology room (bullpens). I don’t need any more space. I don’t want any more space. I feel it would be very detrimental to my personal life, my career, my company and the organization overall if I ever left that bullpen. I function there. I thrive there. I want to be there. I can focus when I have to. But otherwise if I miss that link to the network of information that’s flowing in there I lose tremendously. There’s no way I could keep up with phone, fax or email on the volume of content that is moving through that space. Verbal communication, side conversations, indirect conversations, and etc.*

Explicit and Tacit Learning

Knowledge comes in different forms (explicit and tacit) and is maintained by organizations in a variety of ways in the form of organizational memory. Explicit knowledge is captured and conveyed in things like specification manuals and formal organizational policies and practices. Explicit knowledge can be easily replicated and distributed throughout an organization, though it is often quickly outdated, and subject to the organization’s inherent bureaucracy.

Nonaka and Takeuchi, 1995

There's just no way.

Marketing Associate: *I like it. I like it a lot. Because it opens up the communication. I feel more of a sense of team and I like the idea that I can—not that I eavesdrop—but sometimes you may be too busy to always be conscientious about communicating things. So this way I find out things that eventually I'm sure Matt would get around to telling... I hear more of what's going on. I can be more involved. And... especially if you have the case of people who are poor communicators... you just overhear the conversation over the phone. At one time I used to think that that was not a good thing to do. You just minded your own business, but now you have to (pay attention to everything going on) in order to do your job better. So, I may get a phone call asking about a certain topic and, overhearing a conversation, can put two pieces of the puzzle together. And I'd say, "Wait a minute, you know what? Maybe this has something to do with this, this and that."*

Manager of QA: *There's a person that I think I wouldn't necessarily have talked to [in a closed office environment]. But now, in the open desks, because I'm staring at him everyday and one time our eyes met and we just started talking...now I talk to him. So, I learned what he was working on, which helps beyond the collaborative side. It's more than just learning about what other engineers are working on—I learn about what else is going on in the company. This is important because having a sense that other things are going on generates excitement. And I think it also prevents people from getting down on the company, like, "Oh, nothing's going on. What are we doing?"*

New Knowledge

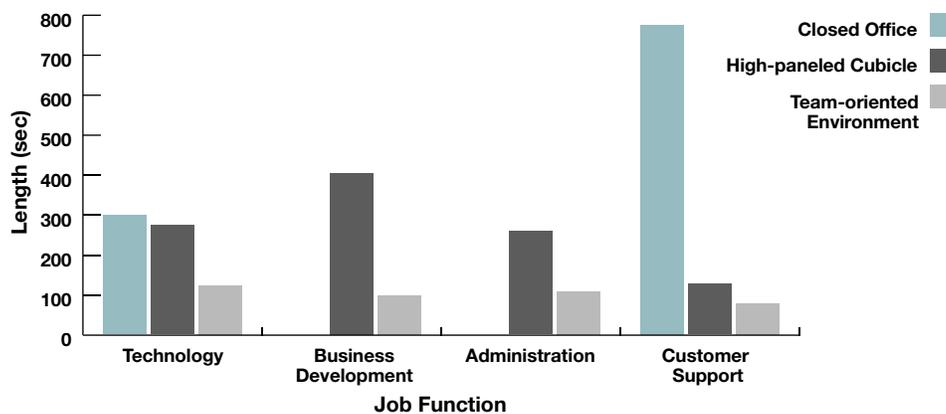
"New knowledge is continually created through complex processes of social interaction that link the tacit knowledge embodied in individuals and the explicit knowledge resources that the organization possesses."

Nonaka and Konno, 1998

Visual Access and Interruptions

- Allows an individual to time the initiation of conversations better, in order to reduce disruptive interactions.
- Enables a person to see actual work occurring in other business units or departments, facilitating a greater transfer of information both within and across teams.
- Enables a person to assess a situation before fully committing to an interaction.
- Reduces the likelihood that someone left out of an interaction in which he or she should be a part.

Length of Interactions by Job Function and Space Type



Overall, across all job functions, interactions lasted about two minutes in team-oriented environments, compared to twice that length (about five minutes) in more closed office types.

Source: Scott, 2001

Non-verbal communication

In a study of the impact of three channels in face-to-face communication. with total impact being 100%, words accounted for only 7%, vocals expressed 38%, and non-verbals conveyed 55% of the meaning of a communication message.

Mehrabian, 1978

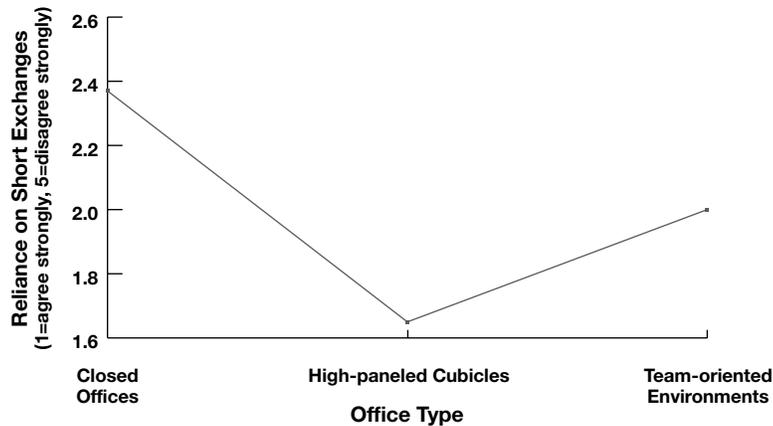
Senior Manager: *[An open workplace] keeps you aware of what's... going on for everybody who's in your earshot. In finance that matters just because you know what people are spending things on, and if people are committing to things, you want to find out why they're committing to it or what they are committing to and is it in the budget.*

IT Engineer: *I think if it was any more sectioned off like a floor in an office building with cubes or offices I probably wouldn't know other people in the company as well as I do just because I wouldn't have that visual contact.*

VP, Finance: *[The open workplace] gives you more information about what's going on in the company. It gives you more insight as to what other groups are doing and that overall is better for making decisions.*

Developer: *Whether it just be hearing information or actually just walking by someone's desk and seeing it laid out. And you feel it's okay to look at it. It just gave me more insight on the company.*

Reliance on Short Informal Exchanges with Team Members by Space Type



Team members in more open, team-oriented environments relied more on short, informal exchanges to gain information from team members.

Source: Scott, 2001

For younger staff being able to learn what is going on from senior management without having to attend formal meetings or be the recipient of formal messages had a lot of appeal.

Manager, Strategic Development: *When I sit in between my boss and my CEO, I hear a lot. I learn a lot just by watching it. As for a company that's evolved as quickly as we have and as much as we have; I don't think we could have done it if each person worked in their own office. Everything that we did was because we had our ears open.*

Decision Speed

According to the interview data, office type was an important factor in decision speed, largely because it affected the speed with which one received information and/or feedback. The proximity and access available in team-oriented open plans fostered an ability to communicate and resolve issues and make decisions as they arose, rather than relying on formal mechanisms and scheduled meetings that by their nature only occurred periodically and, then, for longer periods of time.

VP of Finance: *[In] a setting like this we have impromptu meetings. No formal planning like, "Let's have a meeting at 3 o'clock. Because we are talking about it anyway, why don't we just do it right now?"*

VP of Products: *You would save up all your questions and once a day you would sit down and go over all of your questions. That doesn't happen when you're in this kind of team-oriented bullpen environment. If you have a question you ask it. And sometimes that's better, because if a person's working on something and they need your input, it gets your input immediately.*

Web Developer: *For some things [a bullpen is] faster because you can get feedback. I think the quality is higher because you can get more feedback and get it more often and more timely. I don't have to wait as long.*

Design Manager: *I think it has saved a lot of time. It has prevented a lot of unnecessary meetings. It has enabled us to move a lot faster. When they took the walls down, my initial reaction was that I was really afraid that it was going to be distracting and noisy. And I've found that my ability, personally, to tune it all out is phenomenal. And that the benefits really outweigh anything I was worried about.*

Individuals in closed offices or cubicles relied more on formal mechanisms such as meetings, phone calls, and email to gain feedback or accomplish their work, and even to socialize. Scheduled meetings tended to take longer and be much less frequent than the shorter and more frequent exchanges that were part of daily life in pods and team-oriented bullpens.

Design Manager: *At (this company, with closed offices) there was a lot of email. There were a lot of scheduled meetings. And then the meetings also tended to be very people heavy because you want to pull everybody into it who might have an opinion. So, that makes them longer, too, and less efficient in a lot of ways. And what happens in this environment and in the room with many people (team-oriented bullpen) is that you tend to do it quickly. You tend to pull people in; just the people who need to be there; just the person you need to talk to at that moment. There's less secrecy too. When a big change is coming down, the word gets out faster. This might be a little frustrating to the higher-ups; but I think people work better when they know more.*

A web designer commented on the positive impact of workspace on decision speed:

Web Designer: *I think the open environment facilitates me getting things done even quicker, because I can ask questions quickly where you may get stumped on something and spend a long time trying to figure out what was the right way to go and you can just ask somebody and get a little bit of an idea and take off with it and come up with a quicker solution or whatever solving the problem is.*

Employees at all our sites commented on how easy it was in a team-oriented open environment to know what was going on. One way that increased speed and quality of work was by being able to understand and incorporate a supervisor's intentions and goals earlier into the development of projects and reports.

Computer Engineer: *I'm hearing what's going on with what they're doing. As I hear what's going on, I'm incorporating those things (into what I'm working on) and it just makes it that much closer to what they're really looking for. So, it's not all scheduled meetings. I can stop by his desk and ask him in a 30 second time period—probably 5 or 10 questions that I need to have some quick answers to—go back and do my work—and I'm not constantly waiting to talk to that one person to give me feedback. Because... if it's always going through one person and you're waiting for them, there's a bottleneck and that just slows down the whole decision making process.*

In more closed environments feedback and project reviews occur, but formal meeting mechanisms and scheduled meetings become a necessity.

IT Architect: *We rarely have ad hoc meetings here. Usually we'll pick some times to meet. In our group, we have a standing, every other day meeting. Even if we don't have a defined agenda. We make sure that we have face time to talk about any issues that are going on. It becomes kind of a necessity because of walls, because you sit in your office and email and talk on the phone.*

Software Engineer: *We rely on our management to tell us who's working on what... We can't discern that ourselves as an organization. So, we can't self-manage ourselves in relationship to others... So, I think it's an environment where you have a lot of highly paid, very successful people who could self-manage themselves well and (we) put them into a position where they are reliant on others for what they should and shouldn't be doing and that creates all kinds of problems. That's where this whole thing gets a little goofy.*

Our research, not surprisingly, suggests a trade-off with respect to speed of work because on one hand, you have easier access to information in an open environment; but on the other hand, disruptions of individual work are more frequent. How these two competing observations are valued depends on whether the focus is on what the individual produces in any given unit of time, or on what the team produces, and of what quality, in a given time period. Our data suggest that individual performance or productivity may be reduced in a given unit of time, while both individual performance and that of their team benefit over the life of the project. In other words, this minute's interruption can be annoying, but over the life of the project such "interruptions" tend to be seen as contributing to overall success.

