

dialogue

A modern skyscraper with a glass facade and a vertical garden facade, set against a blue sky. The building features a grid-like pattern of windows and a prominent vertical garden on the right side. The word "dialogue" is written in large white letters across the top of the image.

Special Edition:

19. **DESIGN RESEARCH**

A Gensler publication

Design research enables us to deliver new levels of value.

Diane Hoskins, FAIA, Executive Director, Gensler

Design research helps us generate innovation.

Design that is informed, purposeful, innovative, and compelling requires the rigorous engagement of our clients' business drivers. This goes to the core of Gensler's design research program.

We launched our design research program in 2005. Today, every Gensler practice carries out basic and applied research, separate from project work, on issues of direct concern to our clients. Design research helps us deliver innovative design solutions that directly benefit them. Our research teams study how design can unlock and leverage all of the different drivers of client value: business performance and economic benefit; market positioning; consumer trends; economic, demographic, and cultural shifts; and new materials, products, and technologies.

As architects and designers, we feel strongly that our understanding of our clients' most pressing issues enables us to design high-impact, transformational projects. While many of our peers see this as being "outside their scope," we believe it is crucial. Across our markets and regions, what we hear is a simple question: "Can design improve my business or my community?" Our answer is "Yes!" Through our research, we have proven the relationship between the right design decisions and the benefits they provide to organizations and communities around the world. Research creates value for our clients by maximizing design's full potential for higher performance.

opposite from second left:
Photos: Vitra's Joyn, Harbin Airport (concept),
Johnson Controls, Inc. Headquarters.

SPECIAL EDITION: DESIGN RESEARCH AT GENSLER

Features

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Why Design Research?

Gensler's research sets the context for better decisions, provides new tools for higher performance, and tracks the trends that shape the future.

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Design for Performance

The need for rapid, up-front analysis of a given project's full potential for performance led Gensler to develop a toolkit that delivers it.

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Made to Measure

Gensler's Workplace Performance Index® ties design to performance so that the gains that our clients expect are explicit and measurable.

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The High-Tech Terminal

Airports have focused on security for a decade. New technology won't eliminate this, but it promises to shift the terminal paradigm.

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Roundtable: Design Research

As a leader in design research, Gensler is in good company. We asked others in the field to share their viewpoints and interests.

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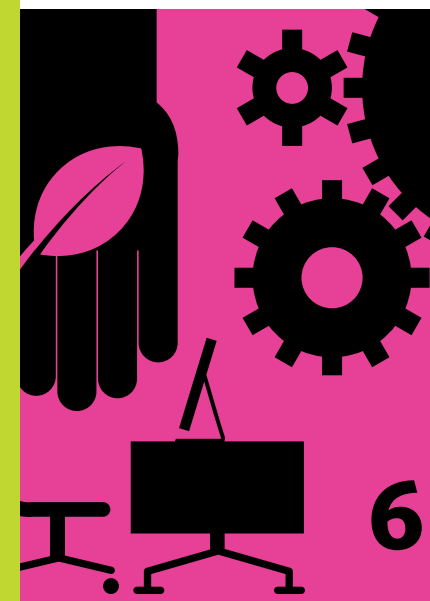
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A LEED Platinum headquarters expansion shows the added performance possible when an enlightened client works with a design team that gets its values.

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Featured are PNC Place, Washington, DC's green gem; Waitrose, London's hot new cooking school; and the Tetons gateway, Jackson Hole Airport.





WHY DESIGN RESEARCH?

By Diane Hoskins

Client impact and innovation are our measures of successful design research. The goals of high performance and strong return on investment drive our projects. Gensler's research program delivers the analyses and insights we need to achieve them.

Gensler's research program first took shape as an important focus of firmwide investment in 2005. Client impact is the program's overriding goal and the main criterion by which we evaluate research proposals. We believe that our research should inform our clients' projects, programs, and strategies. It should help our teams deliver higher performance where it counts. And it should provide insights on how design can best respond to the issues that affect our clients and their projects.

Our program addresses three types of design research. The first provides the data that evidence-based design requires. The second creates tools and methods to support integrated, high-performance design. The third identifies the trends that are reshaping the competitive landscape of our clients. By anticipating change, we can respond with innovative solutions that seize and exploit its opportunities. To understand the breadth of our program, let's look in more detail at these three research types.