Summary of Findings – Office Type, Job Function and Interaction

- Interactions of managers and their teams were shorter in more open spaces.
 - There was a higher percentage of non-work interactions with managers in open spaces.
 - Interactions of managers not co-located with their team members were almost three times longer than those of co-located managers.
 - There was a higher percentage of non-work interactions among managers co-located with their teams.
-

New Product Development

"The ability to create a stream of revolutionary new products can represent a sustainable competitive advantage for firms in almost any industry. Whereas evolutionary product improvements often follow predictable trajectories, breakthrough innovations involve unexpected leaps of creativity and insight."

Mascitelli, 2000

In summary, though the survey results show very little difference between office types with regard to team-based organizational outcomes, the interview data suggest that more open offices do a better job of fostering comfort with team members, informal communication and cohesiveness than do partitioned environments. Repeatedly, people commented that the ability to have a quick informal conversation increased their knowledge and understanding of other team members, and contributed significantly to their effectiveness. This was supported by the observational data that showed more interactions of shorter duration in team-oriented offices. On most measures, the most common and stereotypical open plan environment, high-walled cubicles, performed the poorest and was least liked. Somewhat surprisingly, one-person closed offices, often seen as the Shangri-la of office designs, were not universally viewed as the best or most effective work environment. Age is likely to influence this view.

Age Demographics

During the height of the dot.com surge, the country witnessed an exodus of talented individuals from companies like IBM and Procter and Gamble to start-ups such as Amazon.com. People were attracted to a start-up culture in which they could “come and go as they please, wear what they like, work the hours that suit them... work in small groups and be part of every decision” (4). Even though many of these companies have not survived and people are moving back toward the security of mature organizations, large organizations have and continue to adopt many of the more fundamental characteristics of dot.coms, including minimal formal status, the value of free-flowing communication and debate, and more open and flexible work settings. Younger employees are not attracted to hierarchy, to formalized communication, to “waiting their turn.” And while the loss of employees to emerging business sectors has declined sharply, in 15 years there will be 15% fewer Americans in the 35 to 45-year old range than there are now. At the same time, the U.S. economy is likely to grow 3% to 4% per year. So during that period, the demand for bright, talented 35 to 45-year-olds will increase roughly 25%, and the supply will decrease 15%. (34)

Younger employees may shun dot.coms, but they are not going to shed their world views, no matter how much baby boomers hope they “get real” as they enter larger and more mature organizations. The fundamental issue is not whether one can attract or even retain younger staff. It is whether one can tap their passion and commitment; meet their expectations.

Age and Change

Common wisdom has it that older people are more change resistant than younger ones. Perhaps. My own experience is that people, regardless of age, rarely resist change that a) enhances their status; b) makes them more comfortable; c) strengthens their professional and personal identity. I know of very few cases where employees who have been promoted resist moving in to a larger office. Conversely, many examples come to mind where someone ensconced in a large, comfortable office has resisted moving to a smaller and less comfortable office. It may be because it undermines his or her sense of self-worth, fails to deliver what they feel entitled to, or conveys what the occupant considers is the wrong message about his or her role and authority in the organization.

Resistance also comes from simply having to leave a personal comfort zone, a place that is familiar, if nothing else. The great attachment sometimes evidenced for a small, dull, nondescript gray or beige workstation reflects the comfort many of us find in the familiar. In this context, age is likely to play a role in our reactions to office type simply because

“The most intense competition will not be for capital or technology, but people. Corporate battles will be won (or lost) on the strength of superior human capital.”

Deveshwar, 2000

Attracting and Retaining Employees

Attraction, commitment and retention of employees represent a major challenge for dynamic organizations, notwithstanding the current economic downturn. Seventy-two percent of nine-hundred executives surveyed listed finding exceptional employees as one of their top concerns, followed by motivating their employees (55 percent).

Comeau-Kirshner and Wah, 1999

older workers are more likely to have spent more time in and become accustomed to whatever work environment they are in, whether or not they originally liked it or it actually helps make them more productive.

For all these reasons, it is useful to carefully examine whether worker’s age affects perceptions of the work environment. The firm itself also has to consider, seriously, whether it believes it is in its best interests to support the status quo with respect to comfort levels, status desires and professional identities when personal preferences grate against organizational priorities. Therein lies another organizational dilemma: Do you risk alienating some of your more experienced employees when their personal satisfaction requires using more corporate resources than might be necessary; and more importantly, when the preferred environment might not be the most productive environment?

Our research sites offered us relatively few opportunities to look at age across the full range of office types. That was because in the few sites with closed offices, almost all the occupants were middle aged (and in technology and engineering positions, men). Not surprisingly, we found that middle-aged men in closed offices liked them, found them supportive of their work effectiveness, and believed (as noted above) that they supported effective communication patterns. We did, however, have in our sample what we called “shared enclosed” offices (a fully enclosed room with 2-12 people occupying the room), and these had a wide age range occupying them.

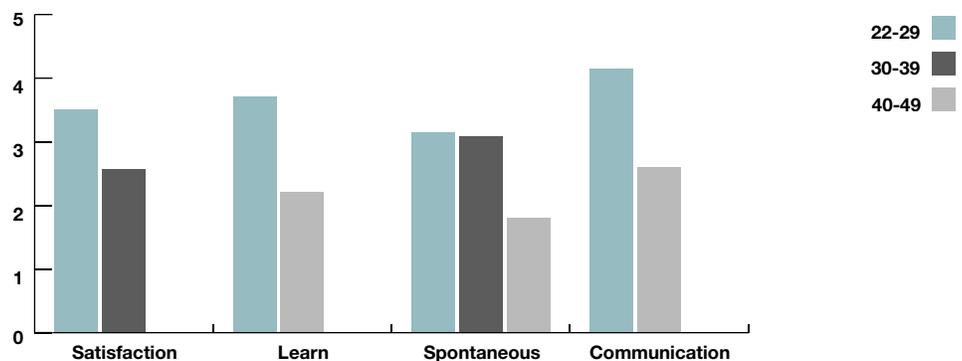
The data showed that younger workers liked these kinds of offices more than older workers. The reason was instructive: they felt they could learn more from their “officemates” in this kind of office. This makes sense, since in interviews a common reason for wanting to join a company was the opportunity to work with “great” people. Having great people around, whom you rarely see and even more rarely talk to, is not of real value. Respondents talked about the much greater learning opportunities in a more open environment. Older respondents, in contrast, found it harder to concentrate and more disruptive. It also seemed the case that older respondents were simply comfortable with how they had learned to do things over a number of years, and did well.

Commitment

Defined as a “strong belief in and acceptance of the organization’s goals and values, commitment is a willingness to exert considerable effort on behalf of the organization and a definite desire to maintain membership.”

Porter, et al, 1974

Shared Office Workspace



Younger computer engineers are more effective in Shared Offices and Bullpen workspaces.

Younger employees place a high value on: learning through having easy access to colleagues.

Source: Dallas, 2001

Their thirst for being “stretched” intellectually to develop new skills and competencies was less evident than that of younger employees who knew they had a lot to learn, and could benefit from being around and interacting with more experienced workers, as well as just other people their same age. Making older workers somewhat more uncomfortable, by collocating them with younger staff, who approach problems in different ways, might contribute to the firm’s longer term success. Ultimately, this kind of collocating might also contribute to strengthening the professional and personal identity of the older worker by keeping her or her skills current. Because this kind of collocation is more likely to meet with resistance than enthusiasm on the part of the older worker, the firm needs to be clear about its priorities and communicate them effectively.

Generations in the Workplace

Baby Boomers (born between 1943-1960) Boomers tolerated employment circumstances that were less than ideal; loyalty and tenure were rewarded and changing jobs frequently raised eyebrows; they expected to work hard and long to have an impact, and to move up the corporate ladder.

The typical **Gen Xer** (born between 1960-1980) wants a high quality of life—flexible schedules, shorter commuting distances, interesting work cultures, higher salaries, and a position that grants them immediate prestige and responsibility. Gen Xers tend to be informal and direct in their communication style, relying heavily on email and thinking nothing of bypassing their managers and going directly to the boss for input and information.

With their attitudes and use of technology, **Gen Yers** truly set themselves apart from the Gen Xer and the Baby Boomer. Baby Boomers remember the days of offices without personal computers. Gen Xers were introduced to the computer in their teenage years and helped popularize the Internet by making it more accessible. Gen Yers don’t know a world without computers, and they have begun to define how the Internet will integrate into everyday life. The first and foremost thought in the mind of the Gen Y worker is “What’s in it for me?” She has no tolerance for corporate hierarchy and politics. Instead, she is far more interested in connecting the work she is doing today with the work that she wants to be doing in the future. Moving ahead is predominantly about contributing ideas to the business that are implemented today, not at some unforeseeable time in the future.

Source: Zemke, Raines and Filipczak, 2000

Workplace Cost, Density and Effectiveness

Workplace Cost, Density and Effectiveness

- Density Variations
- Tipping Point and Buzz
- Density and Cost

Under pressures to reduce cost, the first tactic for many organizations is to increase density. It is fast and relatively inexpensive, compared to leasing more space. It also preserves existing adjacencies, which are typically viewed as critical for effective communication and group cohesion. The critical question is when does increasing density become counterproductive? At what point does adding more people to the same space undermine the ability of people to work effectively, if not comfortably? In effect, what we need to know is what Malcolm Gladwell (16) calls the “tipping point.” It is the point where adding another drop of water makes the glass overflow, or adding another person to a room all of a sudden makes the situation intolerable. The tipping point is the proverbial “straw that broke the camel’s back.”

Part of the popularity of coping with growth and cost by increasing density, aside from its seeming ease, may stem from the fact that there is little published data linking density to organizational effectiveness indicators. We know very little about when increased density intersects with reduced performance or higher turnover. The research on which this reports draws explores this issue. Its value, because of the small sample size, lies primarily in suggesting a methodology for addressing this fundamental space planning-work effectiveness issue.

Density Variations

There was tremendous variability in density across firms, and within the same office type. The studied firms, all with a common business focus of e-commerce, ranged from a web-development group housed within a large corporation’s headquarters to a web-development group spun off from large, established corporations, to start-up dot.com web-development firms (see Appendix A: Site Profiles).

The usable square feet using the IWSP Group Density measure (see Appendix B: Research Methods) for employees in team-oriented bullpens ranged from 51-106 s.f.; in cubicles from 71-144 s.f.; and in offices from 112-235 s.f. Generally, but not always, the more enclosure, the larger the size range. The BOMA floor density measure showed the study firms ranging from 76 s.f. to 200 s.f. The average s.f./person for different office types using the IWSP Group Density measure ranged from a low of 64 s.f./person in team-oriented workstation pods to a high of 153 s.f./person in private offices. The sample was too small to draw any solid conclusions, but it is worth noting that the lower densities (more s.f./person) were not always associated with the larger, more established corporations. Densities simply varied by office type within and across the business units studied.

Density Variation

	Autodesk, California	Autodesk, Ithaca	Buzzsaw	CBORD	eMarketer	istarXchange	Toyota eBusiness	XYZ.com
Group Density (Average)								
Private Office	132	134		112		235	152	
Shared Office		131	93		92		76	
Cubicle	144	92	70	49		120	71	
Pod						64		
Bullpen	51		57		63	61		106
Boma Floor Density (Average)	192	200	191	87	76	162	221	299
IWSP Floor Density (Average)	186	200	177	87	76	155	221	287

Tipping Point and Buzz

Our research sites provided two opportunities to explore how changing densities over time affected employees’ ability to work effectively.

The first was in the web-development firm that was a spin-off from a large, well-established company. In this firm, all the technology people involved directly in web design (not unlike the marketing or human resources groups) occupied a single large room (1,864 s.f.). Over the course of about 12 months, the population occupying this space grew from about 4 people to over 33 people. The density increased from 196 s.f./person (when we first collected data) to 55 s.f./person (the point at which we last collected data).

What started as a quiet, fairly spacious teamwork area evolved into a lively, bustling and energizing space. Then, as density continued to increase to 55 s.f./person, most employees considered this same office area “horrible.” One employee likened the slow evolution of increased density as the difference between being forced to drink 5 gallons of water at once, or just drinking a few additional glasses of water a day until you had consumed five gallons.

Computer Engineer: *When I came here we were about 4 people. So, after 2 or 3 weeks there were 2 people added. And then after 3 or 4 weeks, another 1 person. We didn’t really realize (what was happening with the population growth)... because they came gradually. Because I think now we are at the stage that it’s impossible to handle all these people... we are so many people it will disturb working... But until now I think everybody was comfortable with that. Nobody complained. But now we’ve got to that stage where it’s at a tipping point.*

Another person captured the impact of a density that had passed the tipping point:

VP, Human Resources: *There’s too much noise. In all honesty, there are too many bodies in there. We’ve put an air freshener in there. And this is an environmental kind of thing. It’s gone over the edge. It’s warm in there. The air conditioner isn’t keeping up. All of those factors contribute to why we’ve got to get these folks up to the ninth floor.*

Too many people can obviously be a problem. So, too, can be too few, as another of our sites suggested. Here, at a small, independent dot.com that occupied a large single room, the population fluctuated widely over the course of our one-year study period. At our first visit in October, 2000, this firm had 55 employees. There was a strong “buzz” and sense of energy and excitement. By February 2001, there were 35 employees spread out on the same floor previously occupied by 55 people. Density had changed from 70 s.f./person to 100 s.f./person. The buzz had disappeared. Employees described how it felt to work in the space at different points in time, from low to very high density.

Manager, Strategic Development: *There have been some days where there aren't a lot of people around when it's almost kind of dreary in here. But when most of the people are in there's a general buzz that you get used to. It's great.*

VP, Strategic Development: *This office space is great in a lot of different ways. When something good happens, everyone gets pumped because everyone can feel the excitement and the energy.*

Computer Engineer: *I guess one of the impacts of having so many people is just a big change in the energy level. When there... were 15 or 20 people—some of us over here—some of us in the back—you could walk around and there would be individual people working at their desk but you just didn't get any kind of buzz. And I think now there's a lot of energy. So, you walk in this place at 8 o'clock in the morning and it's humming. And I think people feed off of that and it increases the energy level of everyone. It's easier to keep your energy level up.*

Many factors interact with density to determine the overall impact of the space on employees. At this second firm not only did density eventually decline as the dot.com bubble burst, but with it also disappeared the tremendous excitement and rosy prospects for doing something great and (hopefully) making a lot of money on stock options. In both these firms the office type was a team-oriented bullpen. Whether these numbers would be comparable for high-paneled cubicles cannot be determined from our data. The demographics of these firms were also characteristic of small start-up firms: employees were young, and many were single. All these factors are likely to influence where the tipping point falls, and what generates “buzz”—or conversely—the perception of noise and disorder.

What our data suggests, then, is not that the square feet numbers we found in our small sample are the actual tipping point for unacceptable density. Rather, they suggest that tolerable and even preferred densities may be higher—at least under some conditions—than is generally considered acceptable. Few organizations today would set the density standard at, say, 100 s.f. usable space per person. But in light of the concepts of “buzz” they might consider setting it lower than they do now, especially when considered in the context of the lowered cost that higher density generates.

Density and Cost

Our survey, interview and observational data all show that more open type office solutions facilitate more, and more desirable, interaction than closed offices, particularly with younger workers. The extent and nature of the communication contribute to decision speed, to getting to know and trust team members, and to job satisfaction. These same kinds of more open office types, the team-oriented bullpen and pod, also contribute to reducing cost. They do so in a straightforward manner. Team-oriented bullpens and pods take up less space than high-paneled cubicles and closed offices.

Hypothetical Cost Analysis for Four Office Types

Total Square Feet	10,000
Office Space	4,500
Support Space	2,000
Circulation Space	3000
Inaccessible Space	500

	Bullpens	Pods	Cubicles	Closed Offices
Size of Workspace	50 sq. ft.	75 sq. ft.	100 sq. ft.	150 sq. ft.
Number of Workspaces	90	60	45	30
Number of People in each Configuration	90	60	45	30
Density per Person	110	165	220	330
Cost per @ \$20 per sq. ft.	\$2,200	\$3,300	\$4,500	\$6,600

More team-oriented office types with higher possible density, reduce costs.

Source: Ramani, 2001

To capture the impact of different office types on cost, we did some simple “order of magnitude” calculations. A space plan with 10,000 s.f. was able to accommodate 90 workspaces in bullpen configuration (50 s.f. each), 60 workspaces in pod configuration (75 s.f. each), 45 cubes (100 s.f. each), and 30 offices (150 s.f. each). Assuming in all cases that of the 10,000 s.f. that 2,000 s.f. would go toward support space, 3,000 s.f. toward circulation space, and 500 s.f. toward what we called “inaccessible” space (e.g., server rooms not intended for daily work activities), this left 4,500 s.f. for whatever type of office we were considering. Using this form of analysis, the floor density within each workspace ranged from a high density of 110 s.f./person (all bullpens) to a low density of 330 s.f./person (all closed offices). At an assumed annual rent cost of \$20/s.f., the differences in cost per employee ranged from \$2,200 to \$6,600.

While these cost figures are rough, they do capture the fact that there are significant reductions in real estate cost associated with higher density. When that fact is coupled with the less well-accepted one that the more open type of work environment actually enhances communication that promotes work effectiveness, one begins to have an answer to part of the wicked problem we posed at the beginning of this report: How does one enhance work effectiveness? The answer, our data suggest, is more team-oriented bullpens and pods. We now turn to the third facet of our investigation: Flexibility and the concept of value for money.

Workplace Flexibility: Value for Money

Over the past several years, the IWSP has explored some of the ways workplace strategies—how space is designed, procured, built and managed—can help organizations better cope with uncertainty. The focus of an earlier report *Managing Uncertainty: Integrated Portfolio Strategies for Dynamic Organizations (3)* was “zero-time” space solutions (tensile and prefabricated modular structures and fully serviced offices) that simultaneously enhance flexibility, reduce costs, are acceptable to employees, and support effective work processes (3).

That interest has continued with the current research, but with a focus on how smaller, start-up firms have managed uncertainty when money and time are scarce and longer term prospects are unclear. Smaller, start-up firms are also fertile ground, we think, for gaining insight into how firms of all sizes might, to use a British expression, get more “value for money” from the workplace.

Workplace Flexibility: Value for Money

- Minimal Renovation
- Iconic Branding
- Targeted Spending
- Open Plan Designs
- Aesthetics of Flexibility
- Diversifying the Workplace Portfolio



This tensile structure was built and occupied in 28 days by bioinformatics scientists, who considered it a first-class work environment. When the team disbands or outgrows the space, the structure can be relocated, sold, or stored.





This 110 thousand s.f. building is constructed of hundreds of prefabricated modules, and then assembled on site to create a building indistinguishable from any conventionally constructed building, inside or out. It costs ~30% less to build, took 8 months to construct, and can be dismantled and removed (and the individual units refurbished and resold) if and when needed.

Minimal Renovation

Buzzsaw, a spin-off of Autodesk, the leading supplier of software for the architecture and design community, was like a lot of other dot.com companies around the country in 1998. They had more ideas than time or money. They were growing fast, and they needed offices quickly. Like many other firms in the same situation, they leased space wherever they could find it. In their case, it was the offices of an old-line San Francisco law firm in a venerable building in the heart of the financial district. They needed space for web designers and software engineers, marketing and sales, and the standard complement of executive and corporate support functions.

Where an established firm with a well-developed corporate identity and the associated space standards and design “look and feel” might have extensively renovated the space before moving in, Buzzsaw by and large “made do.” The large conference rooms became a shared executive office. Individual closed offices were shared by two to four people. The “open” area was filled with the folding tables used in hotels for banquets and meetings, and occupied by a dense pack of computer engineers. A storage room became the meeting area.



Reuse of existing conference rooms and private offices as shared enclosed offices, reduces the time and cost of renovating space, has high density, lower cost and creates good communication and a strong sense of camaraderie.

When Buzzsaw outgrew this space, it moved down the street into a similar type of building. Once again, renovations were minimal. The primary expense was beefing up the power and data infrastructure, fundamental to the nature of the business. The only other significant renovation was laying down carpet tiles and painting the walls, and creating a simple but attractive reception area.



Carpet, paint and a few key design elements transform space quickly and at minimal cost.

What was gained? Time and money. Minimal renovations reduced the time to occupancy and cost relatively little money. These targeted renovations resulted in a space that created a clear corporate image. And as our earlier discussion of office types indicated, the decision to put executives and other staff together in a shared office, rather than renovate space to create individual offices; facilitated communication and interaction and the flow of information that the firm depended on to be able to develop new products and services as fast as possible.

Iconic Branding

One of the reasons large corporations spend the kind of money they do on design is that they want to establish and convey a consistent corporate image to both their employees and to the marketplace. Such corporate design standards can be all encompassing, from business cards and stationery to furniture, materials and finishes, and the architectural design of the building itself. In a recent merger of industry stalwarts in Europe, the new company is designing all of its buildings to be essentially similar, so that they are a recognizable brand from the outside. The image is consistent, but so is the cost and effort required, all of which are considerable. The small start-up companies we visited shaped their corporate image in much simpler, faster and less expensive ways, primarily using the building's interior as the corporate image's canvas.

Google, the highly regarded Internet search engine, captures perfectly the use of very simple iconic features to create a strong brand at minimal cost. Walk into its non-descript headquarters building in the heart of California's Silicon Valley and you immediately feel like you are in a "hip" firm. Why? A row of lava lamps, one of the icons of the digital world, stands near a window. There are two bright red-curved sofas in the tiny reception area, along with a continuously scrolling live digital screen that displays key search words people are entering at that moment in time around the world. In the work areas, the Google "brand" is achieved with brightly colored physio balls lying around to kick or sit on, and name plates made from CD cases with computer-printed inserts that cost fifty cents, rather than the ones originally specified by designers that cost \$75 each. With very little expense and the ability to create the brand almost instantly, Google conveys that it is a fun and imaginative firm that invests its scarce resources where it has the most payoff. Workstations are of good quality, technology is superb and the meals at the company cafeteria (which employees value hugely) are first-rate.

Visit Google’s new, small office in New York City and you immediately know you are in a Google facility: lava lamps, physio balls, colored spheres in the carpet tiles. With very little money and requiring very little time to implement, Google has created a corporate standard that is extremely fast and easy to replicate on as wide a scale as it wants, in any type of facility or building.



Creating an angled architectural wall is expensive and inflexible. Curved walls that are movable, or using icons like lava lamps and red sofas in a lobby is another way to build a brand image at lower cost.

Physio balls project a sense of fun at low cost, and can become part of a simple way to create a brand image easily recreated in different offices.

Targeted Spending

Common to what we found, Buzzsaw, Google and other small start-up companies doing is targeted spending. It starts by rethinking what level of “quality” one actually needs.