Evidence-based design

In 2005, we launched our first workplace survey, which drew on end users as key informants on how work settings affect personal and organizational performance. This led to the development of the Workplace Performance Index (WPI), which we use to measure workplace effectiveness and design work settings to support higher organizational performance. The WPI methodology was initially developed by Gensler with the survey expertise of the market research firm, Added Value, part of the WPP Group. It was recently verified by Minimax Consulting, a group of statisticians from Columbia, Harvard, and MIT. Validation also came from BOSTI, whose founder, Michael Brill, was one of the pioneers of workplace research—and a longtime friend of the firm. Seeing WPI as a successor to its own surveys, BOSTI invited us to integrate its 20 years' worth of research data. This complements our own more qualitative and experiential understanding of these two decades. It also gives WPI a unique ability to track a generation's worth of workplace trends and implications.

Design tools and methods

Gensler is a global platform for integrated design and delivery. Integration means more than just the speed with which teams can take projects from start to finish, regardless of location. The performance that results is the real payoff. The goal of integration is to maximize performance within the constraints of cost and schedule. The tools that get used let designers work at their usual blazing pace. These tools plug directly into the building information modeling (BIM) software that facilitates integration. More to the point, these tools comprise suites or packages that help designers orchestrate their approach. By using them from the outset, they can quickly analyze the project's context and opportunities for higher performance. Moving forward, they can use the tools to generate and integrate design strategies. This is crucial, as post-occupancy evaluations consistently show the added value of integrated solutions.

Trend and issue forecasts

The size of our client base and the number of projects we complete—nearly 6,000 per year—give us a unique exposure to the way that larger trends impact the built environment. Part of our research effort is to explore the implications of these trends for specific industry sectors and project types. An example is retail banking. As their transactions move online, the traditional role of the branch bank is in question. Yet banks are part of the cultural fabric of their communities. Demographic trends like the aging population profile in developed economies give them potential reasons to emphasize the personal. Our research looks at the evolving role of the branch bank, asking what form it will take.

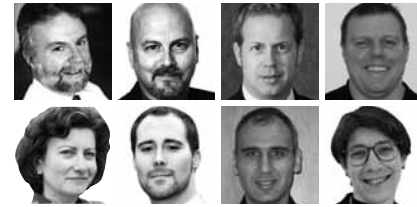
Over the last six years, we have steadily increased the funding we allocate to research, believing it to be an important benefit we provide our clients across the global economy. Research that leads to measurably higher performance is the program's credo. While our commitment to research makes us part of a larger research community, client benefit is our primary motivation. We share our findings with our clients through symposia, outreach, and partnering, recognizing their strong interest and engagement in our research topics. We expect every research initiative to find immediate application, helping us solve problems and arrive at more innovative design solutions.

Diane Hoskins, FAIA, is an executive director of Gensler.

left:
Naru Tower, Seoul, Republic of Korea.

GENSLER'S 2011 DESIGN RESEARCH PROGRAM

AVIATION & TRANSPORTATION



Research Leaders: Bill Hooper, Keith Thompson
Research Team: Todd Osborne, Ty Osbaugh, Marion White, Darris James, Andreas Andreou, Isabel Kraut

Airport Terminal 2015

How will technology reshape the airport terminal in the near future?

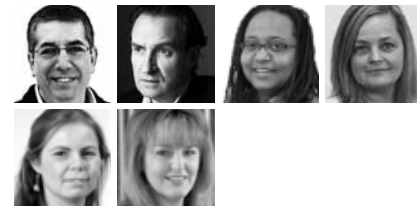
Impact: Redesigns terminals for higher performance and a stronger business case

Aviation Performance Index

How well do airport terminals serve passengers and airport/airline staff?

Impact: Provides a tool for measuring performance and connecting it to terminal design

FINANCIAL SERVICES FIRMS



Research Leaders: Jan Gross, Ross Naismith
Research Team: Lisa Cholmondeley, Natalie Miller-Ramos, Clare Richmond, Dianne Dodge

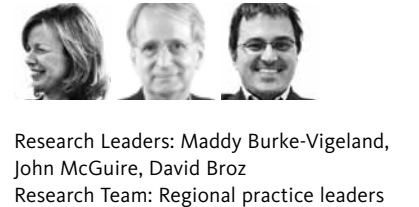
Global Finance Portfolio Management Survey
What issues are driving financial firm real estate programs and decision-making?