Years ago Kodak realized that its commitment to quality sometimes made little sense. Why buy the 25-year carpet if you only plan on occupying the space for five years? The definition of quality shifted from buying the “best,” to buying what fit the situation. At one of the software development firms we visited, this took the form of buying free-standing screens from Cost Plus (a retail home furnishings store) at about \$70 each, rather than buying screens that served the same purpose for about \$800 from one of the large contract furniture companies. Without doubt, the \$800 screens were more durable and of better materials. But functionally, there was little difference. And from a design perspective, the noncorporate look and feel of the less expensive screens were a good fit with the young, informal culture of the firm. If the screen broke, you could replace it several times over and still not have paid the price of the more expensive screen. Implementation speed benefits as well, since the time from purchase to installation can be counted in days, not weeks or months.

Our visits to small firms found many examples of this approach. Buy something that works well for a specific time and purpose, accepting that it may not last as long as a better engineered product or that you may not be able to find the same product in five years time. At Google, the cafeteria chairs cost \$7 each, and a rolling T-screen that served both as a white board and movable divider between workstations or as a sliding “door” to a workstation was purchased from a local job shop that produced it at about a quarter of the cost as the same unit from a contract furniture company. Again, it worked just as well functionally as its more expensive version.



Rolling white boards that double as room dividers or sliding “doors” are flexible and may be made to order at lower cost than a catalogue purchase.

Firms engaged in targeted spending are not buying everything as cheap, in price or quality, as they can. They are doing exactly what Kodak was doing with carpet. They are targeting where they spend their scarce resources. The same start-up firms purchased good quality ergonomic chairs from the large contract office furniture companies because they are demonstrably better, from the beginning, than those one can purchase in retail office furniture stores at much less cost.

Open Plan Designs

The cheapest, and perhaps the most flexible, office is the nonoffice. The less office space required, and the longer the same office can be used (and accommodate change) without having to reconfigure it, the more flexible and less expensive it is. This is one of the benefits of nonterritorial or “hoteling” offices. As more people come on board, the ratio of employees to offices changes, not the physical characteristics of the office itself. This is a perfect example of a “zero-time” space solution, since change is accommodated by a shift in policy (the employee-desk ratio) not a change in the environment.

None of the firms we studied, employed hoteling, but several had adopted some form of team-oriented bullpen or pod. Free-standing desks can be easily reconfigured by the users themselves to reflect shifts in the composition and size of work groups and teams. The constraints are power and data connections, which typically dictate where furniture is organized in space. Power poles, raised access floors, dense floor power grids, flexible overhead wiring (like the power supplies found in automobile repair shops) all help.

Eliminating walls and panels reduces the clear lines between individuals and groups, creating a more permeable set of boundaries that can ebb and flow as groups change and evolve over time. The range of furniture that can be purchased is also wider and less

expensive when free-standing desks are chosen instead of desks that are part of an integrated panel-based furniture system.



Grouping desks in a team-oriented bullpen around a common job function reduces the sense of distraction and interruption that comes from overhearing people talking about and working on something very different than you. Free-standing desks make reconfiguration fast, simple and inexpensive.



The web designers and software engineers in this team-oriented bullpen (top photo) fiercely resisted moving into the high-end cubicles they were entitled to (lower photos) because they felt these would undermine their ability to communicate and work effectively.



Employee complaints about high-density bullpens without any team orientation (a) led this firm to build high-paneled cubicles when they moved into new space (b).



The sense of isolation and disruption of valued communication created by high-paneled cubicles led this same firm to replace the cubicles with team-oriented bullpens that were well-received (c and d).

Reducing the cost of churn (primarily caused by the necessity of reconfiguring workstations and offices to accommodate organizational changes) can have a significant corporate impact. In one global financial services firm, the cost of churn is estimated to be about \$50 million annually. Each physical change of a workstation costs about \$2,000–\$4,000. In other firms, even with “box moves,” where the only thing that moves when an individual changes location is a box of personal files and belongings, the typical cost is \$400–\$600 per move.

Universal plan offices, in which most of the offices or workstations have the same size footprint, make it possible to move people, not walls. But our data suggests that this approach, while reducing costs, also reduces effective communication and interaction when it takes the form of a sea of identical cubicles. As we have argued, few organizations can afford to maximize benefits along a single dimension. Team-oriented bullpens and pod designs typically cost less initially, are easier to reconfigure, and can better accommodate changes in population density. They also allow higher densities before becoming uncomfortable and counterproductive. Squeeze a high-paneled cubicle to the footprint of a desk in a bullpen, and it more closely resembles an isolation cell than an office.

Aesthetics of Flexibility

Speed and precision are uncomfortable bedfellows. Yet for a variety of reasons the “modern” office is, in fact, put together extremely precisely. Hard-walled offices and panel-supported cubicles are rigidly interconnected and changing one creates a ripple effect that can be extensive. Minimally, corporate offices are very tidy in look and appearance. Like the dining room sets advertised on late night television, everything matches. Corporate image defenders like to keep the evidence of work hidden: in drawers, files and behind closed doors. And like a showroom, furniture is lined up and ordered. There is a place for everything and everything has its place. Think of a teenager’s bedroom, and then imagine the opposite.

Buying and maintaining all that order take time and money. An aesthetic of flexibility costs less and supports organizational change better.

It tends to have the character of “messy vitality.” At Igus, a German manufacturer of precision bearings, the exterior building panels, as well as the workstation components are fastened with exposed bolts. They are easy to get to and no special tools are required. Workstation panels overlap, making it fast and economical to get the size of workstation needed without having to buy special panels (requiring time and money); or have available the panel sizes which dictate the size of the workstation.

Why must all the furniture come from a single manufacturer, or be from the same manufacturer line? Even “quick ship” programs from the major contract office furniture firms can take several weeks if not months. Our experience with small firms needing to quickly accommodate growing populations is that they go to retail office suppliers where they can get products the same or the next day, and at lower cost. But cost is not necessarily the only or primary driver; speed of delivery and installation is, because that directly influences how soon people can begin productive work. Often, it is free-standing and can be easily rearranged. All the furniture may not look alike, but the aesthetic and branding conveys the need and desire to be nimble, quick to respond, and to spend time, energy, and money where it gives the best return. Precision is a luxury and a by-product of time that fewer companies can afford today.

Diversifying the Workplace Portfolio

If you look at the sales pitch of a firm like Regus, which is the largest provider of fully serviced, on-demand office spaces globally, you will find that it argues that 60 percent of the corporate workspace portfolio is likely to take the form of conventional office buildings. It is interested in the 40 percent of demand that might be met by its specialized product and service offering. In other words, there is not a single workplace solution.

Like any financial portfolio, the goal should be to have a highly diversified range of workplace solutions. Every piece of furniture in a Hewlett Packard or Citigroup or any other large firm should not be from IKEA or Office Max. Nor are we saying that all order and standardization are bad. We are saying that firms truly pursuing—whether from preference or necessity—a workplace strategy that solves the dilemma of creating environments that are flexible and support work effectiveness at as low a cost as possible, need to diversify their workplace portfolio. Part of that requires rethinking what constitutes “quality,” and conveys being “professional,” “contemporary,” and “successful.”

Part 3—Research Into Practice

Meeting Business Challenges

The IWSP's mission is to conduct research on how the planning, design and management of the workplace influence individual team, and organizational effectiveness. The intent is to provide organizations with better information and tools for resolving the fundamental organizational dilemma we stated at the beginning of this report: How does an organization, in the face of unrelenting uncertainty, simultaneously contain costs, increase flexibility and speed and support effective work practices? Flexibility, communication and cost all contribute to agility: the ability to respond quickly to and exploit opportunities. Open plan or closed offices and other office strategies, framed in this way, are not about real estate; fundamentally, they are about competing successfully in a turbulent business environment.

Meeting Business Challenges

- Cost
- Flexibility and Speed
- Work Effectiveness

Cost

The IWSP's current research cycle examined small, mostly start-up initiatives, both inside large corporations and independent firms. The goal was to see what might be learned from small firms that could be applied to large ones. We are not suggesting that a Goldman Sachs, IBM, or any other large global enterprise should copy the workplace strategies of a fifty or one-hundred person start-up. The intent is to stimulate large organizations to think about some of the principles of how space is planned, designed and managed in small firms which might be adapted to their own context to increase organizational agility and effectiveness while minimizing costs. The Kodak example noted earlier, of buying less expensive carpet based on historic occupancy patterns reflects a principle of value for money. Union Carbide's headquarters in Danbury, Connecticut more than twenty years ago embodied the same kind of small firm principle we found at Google: go to a job shop to manufacture portions of the furniture required, while spending more money on a few key contract furniture components. Union Carbide headquarters encompassed a million square-foot building with more than 3,000 employees, hardly a small, start-up enterprise.

A principle reflecting workplace strategies found in start-up enterprises already adopted by large firms is accepting higher densities than typically were considered acceptable. They do it for the same reason as small firms: it is faster and less expensive, and the point at which higher density becomes dysfunctional or counterproductive appears to be higher (fewer square feet per person) than might have been expected.

As with any solution, workplace solutions do not need to be applied universally, to every job function in every business unit in every part of the globe. Many firms believe that they have a “one firm” policy about space allocation, despite clear evidence that they do not. Look in almost any global financial services firm, for example, and you will find that the technology people do not sit in the same kind of space, at the same densities, as equity traders. They, in turn, occupy different space than research analysts, who are in different space than the people in human resources. In fact, different solutions are already being applied in these companies, but go officially unrecognized, in part in the name of fairness.

The small firm principle is to look for places where natural differences across job functions and employee profiles make it possible to exploit value for money options. At Google, this meant buying more expensive workstations and very inexpensive cafeteria furniture. At Digital Equipment Corporation in Finland (before the acquisition by Compaq), the lounge furniture was inexpensive patio furniture; while the telecommunications equipment was the best money could buy. In a similar way, free-standing furniture and workstation layouts that reduce the cost of minor reconfigurations reduce the operational cost of churn as well as organizational disruption. This may require spending more money initially on different, and more flexible furniture, but that investment is likely to payoff significantly in lowered costs and greater organizational effectiveness and agility. Reducing churn by even relatively small percentages, when per unit moves cost between \$1,000-\$3,000, generates savings in large organizations that are more than pocket change. At the same time, they may allow the organization to dictate how it wants to organize itself, rather than having the building, or the prohibitive cost and disruption of churn, dictating how the organization functions.

Flexibility and Speed

The starting point for our analysis of workplace strategies was organizational ecology: the concept of an interdependent web of spatial, technological, cultural, demographic and work process factors. As should be evident by now, our data indicate that some workplace strategies are more likely than others to reduce costs while increasing flexibility and work effectiveness. Some things companies can do, specifically, to increase the speed with which groups are able to begin work in a new environment, and to accommodate change in group size and structure as teams and units shift in composition, including downsize, are:

- Minimize renovations in space; look for ways of imaginatively using existing space and design. That may mean using a conference room for an executive team space; a lobby for a central social hub and meeting area.
- Do targeted branding. Identify a few key features such as a highly visible reception area, a break area with inexpensive, but distinctive, patio furniture that will establish the desired image and feel at low cost.
- Zone activities more carefully, to minimize the need for physical barriers between incompatible job functions (e.g., marketing and software development) that are costly and disruptive to move over time.
- Create an aesthetic of flexibility; that is, celebrate visible diversity related to productive work. All spaces do not need to look like a furniture showroom. Create more “dens” and fewer “parlors.”

- Think about how to make cable drops and other technology solutions a simple design element, not just a morass of wires. Whimsy does not cost a lot, but in the right setting is effective.
- Use more free-standing furniture, that workers themselves can reposition for a team meeting to add a new team member or to support a newly created work group in an open bullpen arrangement.
- Create more permeable boundaries between groups by using flexible, easily movable, free-standing panels instead of walls or fixed panels. This allows groups to ebb and flow over time.

As noted in an earlier report (3), imaginative use of tensile and modular structures and fully serviced space also speeds entry and exit as groups form, disband and reemerge. Strategies like hoteling allow for changes in the ratio of people to offices without physical change and without negative effects on productivity and morale. The underlying principle is eco-diversity: developing a diverse portfolio of real estate and design and furniture options that can be deployed as necessary, without assuming that any one of them is “the answer” for the whole company or for ever after.

Work Effectiveness

Much of this report has focused on communication and interaction as a key element of an agile organization. Any workplace strategy that reduces costs and increases flexibility but does not support effective communication and interaction is, from this perspective, counterproductive. The remainder of this report examines some of the issues surrounding workplace strategies, like team-oriented bullpens and pods, that have the potential to work on all three levels—cost, flexibility, and effectiveness simultaneously.

Summary of Findings: Balancing Communication, Flexibility and Cost

Overall, our data suggest that firms can find an effective balance between cost, flexibility and effective work practices by considering team-oriented bullpen and pod work environments, particularly for their younger employees. Specific findings included:

- More open work environments supported a higher level of face-to-face interaction. Team-oriented bullpens and pods were superior in this regard to any other office type.
 - On almost all measures, the high-paneled cubicle performed poorly.
 - Small scale team-oriented bullpens had more very short duration interactions that were viewed less as distractions and more as fostering higher quality work and faster decision making.
 - The data available suggested that age demographics influenced response to work environments: Older workers were less satisfied and felt they were less effective in shared enclosed offices and bullpens than did younger workers.
 - Workers in closed offices liked their workspaces. They also tended to be older than those in more open environments, and were inclined to compare the closed office to high-paneled cubicles with which they were familiar (not to other forms of open environments they had not experienced).
 - Survey data alone did not distinguish significantly among the office types studied; respondents reported high levels of communication and interaction in all office types. However, in-depth interviews revealed significant differences in the nature and character, as well as frequency, of communication and interaction in the different office types.
 - The more open office types helped respondents form social networks and friendships that directly related to their ease, comfort and trust in asking for help, giving assistance, and clearly understanding project direction and focus, as well as contributing to their job satisfaction.
 - The more open office environments allowed higher densities than did cubicle or closed offices, and thus contributed to reducing the cost of facilities.
 - These higher densities were associated with a sense of energy and “buzz” until they reached a tipping point, where they became dysfunctional. The density tipping point appeared quite high (~55 s.f./person), but because of small sample size this should not be taken as a firm number.
 - Our study firms engaged in “targeted spending” and limited renovation to reduce costs and speed the time to occupy new space, without sacrificing effectiveness.
 - Open plan bullpen environments with free-standing furniture offered greater flexibility and speed for dealing with organizational change, while reducing the cost of churn.
-

The IWSP’s current research cycle has viewed the debate about office type as a business, not a real estate issue. We have looked at how the type of office, ranging from very open team-oriented bullpens to the individual closed office, affects communication and interaction patterns. In manufacturing terms, these kinds of organizational outcomes are “throughputs.” They are outcomes that become inputs for other valued outcomes. Communication is not the goal in itself. It underlies and supports other critical organizational objectives like decision speed, clear understanding of corporate and project objectives, project coordination and quality, and employee job satisfaction and commitment. We have also looked at the relation of these office types—and the organizational outcomes associated with them—to density, since this directly impacts cost. Ultimately, these outcomes interact with still others to determine the organizations’ ability to prosper over time.

We examined communication and office type in the context of a variety of types of small firms because we wanted to explore how such small firms dealt with issues of speed, uncertainty, and commitment, and whether their approaches held useful insights for large corporations. Some of our study sites were independent firms; some spin-offs of large established firms, and others were internal initiatives within large firms. While the systematic data collection occurred in the United States, as part of this research we also visited sites in Northern Europe (Sweden), as well as using examples from earlier IWSP studies (3) in England and Germany. All were oriented toward the “New Economy”; that is, the business focus of our study sites was web-based commerce, and the job functions included were primarily related to this: computer engineers (web designers, network engineers, software developers) and business strategy and marketing. Not only are these job functions among the most rapidly growing, but also they typically are viewed as requiring the highest degree of concentration. Understanding how more open type office environments support this group of workers yields insights, we think, for other types of work, while recognizing that the kinds of people attracted to these job types are distinct.

Preferences vs. Effectiveness

Our data and that of other researchers (Brill, 2001, McCue, 1978; DeMarco and Lister, 1987) show that the typical high-paneled cubicle, the kind made infamous by the Dilbert cartoons, is almost universally disliked and generally dysfunctional. Contrary to conventional wisdom our data suggest, however, that the answer is not closed offices, but rather some form of team-oriented bullpen or pod. Counter to conventional wisdom, this kind of more open environment, if implemented on a small, team-oriented scale, actually provides opportunities for both communication and concentration. And it can do it at lower costs (because of higher densities), while providing more flexibility. Such environments are not perfect. None are. What our interview data, in particular, show is that the presumed trade-off between the greater concentration and fewer interruptions in the private closed office, and the higher levels of communication but more distractions in the open office, is not as clear as commonly thought. By creating an environment in which workers get to know each other well, and can easily visually learn and observe cues about when interruptions are best timed, the more open environment of the team-oriented bullpen actually benefits both communication and concentration. And as noted above, it can do it at less cost and with greater flexibility.

Based on their research on office interactions in a number of firms, Kraut, et al. (1990) emphasize the importance of informal communication. Kraut found that:

- **Many smaller decisions and coordination of projects occurred in brief, spontaneous encounters,**
- **Unintended meetings were as valuable as scheduled ones for getting tasks accomplished,**
- **Unintended meetings occurred four times as frequently as scheduled meetings, yet took only one third as much time on a per meeting basis than scheduled meetings, and that all types of conversations provided opportunities to enjoy the company of coworkers, learn more about them, and build bonds with them, where as scheduled meetings fulfilled these needs inefficiently.**

Source: Tennesen and Becker, 1998

Such team-oriented offices are not the first choice of many workers, especially if they have not been personally experienced. But it is worth distinguishing between preferences and effectiveness. They are not always synonymous.

Working Alone and Working Together.

The results of a study of the amount of time IBM developers spent in different work modes showed that 30% of their time was spent working alone, 50% of their time was spent working with one other person, and 20% of their time was spent working with two or more people.

McCue, 1978

“Whatever its particular form, the team is a thinking organism where problems are named, assumptions challenged, alternatives generated, consequences assessed, priorities set, admissions made, competitors evaluated, missions validated, goals tested, hopes ventured, fears anticipated, success expected, vulnerabilities expressed, contributions praised, absurdities tolerated, withdrawals noted, victories celebrated, and defeats overcome.”

Cox, 1990

Most employees, when asked what type of office they prefer or feel they are most productive in, will answer “closed” office. If what they have experienced in their working life is an “open” office that is a high-paneled cubicle, or a private closed office, then it is not surprising that they would prefer a closed office. At least until recently, relatively few American workers would have experienced a well-designed cluster or pod arrangement. The predominant office type has been the high-paneled cubicle that flooded offices for the two decades between 1970 and 1990s (and which are by no means absent today).

It is also worth examining in closer detail the main complaints about “open” offices. These are about uncontrolled noise and distractions: overhearing coworkers (especially from different departments and disciplines) on the telephone and in informal meetings; and people “popping” in uninvited to chat or ask a question. To a somewhat lesser extent, concerns about confidentiality, especially in functions like human resources, finance and legal, also frequently surface.

For many workers, such distractions undermine work effectiveness, particularly when effectiveness is defined individually and organizationally in terms of individual achievement or productivity. Yet even for the prototypical heads down work of software developers, it turns out that interaction is critical to project coordination and overall effectiveness (not just what the individual achieves, but what a team or group achieves together). Without doubt, working with others is more difficult, and takes more personal adjustments, than working alone. But if the key is not maximizing benefit along any single dimension, whether comfort, cost, or performance, then the greater effort required in more team-oriented open environments may be justified.

Passion vs. a Job

As we have worked in the different study sites over the past two years another factor has surfaced that influences the data, and the implications for finding practical solutions to pressing organizational dilemmas. That factor is the difference between employees who are passionate about their work, who are inspired and inspire others, and those for whom the work is just a job.

People like Linda Coventry (a pseudonym), the VP of Engineering at one of the study spin-off firms, or Joyce Smith (a pseudonym), the Director of Marketing at another, were bursting with energy and enthusiasm. They attracted and inspired staff with these qualities. At another of our study firms, one which was an internal corporate web-initiative, the workers were bright and committed. But the embers of passion glowed faintly. These emotional states influence employees’ response to their work environment.

Passionate employees inspired by their job focus on the work, and not the work environment. They focus on how the work environment helps energize them, on the opportunities it offers to learn from others and to benefit from being in a firm that has “great people.” They pay relatively little attention to rank and status, or to office size. For those less passionate about their work, such factors seem to be more important.

Expected reward obviously plays a role here. Employees in some of our small start-up firms had extraordinary expectations about how much money they would make on stock options when (not if) their firms went public or really flourished (this is before the dot.com bubble burst). They were willing to work long hours in sometimes uncomfortable conditions in pursuit of the financial rainbow. But what still emerges as the more fundamental driver is a passion about the work itself.

How Diverse a Portfolio?

A riddle within an enigma is whether the organization should provide workplaces that differ for workers of different ages, who have different work styles and preferences. Do older workers get closed offices because they prefer these more than do younger workers? Do you move all the offices out of the suburbs because younger workers find suburbia boring?

The answer is unlikely to include selecting the most expensive option for everyone. But that doesn't require standardization, nor does it preclude adopting varied but less expensive options. Study sites like iStarXchange, a spin-off of a large established firm, suggest that it is, minimally, possible and desirable to allow those who prefer less expensive workplace solutions to have them. At iStarXchange these were the web designers and software engineers in the Technology Room, and the human resource team in a team-oriented workstation pod. Both groups vigorously defended their desire—based on their work effectiveness—to remain in an undivided team-oriented space rather than occupying the very expensive, high-end, high-paneled workstations to which they were entitled by company standards.

Similar adaptations have occurred in other firms we've visited where, for example, the Director of Research for a global financial services firm and several partners and vice presidents in his group voluntarily chose to occupy low-paneled workstations in a team-oriented space rather than the private offices specified for their rank by the corporate space standards. At old line firms like Monsanto and Alcoa, CEOs Robert Shapiro and Paul O'Neill, respectively, abandoned their sumptuous executive offices for open plan workstations because they felt this was a more effective way for their executive teams to interact. Their actions also sent a strong, unambiguous message that the established culture needed to—and was going to—change.

The dilemma is whether one forces employees to occupy space they do not prefer (to reduce costs and increase flexibility and work effectiveness) in the hope that they will adapt as they realize the benefits, but at the risk of alienating and demoralizing them. Individual preferences and performance must be balanced against the good of the team and organization as a whole. That may mean losing good people in some cases; for the benefit of the organization as a whole.