Impact: Delineates how financial firm real estate priorities track/vary from other sectors

Global Finance Emerging Geographic Markets
What RE issues are facing global financial firms as they move into new markets?

Impact: Tailors Gensler services and support to global finance clients in emerging markets

EDUCATION



Research Leaders: Maddy Burke-Vigeland, John McGuire, David Broz
Research Team: Regional practice leaders

Place and Higher Education

How can design be leveraged to enhance learning at the university level?

Impact: User insights will help define the features of effective learning environments

COMMERCIAL OFFICE BUILDINGS



Research Leaders: John Adams, Duncan Swinhoe, Leslie Jabs
Research Team: Olivier Sommerhalder, Doug Gensler, Jay Longo, Craig Taylor, Li Wen, Reg Prentice, Ben McAlister, Shawn Gehle

High-Performance Building Envelopes

What is the state of the art and likely future of HPB envelopes and components?

Impact: Provides design teams with ROI-focused case studies of HPB envelopes and components

HPB Tools and Metrics

What tools/metrics do designers need to deliver high-performance buildings?

Impact: Provides strategies to help teams/clients respond optimally to performance drivers

Mapping Environmental Factors

How can teams engage clients about building performance earlier in design?

Impact: Provides designer-friendly tools for evaluating a full range of performance drivers

CONSULTING



Research Leaders: Andrew Garnar-Wortzel, Gervais Tompkin, Tom Vecchione
Research Team: John Duvivier, Randy Howder, Nambi Gardner, Chris Jerde, Erin Cubbison

Activity Analysis

Is there a faster, more accurate way to analyze/optimize real-time space utilization?

Impact: Leverages wireless handheld technology to speed data collection and analysis

Measuring the Value of Design

How does design quality affect building value (lease rates, vacancy rates)?

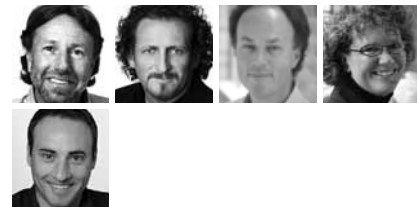
Impact: Gives owners and developers a location-neutral measure of design's added value

World in 2015 Forecast

What do the trends and issues of 2011 suggest about our clients' world in 2015?

Impact: Discusses implications for client real estate strategies and programs

MIXED USE & ENTERTAINMENT



Research Leaders: Marty Borko, Duncan Paterson
Research Team: Michel St. Pierre, Kirsten Ritchie, Dom Ricci

Sustainability and Mixed Use

How do mixed-use strategies in large-scale development support sustainability?

Impact: Delineates sustainable best practices in mixed-use development

SUSTAINABILITY CONSULTING



Research Leaders: Kirsten Ritchie, Anthony Brower
Research Team: Michelle Devins, Melissa Mizell, Jody Handley, Isabel Kraut

Sustainability Trends Analysis

What can be learned about performance and value from Gensler's 400+ LEED projects?

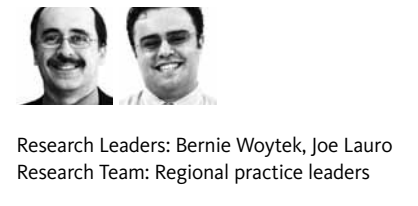
Impact: Highlights sustainable best practices for Gensler clients and teams

Sustainable Products and Materials

How best to support informed selection of sustainable products and materials?

Impact: Gives Gensler designers a tool for identifying and selecting best-in-class solutions

MISSION CRITICAL



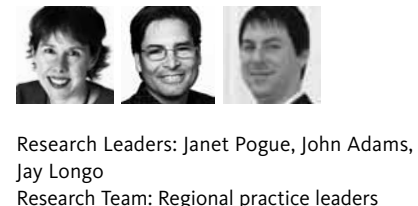
Research Leaders: Bernie Woytek, Joe Lauro
Research Team: Regional practice leaders

Repositioning for Data Centers

When and how best to reposition existing buildings as mission-critical data centers?