Costs and Benefits of Individual Preferences

The key is deeply understanding not just how people are working currently and prefer to work, but how they might work with different technology and a range of different work settings available to them, inside and outside the office. Because a new way of working is uncomfortable, especially initially and without prior experience, does not necessarily mean it is inappropriate or will not come to be liked over time.

Our data suggest, for example, that younger workers are more interested in learning from their peers and more experienced workers, than are older employees. Locating more experienced staff in closed offices, while increasing their comfort level and allowing them to work more productively individually, has the potential to significantly slow the development and learning opportunities for the younger workers. It also has the distinct potential to support the freezing of the older workers' development and skills, since they also lose the benefit of being pushed by younger staff to learn new skills and think in new ways about problems which they have developed in a fixed way of approaching over the years.

Given the need to balance cost and effectiveness, the better solution would seem to be one more often observed in Sweden than in the United States. There, the combi office, a relatively small, individual, closed office with a sliding glass door opening onto a common area, has been replaced in some firms by team-oriented bullpens and pods. These are very dense at the individual desk level. But this density allows for a good number of enclosed meeting and work areas while still maintaining a moderate density overall. With wireless telephony and laptop computers, workers can easily move to one of the closed offices for a small group meeting or simply to work without interruption. This is akin to what we have done with the best examples of hoteling in this country, but without always making the open area an unassigned space.

Zoning

Zoning of activities and functions provides another option for dealing with different needs and preferences for concentration. Locate a software developer within overhearing distance of a marketing person and you have asked for conflict. They are working on different problems, using different tools, with different work styles. Some dogs and cats get along; but it is not a good idea to plan on it.

In several of our research sites, what made the team-oriented bullpen effective was just this sort of functional zoning. Software developers sat near software developers. Human resource people sat near human resource people. Even, or especially when, cross-functional teaming is desired, it is critical to provide clusters of people engaged in a project or common work. Our interview data showed that concentration is possible in this kind of open environment because one could judge, by looking at the other person and his computer, when it made sense to interrupt and when not. It was the high-paneled cubicle, where to see what the person was doing meant, de facto, that the person was interrupted. This contributed to the “open plan” being so disliked.

Another form of zoning combines physical layout and user protocols or planned etiquette. In this case, as was done in KPMG offices in Stockholm, a section of a floor can be separated by screens from a work area, with those in the “quiet area” not allowed to use a phone, talk with other people, or interrupt another person in the same zone.

Loosely-Coupled Settings

The notion of “loosely-coupled settings” (1) suggests still another way of addressing this issue. Here, the workplace is consciously conceived as including settings both inside and outside the office, including the home, that are loosely connected by the physical movement of people and the electronic movement of information. Employees are not required to work at home, nor are they encouraged to stay away from the office for days at a time. Rather, employees are equipped with the technological support (high-speed network access and laptop computers) that allow them to work from home whenever they choose, depending on the work they are doing, the stage in the project they are in, etc. As is the case with many university faculty, this means working at home in the morning, writing and doing other work requiring extensive concentration, and coming in to the office in the afternoon to meet with students and colleagues, deal with administrative issues, and so on. The key is to understand that the office is, for most people, a central social space.

The Organizational Dilemma and Workplace Solutions

Our research, like all other research, cannot provide a definitive answer to every issue, or consider every factor, a workplace strategist faces. Rather, it strives to generate useful insights grounded in credible evidence that can influence the everyday decisions organizations make as they shape the workplace and its effects on those working in it. For workplace practitioners, those responsible for developing and implementing workplace strategies, our work over the past two years provides, we think, useful ways of resolving the competing pressures of reducing cost and increasing flexibility, while attracting and retaining staff and enabling them to work productively.

Data Drought

Our data are based on fairly small samples from a relatively small number of firms. Collecting the kind of in-depth interview and observational data made a small sample imperative. The strength of our data comes from the use of multiple data collection methods whose findings reinforced and gave depth to each other. Our data are also supported by the findings of other researchers who have stressed the contribution of free-flowing communication and interaction to individual as well as team performance.

Like all research, ours would benefit, nonetheless, from larger sample sizes and a research design that allowed us to systematically compare large numbers of computer engineers, say, in a team-oriented bullpen with those in high-paneled cubicles, when doing the same kind of work in the same size company. This kind of data by and large does not exist in a publicly accessible form. A global databank that used a common survey and other data collection techniques would be a useful first step in generating the kind of information most firms want and need to be able to make informed decisions about the kind of workplace strategy that makes most sense for them.

Along with the data comes the need for a research methodology that draws on survey research methods, but also incorporates the approach of a field biologist and anthropologist. That is, an approach that seeks to understand the dynamic interdependencies within a complex and continuously changing organizational ecology. The field observations done as part of this research are extraordinarily time consuming, as is transcribing hundreds of hours of in-depth interviews. But it is precisely this combination of methods that allows one to develop deeper insights into why and how different workplace strategies function the way they do.

Such an approach may appear, at first glance, to come neither cheaply nor quickly. In the context of the literally hundreds of millions of dollars large corporations invest in their workplace strategies in the pursuit of competitive advantage, the cost and time of supporting such research, both financially and simply by participating in studies such as this one, would seem to pale in comparison.

We began this report by talking about “wicked problems.” They are so because by their very nature they embody competing interests and claims. The 100 percent solution, the one everyone enthusiastically embraces always remains, like a rainbow, just out of reach. Our data do not change that. The employee who wants a closed office, for reasons of comfort, professional identity, a sense of entitlement, or to support his own personal work style and productivity, is unlikely to welcome a more open, team-oriented environment. Yet our data suggest that work, even work requiring high levels of concentration, is ultimately a social activity. Individual performance is grounded in the performance of others.

If more team-oriented environments can reduce costs, increase flexibility, and help build and strengthen the social ties that underlie the fast flow of information on which organizational agility ultimately depends, then we think such environments make sense.

But the concept of organizational ecology also underscores the importance of thinking of the workplace as a system. That means technology, organizational culture, work processes and the physical settings of work must be as rich in diversity as are the people and the work being done in them. The practical lesson is the need to create opportunities for employees to work in different ways. Our data suggest this might best be done by turning inside out the way we plan offices today. Rather than thinking of the office as a place primarily for solitary activity, from which one occasionally breaks out in time and space to settings intended for social activity, the office is designed primarily as a social setting, from which one occasionally seeks out more private places for contemplation, concentration and confidentiality. Both exist, but with the figure and ground, the primary and secondary functions reversed. Part of this workplace ecology recognizes, as noted above, that not all work must or does occur in the “office” or in spaces assigned exclusively for one individual’s use. The underlying premise is that space, ultimately, is not about real estate. It is about using all of the organization’s scarce resources to their fullest potential, to meet pressing business challenges. That means recognizing that the office as we have known it over the past 50–100 years is an “idea,” not an indubitable form, shaped by values, technology, economics and demography. It started out as a social space, and as we launch the 21st century, it may well become that again.

Part 4—Appendices

Appendix A: Site Profiles

Summary of Site Characteristics

Selected real estate and organizational characteristics of the IWSP research profiled in Table 1.

Table 1: Business and Real Estate Characteristics

	TEB	iSTAR	XYZ.com	BUZZ	ADCA	ADNY	EMKT	CBORD
Company								
Year	1999	1999	1999	1999	1982		1996	1975
Size	42	60	35	275	3484	40	45	200
Growth	None	Moderate	Major	Moderate	None	None	Moderate	Moderate
Public/Private	Public	Private	Private	Private	Public	Public	Private	Private
Employee Age (% under 30) †	19%	9%	30%	33%	11%	<5%	54%	30%
Gender Composition †	48%	52%	73%	78%	74%	75%	63%	70%
Real Estate								
City	Torrance	Irvine	Los Angeles	San	San Rafael	Ithaca	New York	Ithaca
Location	Suburb	Suburb	Suburb	Downtown	Suburb	Suburb	Downtown	Suburb
Lease/Own	Own	Lease	Lease	Lease	Lease	Lease	Lease	Own
Workstation								
Private	x	x			x	x		x
Shared Enclosed	x			x	x	x	x	
High-Paneled		x		x		x		x
Low-Paneled	x	x				x		
Bullpen		x	x	x	x		x	
Floor Common								
Open Collaboration		x	x			x		x
Closed Collaboration	x	x		x				
Employee		x	x	x	x	x		
Conference	x	x	x	x	x	x		
† Based on survey								

Organizational Profile

Cultural characteristics of each company were profiled by rating each firm on six dimensions:

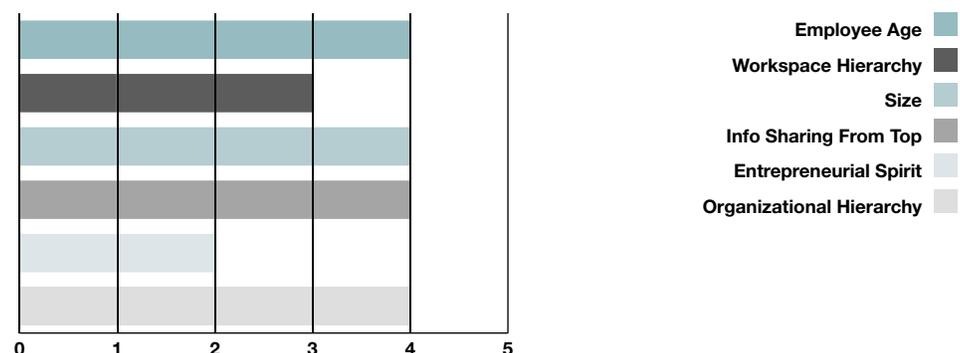
1. Organizational Hierarchy: How many layers of management are present in the organizational structure? (Ratings: 1=flat structure, 5=hierarchical structure)
2. Median Age: What is the median age of employees in the company (Rating: 1=younger, 5=older)
3. Entrepreneurial Spirit: To what extent does a company exhibit an entrepreneurial spirit? (Rating: 1=low, 5=high)
4. Information Flow: How well does information flow from high levels of management to individual employees? (Rating: 1=low sharing, 5=high sharing)
5. Organizational Size: How large is the company? (Rating: 1=small, 5=large)
6. Workspace Hierarchy: To what extent is space allocated by rank? (Rating: 1=low, 5= high)

Research Site Profiles

Autodesk

Founded in 1982 and headquartered in San Rafael, California, Autodesk is a global company that describes itself as “the world’s leading design and digital content creation resource company providing software and Internet portal services to help customers through the power of design.” In the primary unit studied, each individual has a private office. (See photos.)

Organizational Profile, Autodesk





Autodesk, CA: Hallway of Closed Offices

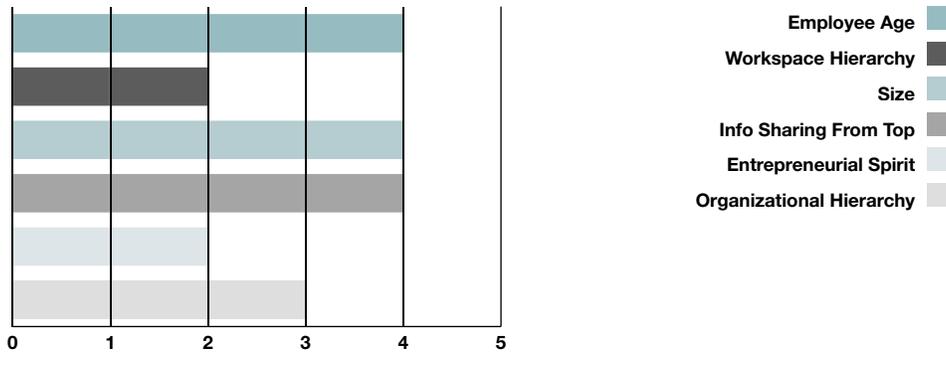


Autodesk, CA: Private Office

ADNY

ADNY, a unit of Autodesk, is a research and development team of 40 people in Ithaca, NY that is responsible for the adaptation and creation of a web-based product. The Ithaca site has only two private offices and one office shared by the two senior managers. All other employees sit in cubicles in one large open space.