Impact: Expands the opportunities to accommodate this project type for clients and owners

HEADQUARTERS



Research Leaders: Janet Pogue, John Adams, Jay Longo
Research Team: Regional practice leaders

Measuring HQ Performance

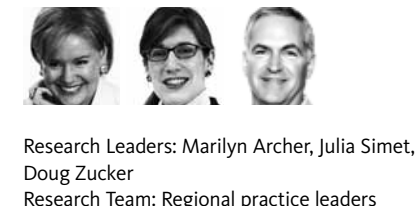
How do headquarters buildings and facilities impact client business performance?

Impact: Measures the performance gains associated with Gensler's integrated approach



Gensler's Chicago office.

PROFESSIONAL SERVICES FIRMS



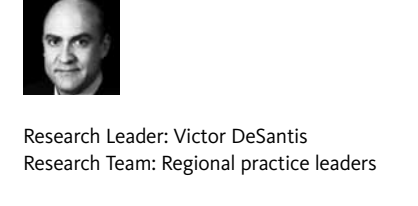
Research Leaders: Marilyn Archer, Julia Simet, Doug Zucker
Research Team: Regional practice leaders

Legal Workplace Performance Index

What issues are driving law firm real estate programs and decision-making?

Impact: Establishes a Legal WPI survey and planning/design tool specific to law firms

SCIENCE & TECHNOLOGY



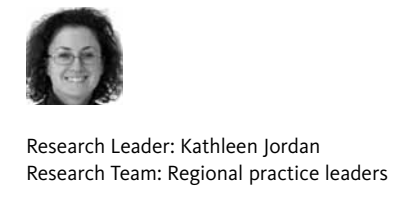
Research Leader: Victor DeSantis
Research Team: Regional practice leaders

Lab Environments 2015

How are science/tech lab settings being impacted by technology and other trends?

Impact: Establishes the basis for "the lab of the near future" in relevant industry sectors

RETAIL



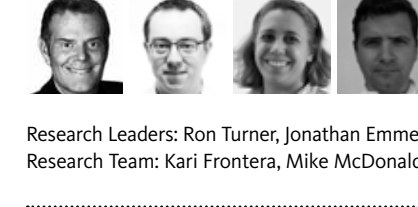
Research Leader: Kathleen Jordan
Research Team: Regional practice leaders

Future of Retail Banking

How will demographic shifts and trends like social media transform retail banking?

Impact: Anticipates shifts in retail banking prompted by media and technology

SPORTS



Research Leaders: Ron Turner, Jonathan Emmett
Research Team: Kari Frontera, Mike McDonald

Rethinking Sports Sponsorship

How best to make corporate sponsorship more effective in sports facility settings?

Impact: Provides new strategies for integrating sponsorship in the sports experience

WORKPLACE



Research Leaders: Andrew Garnar-Wortzel, Gervais Tompkin, Tom Vecchione, Janet Pogue, Jim Williamson
Research Team: Lisa Hsiao, Isabel Kraut, Andreas Andreou

Services and Amenities Benchmarking

Which services and amenities enhance people's work experience and performance?

Impact: Leverages WPI database to identify the most effective amenities/services

Workplace Performance Index Development

What is the best way to extend the geographic range and client relevance of WPI?

Impact: Broadens survey coverage and reporting of WPI findings to new geographic markets

Every Gensler practice area is actively involved in design research on topics and issues of direct benefit to its clients and projects.

DESIGN FOR PERFORMANCE

BY MARA HVISTENDAHL

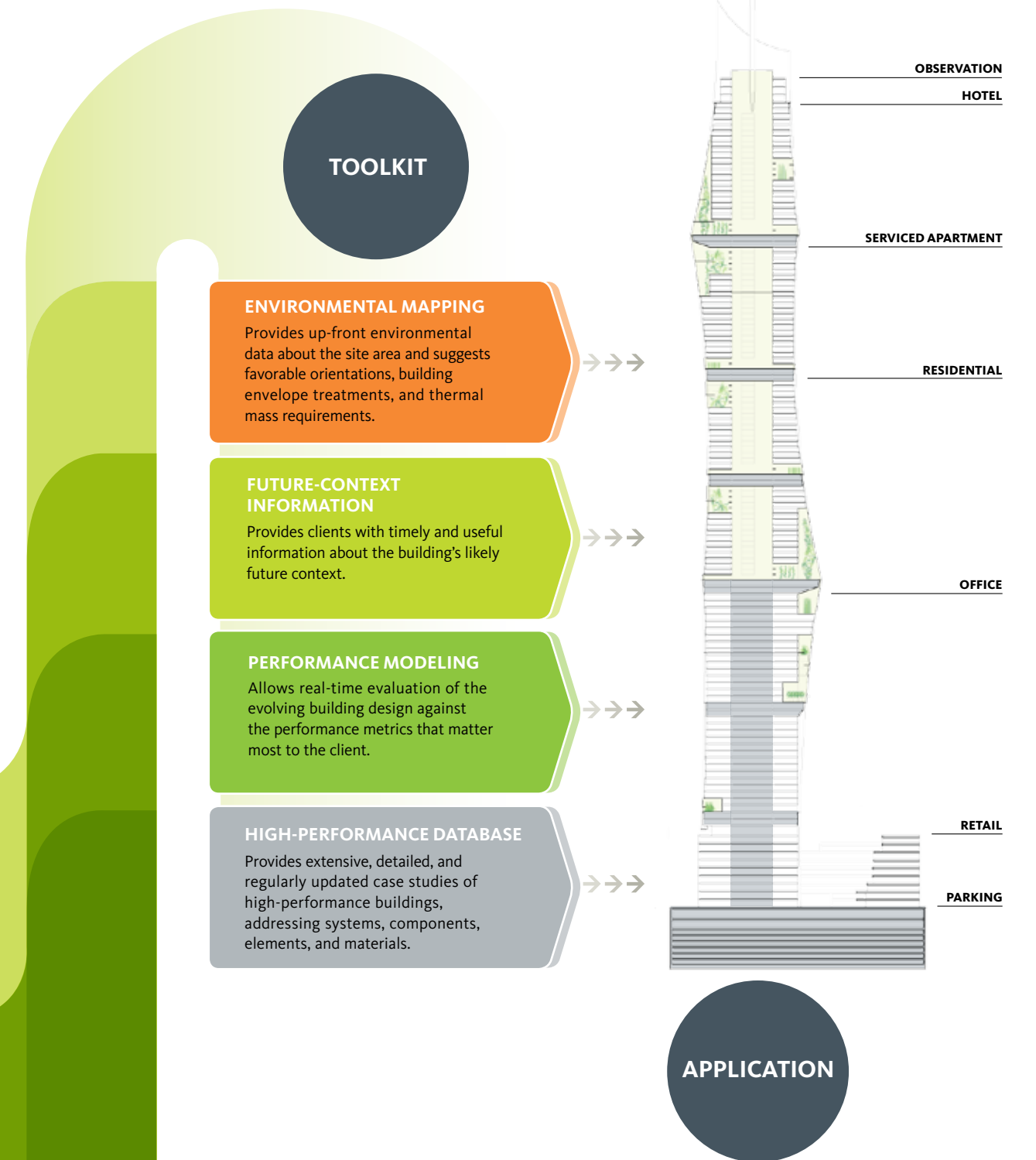
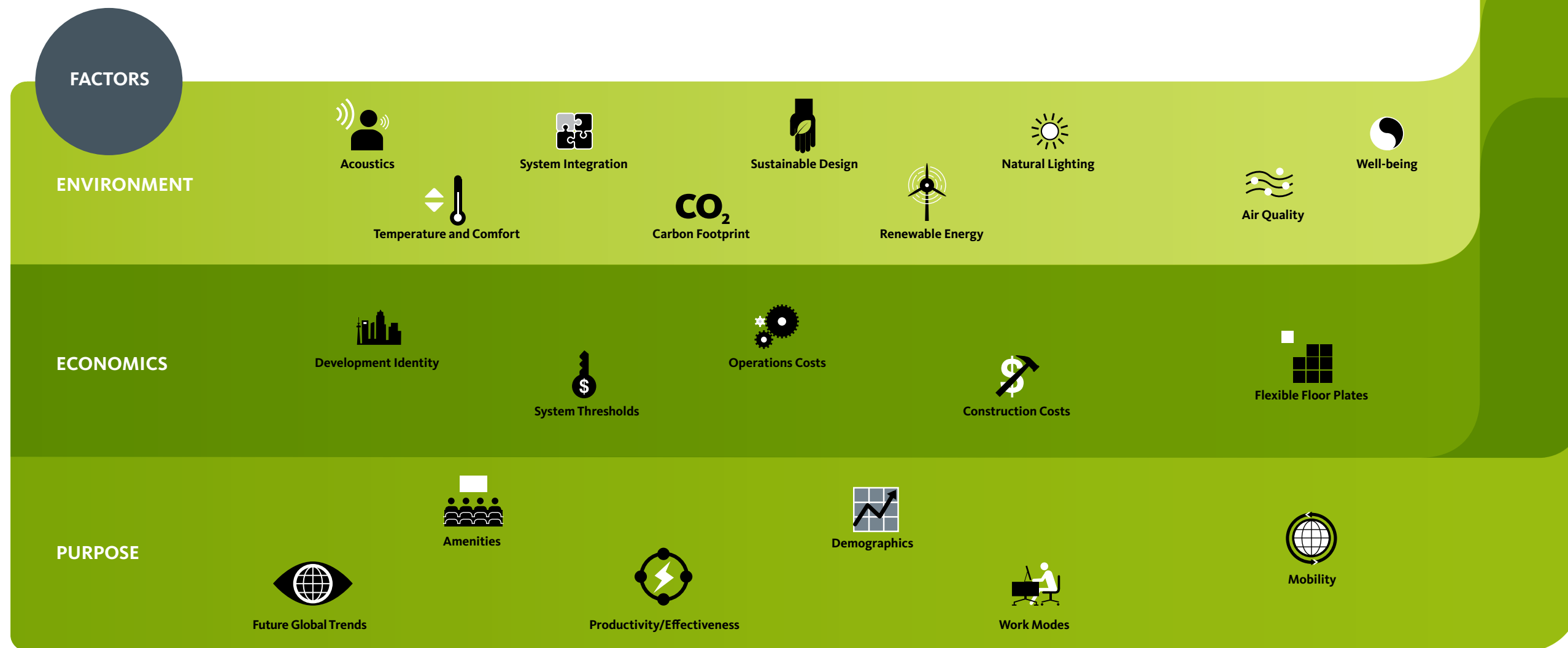
Higher performance is much more likely when the client and design team see the opportunities very early on. A two-year Gensler R&D effort brings that knowledge to every building project.