Organizational Profile, ADNY



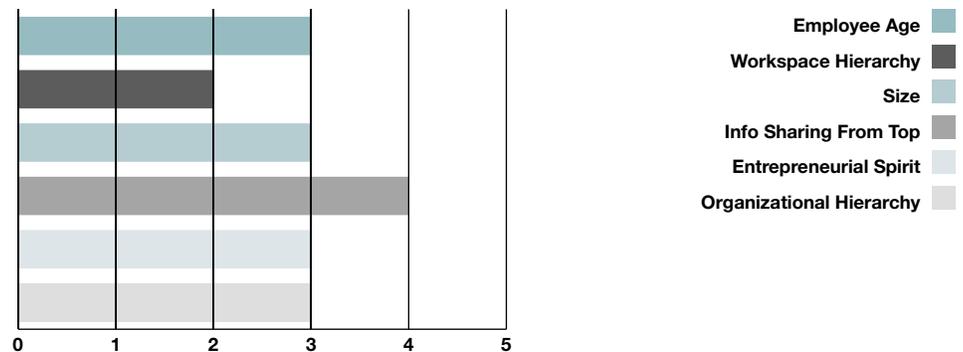
Autodesk, NY: Cubicles



Buzzsaw

Headquartered in San Francisco, California, Buzzsaw is a business-to-business (B2B) marketplace and collaboration workspace for the building design, construction, and real estate management industry, and was begun as a spin-off of Autodesk. Founded in 1999, it employs about 275 people. Employees sit primarily in two wings of the two floors the firm occupies, in both cubicles and bullpen spaces or in shared enclosed offices with approximately 12 people. There are no private offices. Managers and executive management sit in cubicles in the wings.

Organizational Profile, Buzzsaw



Buzzsaw Bullpen and Cubicles

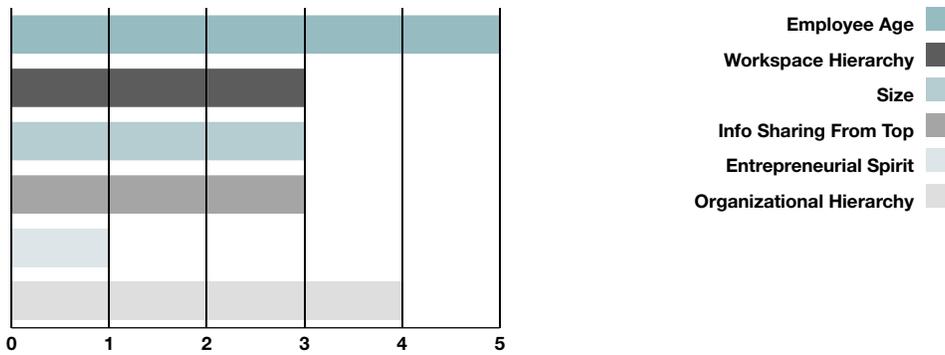


Buzzsaw Shared Enclosed Offices

CBORD

Located in Ithaca, NY, CBORD is a worldwide provider of food & nutrition services software and systems for campus-wide ID card programs, housing management, and cashless dining services. It delivers products, services and solutions for a wide variety of markets including colleges and universities, corporations, healthcare, restaurants, and supermarkets. Begun in 1975, the company has approximately 200 employees and annual sales of approximately \$20 million. Within the single-story, owned building, managers are each allocated a private office within a project area that has a cubicle for each employee.

Organizational Profile, CBORD



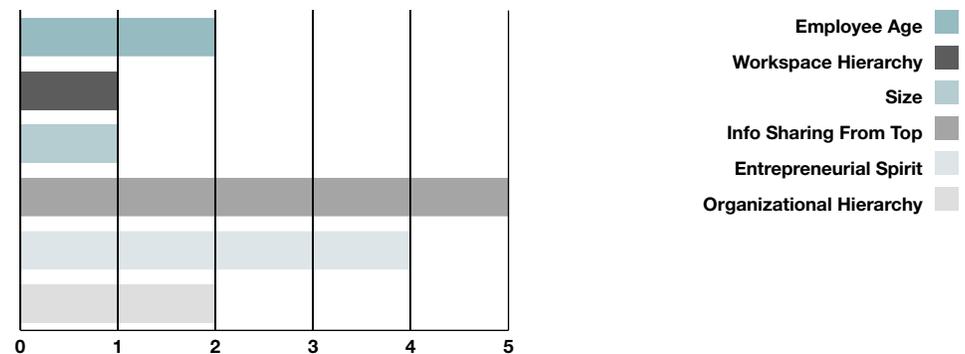
CBORD Workstations



eMarketer

eMarketer, a privately held company headquartered in Manhattan, was founded in 1996, and currently employs approximately 45 people. Its purpose is to provide aggregated statistics and research on Internet topics such as B2B and B2C e-commerce, Internet demographics, Internet advertising/marketing, as well as international Internet use. eMarketer occupies a large, airy loft. The majority of employees sit in one large area, with people collocated by function and teams. Managers sit together in one corner of this open area.

Organizational Profile, eMarketer



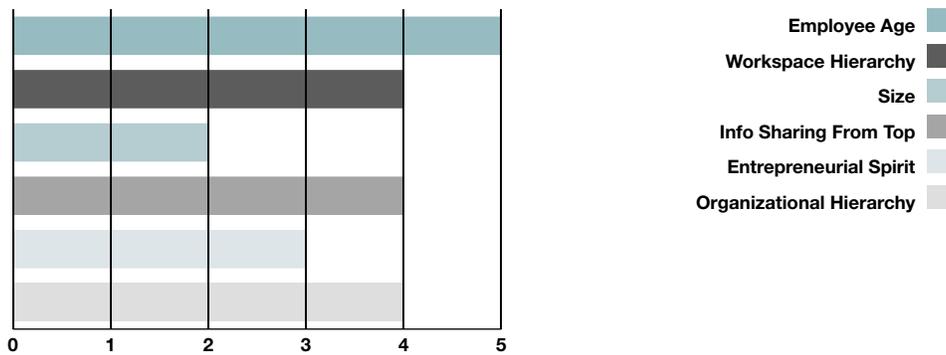
eMarketer team-oriented bullpen



iStarXchange

iStarXchange is a joint venture between Toyota Motor Sales and i2 Technologies. iStarXchange facilitates purchase of after-market automobile parts. Because, iStarXchange occupied space vacated by Toyota Motor Credit Corporation, part of iStarXchange offices have high-end wood finishes and furniture. Engineering staff occupies a large, team-oriented bullpen space (Technology Room).

Organizational Profile, iStarXchange



iStarXchange "Technology Room"



iStarXchange Pods

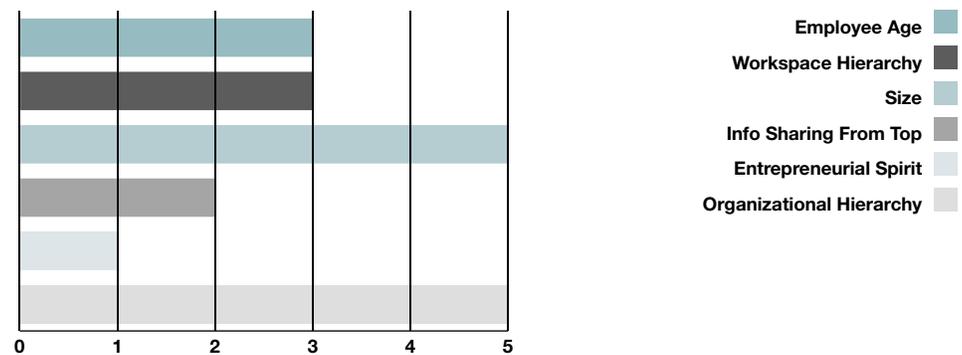


iStarXchange Cubicles

Toyota eBusiness—Toyota Motor Sales

In 1999, Toyota Motor Sales (TMS) executive management created Toyota eBusiness (TEB) to set its web standards, consult with business groups, pull together the corporations' internet expertise and gain more control of "siloesd" Internet projects throughout TMS. TEB shares floor space with other TMS functions such as the executive offices, fleet services and dealer daily. The TEB site has two types of workspaces: cubicles and closed offices. The National Managers and Vice President have closed offices; group members are stationed in low-paneled cubicles, while high panels separate the different groups.

Organizational Profile, Toyota eBusiness



TEB Low-Paneled Cubicles

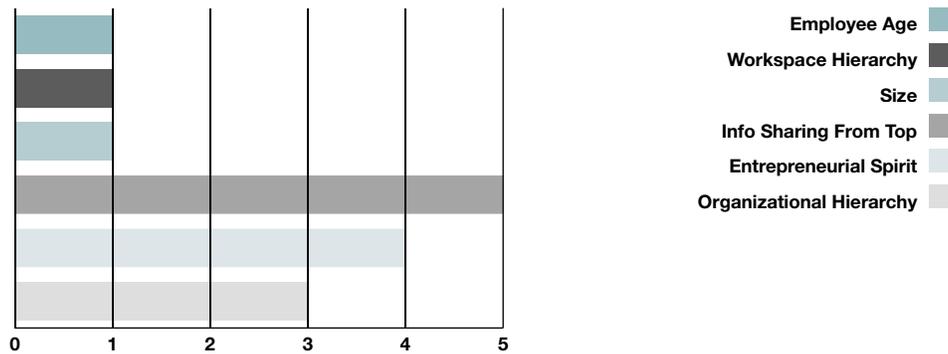


TEB Shared Office

XYZ.com

XYZ.com, launched in October 1999, “builds and maintains customized e-commerce solutions specifically targeted to the service sector.” XYZ.com has followed the path of the dot.com boom and bust cycle. In October 2000, the company had over 60 employees but by February 2001 the number had been reduced to 39 people. The offices of XYZ.com are located in a building that previously functioned as a sound stage for an advertising agency, and typify what most people would think of as “dot.com” space. The office space is a large area with bullpens structured as groups of four. All job levels and job functions are grouped together within these bullpens. The various team members are stationed in close proximity, with a conscious effort to locate the team leader adjacent to the group.

Cultural Characteristics, XYZ.com



XYZ.com workstation



XYZ.com Bullpen

Appendix B: Research Methods

Research Design

Research sites were chosen from independent start-up firms, corporate spin-off start-ups, and internal corporate web-related initiatives. Within these business models, workplace strategy ranged from private closed offices to undivided team-oriented bullpens and pods. Specifically:

Office Types

- Private offices: Hard wall offices with a door and only one occupant.
- Shared enclosed offices: Hard wall offices with a door shared by 2-12 occupants.
- High-paneled cubicles: Workstations where occupant cannot see over panels when seated.
- Low-paneled cubicles: Workstations where occupant can see over panels when seated.
- Pods: Sets of 4-6 workstations that are surrounded by high panels around the perimeter of the group.
- Team-oriented bullpen: A group of 4-12 desks that has no dividers or partitions between them.

Job Types

Job types were grouped into the following general categories:

- Technology (engineering, web, application, or software development),
- Business Development (sales, business development, marketing, public relations),
- Administration (human resources, finance, administration, senior management),
- Research (analytical research, report writing), and
- Customer Support.

As is often the case in field research, the design was limited by the unequal distribution of space types across sites and by the small number of people or job types in each space type. Given the focus on the IWSP research on small start-up web-oriented businesses, the primary job function included in the study was technology and business development.

Data Collection

Surveys and interviews were conducted at nine companies, from diverse industries in different geographic locations (see Appendix A: Site Profiles). Systematic observations of interactions were conducted at eight of the nine sites. The multifaceted data collection approach enabled us to collect richer information and better interpret the observational data.

Surveys: The purpose of the survey was to assess employees’ opinions regarding their workplace and other organizational factors. Web surveys administered at each of the nine sites addressed demographics, perceived work effectiveness, interaction patterns, availability of information, leadership and level of commitment. Questions for the surveys were developed or adapted based on a review of the literature in the fields of human resources, engineering, organizational behavior and organizational ecology. The surveys were distributed and completed using host Internet survey sites (www.formsite.com). Completed surveys were downloaded directly from the web site into an IWSP database for analysis. Because of the difference in start times and goals of the data collection process, the survey instruments used at the Northern California sites are slightly different than those used for the remaining six sites (see Dallas 2001). Ten survey questions were consistent across all sites.

Once developed, the survey questions were reviewed and approved by department managers. The web link was then sent by the managers to their employees, with a brief explanation of the project. It was emphasized in all communication that the survey was confidential and voluntary, and that only aggregate data would be used.

The response rate for the surveys ranged from 28%–71% (see Table 2). Of the 229 survey respondents, 62.1% were male and 37.9% were female. The age category with the most respondents was 30–39 years old (43.5%), followed by 22–29 year olds (28.5%).

Table 2: Survey Response Rates

Company	Number of Employees Surveyed	Response Rate
Autodesk, CA (ADCA)	334	28%
Autodesk, NY (ADNY)	27	44%
Buzzsaw (BUZZ)	86	34%
CBORD	18	61%
eMarketer (EMKT)	35	71%
istarXchange (ISTAR)	60	57%
Toyota eBusiness (TEB)	42	50%
XYZ.com (XYZ)	35	31%

Observations: Systematic observations were conducted at eight of the nine participating sites. The purpose of the observations were 1) to identify how and where interactions occurred in a given space and their duration and purpose; 2) to avoid relying on self-reported data regarding the frequency of interactions; and 3) to determine, when possible, the nature of interactions that occurred in an organizational unit.

A pilot site in Ithaca was used to develop the observation methods. Three researchers spent a total of 20 hours at the pilot site determining what type of data was feasible to obtain, as well as the least intrusive method. The final method used is described below.

Each open space (all space other than corridors or closed offices) was divided into observation zones during the first visit. Each zone was an area in which all seats could either be viewed with little movement, or within earshot, so that when the coder heard an interaction begin, he or she could move to a better vantage point. Because ability to see or hear an entire area was the sole criterion for the creation of a zone, and architectural features impacted how this criterion was met, the zones varied in population, size and space type. To account for this, roughly the same amount of time was spent in each zone. One site had up to 6 zones, while others had between 2-4 zones. No site could be observed at once in its entirety. The interaction frequency data was weighted to account for the number of seats in the zone, as well as the total amount of time spent in each. The minimum total time spent in a zone was 4 hours, and the maximum was 12 hours. The majority of the zones were observed for 5 hours each. These observations occurred at varying times of day and on various days of the week, depending on the hours of operation of each site. Each site was observed during at least two different calendar weeks to account for variation in activity.

At the beginning of each observation session, the researcher noted who was present within the zone. The data was collected in intervals of 15 minutes. Thirty minutes was the shortest planned observation period, and 90 minutes was the longest, due to the fatiguing nature of the observations. In some cases, the majority of the occupants left a zone during an observation interval, so the period was ended at the nearest 15-minute mark. A total of 3,160 interactions among 329 people were observed over a total of 130 hours.

Data collected for each interaction included:

- **Where** the interaction occurred on a floor plan (where a floor plan was not available from an office administrator, the workspace was measured by hand and a sketched floor plan was used).
- **Who** was involved in each interaction (each seat was assigned a number, and the seat number of each person involved in an interaction was coded). When the person(s) was unknown, characteristics were noted to attempt to identify his identity at a later time. If it was not possible to find the person again, the person was coded as unknown.
- **Length** (in seconds) each interaction lasted.
- Whether the **nature** of the interaction was work, not work, or both (the observation zones were designed to be small enough to be able to hear many of the interactions that occurred. In those that were too large, the rater could code the interaction based on body language (i.e., if the individuals were clearly working on a document together), or simply code the context unknown.

Observation frequencies are reported as “Interactions/Hour/Person.” See Table 3 for a summary of the space types observed at each site and the number of people in each type.

Table 3: Summary of Spaces, Job Titles and People Observed

Space Type	Companies Represented	Job Functions Represented (Number of people in each)	Total Number of People
Closed, private office	ADNY, CBORD, ADCA, TEB	Tech. (41), Cust. Support (1)	42
Shared, enclosed office (2-3 people)	ADNY, ADCA, TEB	Technology (9)	9
Hight-paneled cubicles	ADNY, CBORD, ADCA, BUZZ, ISTAR	Tech. (43), Cust. Support (18), Bus. Develop. (4), Admin. (19)	84
Low-paneled cubicles	ADNY, TEB	Technology (29)	29
Pods	ISTAR	Bus. Develop. (6), Admin. (6)	12
Shared, enclosed offices (≥4)	EMKT, ADCA, BUZZ, ISTAR	Research (2), Bus. Develop. (12), Tech. (57)	71
Open, bullpen-type offices	EMKT, BUZZ, XYZ	Research (12), Tech. (43), Admin. (6), Bus. Develop. (19), Cust. Support (2)	82

In long hallways of private, closed offices, it was not possible to use the above observation methods. In these areas, the coder walked through the zone every 15 minutes, recording all of the interactions that could be seen. The limitations of this are the following: duration of each interaction could not be obtained (it could only be noted if an interaction continued across multiple 15-minute intervals); in those offices where there was not visibility to the inside, interactions could be missed; the context of the interaction was unable to be determined in many cases. In most of the spaces observed, there were glass panels in the doors, so the coder could view the interior of the office if the blinds were open. If the coder had visual access to the office, he or she could often discern the context of the interaction. This was also true if the coder was able to hear the interaction.

Interviews: The purpose of conducting interviews at each site was to collect personal narratives or stories about how the workplace ecology enabled or inhibited individuals from working effectively. They were also used to probe issues raised by the observations and fill in any holes in the collective story created by the various data collection techniques.

At each site, interviews were conducted with individuals who ranged from employees to mid-level managers to executive members of the organization. Interview subjects were obtained either by asking various individuals to participate, or by asking a manager to select a few members of his or her team. Interviewees were typically approached after several days of observation, or managers arranged to have some of their team members meet with us at their convenience. Interview typically lasted 25–40 minutes. Table 4 includes the sample size for interviews in each of the eight sites.

Table 4: Interview Sample Size

Company	Number of Employees in Target Unit	Percent of Unit Interviewed
ADCA	58	22%
ADNY	27	26%
BUZZ	115	11%
CBORD	18	17%
EMKT	35	14%
ISTAR	45	44%
TEB	23	30%
XYZ	26	35%

Plan Analysis: The density analysis was conducted at two levels; 1) Floor and 2) Group. For floor level, two measures were used a) Building Owners Management Association (BOMA) measure of useable area and b) International Workplace Studies Program (IWSP) measure. For the group level only the IWSP measure was used. The BOMA floor level analysis gives an industry benchmark that could be used to compare across other similar benchmarks. It is measured from the interior side of exterior walls and surrounding walls and excludes vertical penetrations, common support areas and primary circulation. The IWSP floor measure was developed to reflect the experienced density in a given space rather than a real estate based density measure, and thus does not include inaccessible areas (e.g., storage/server/data rooms), as these areas are not part of the work or the communication and interaction zone of the employees.

The IWSP Group measure goes one step further than the floor measures in trying to reflect density as it is experienced on a daily basis by employees. It measures the density in the area immediately surrounding the employees group work area. An area less than 1,500 USF was defined as closed space, while an area greater than 1,500 USF was defined as open. The IWSP Group measure included dedicated support space. This was defined as an area that was directly accessible from open or closed group space dedicated for the sole use of the occupants of the space. Table 5 denotes all areas included in the density analysis for each specific level and the assumptions for each calculation.

Table 5: Assumptions for Plan Analysis for Three Sites

3 Levels of Analysis	Defined as
BOMA Floor USF	Standard used by Building Owners Management Association. Includes A, B, C, D, and E.
A. Office Space	
B. Support Space	
C. Dedicated Support Space	
D. Circulation Space	
E. Inaccessible Space	
IWSP Floor USF	Standard used by International Workplace Studies Program. Includes A, B, C, and D.
A. Office Space	
B. Support Space	
C. Dedicated Support Space	
D. Circulation Space	
IWSP Group USF	Defined individually for each case site. Includes Office Space and dedicated support space directly.
A. Office Space	Includes all office types: closed office, cube, pod, and bullpen.
1. Closed	<1500 sq. ft.
a. Single	Area of enclosed space
b. Shared	Area of enclosed space/No. of Occupants. Support Area directly accessible included in USF.
2. Open	>1500 sq. ft.
a. Bullpens	2x Area of Desk Space
b. Cubes	Area of the Workstation
c. Pods	Area of pods/No. of Occupants
B. Support Space	Includes both Collaboration & Common Space
1. Collaboration Space	Includes Conference Room, Project Room, Team Room, War Room, Break Room, Kitchen, Game Room, etc.
a. Closed	Area of enclosed space
b. Open	Area of circulation space
2. Common Space	
a. Lobby/Reception	Area of enclosed space
b. Copy/Mail Room	Area of enclosed space
C. Dedicated Support Space	Support space directly accessible from and dedicated to open or closed space
D. Circulation Space	Calculated as: Total usable square feet – (Office Space + Support Space + Inaccessible Space)
E. Inaccessible Space	The definition for Inaccessible space is defined by IWSP to include Storage/Supply Room, Server/Data Rooms.
1. Storage/Supply Room	
2. Server Room	
3. Data Closets	

Cost Analysis

The plan analysis data from three sites was used to create a hypothetical plan with similar space allocation ratios and workspace sizes. Based on the plan analysis, 45% was allocated to office space, 20% to support space, 30% to circulation space and 5% to inaccessible space(3). The workspace size for closed office (150 sq. ft.), cube (100 sq. ft.), pod (75 sq. ft.), and bullpen (50 sq. ft.), reflected the average of the sizes actually observed in our study sites. Floor plans were created for all workspace types, i.e., bullpens, cubes, pods, and offices and analyzed to calculate the size of workspace, number of workspace type accommodated in given square feet, and the density and cost per person. The cost is calculated at \$20/sq. ft./person and then multiplied by the density to arrive at the cost/person for a plan consisting of a specific office type.

The analysis is limited to the space allocation ratio and different workspace sizes in the hypothetical plan as it provides a framework for analyzing the direct impact of different office spaces on density and cost per person. The analysis does not consider any furniture or operational costs. It is meant only to provide a rough comparison of the effects of office type on density, and hence on cost.

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