High-Performance Building Research

Questions: What is the state of the art and likely future of HPB envelopes/components? What tools/metrics do designers need to deliver high-performance buildings? How can teams engage clients about building performance earlier in design?

Impacts: Provides design teams with ROI-focused case studies of HPB envelopes/components and a designer-friendly toolkit for evaluating the full range of performance opportunities. Provides strategies to help design teams and clients respond optimally to the different drivers of building performance.

A Gensler research team based in London and Los Angeles has led a series of applied research initiatives around high-performance buildings. The result is a new approach to building design that's being applied across the firm.



High-Performance Buildings Toolkit supports design from the early assessment of site conditions and client needs to the choice of systems, elements, components, and materials, and the modeling of their performance.

Application of the HPB Toolkit enables design teams to deliver innovative solutions faster, integrating comprehensive site, client, technical, cost, and constructability data much earlier in the process. Naru Tower in Seoul, developed for an international competition, used the full toolkit to create a breakthrough in the design of superhighrise mixed-use towers.

Consider a recent Gensler project—a concept for a mixed-use superhighrise tower in Seoul, Korea. Armed with research on consumer preferences for hospitality and hotel-serviced apartments, trends research on retail in that market, and WPI-based research on international and local work styles and needs, a Gensler design team based in Seoul and Los Angeles considered the potential to shift the mixed-use tower paradigm further, taking advantage of new developments that are reshaping its design, construction, and performance. The tower's rectangular floor plates expand and contract to tailor vertical neighborhoods to specific uses. Sustainable features are integrated and leveraged to combine amenity with high performance.

Or consider two current Gensler federal building repositioning projects in Honolulu and Houston. Their teams drew on up-front analysis of their current performance to uncover the opportunities for design interventions that would deliver the highest return on investment. Both used their analyses to inform and support client decision-making about the directions to be taken.

These projects reflect the application of a research initiative launched in 2008 to ensure that every Gensler studio had access to tools and methods required for high-performance building (HPB) design. "The demand for high-performance buildings is growing," says John Adams, who led the effort with his UK colleague Duncan Swinhoe. "Our goal was to develop an accessible HPB toolkit that would work seamlessly with Gensler's integrated approach to design and delivery."

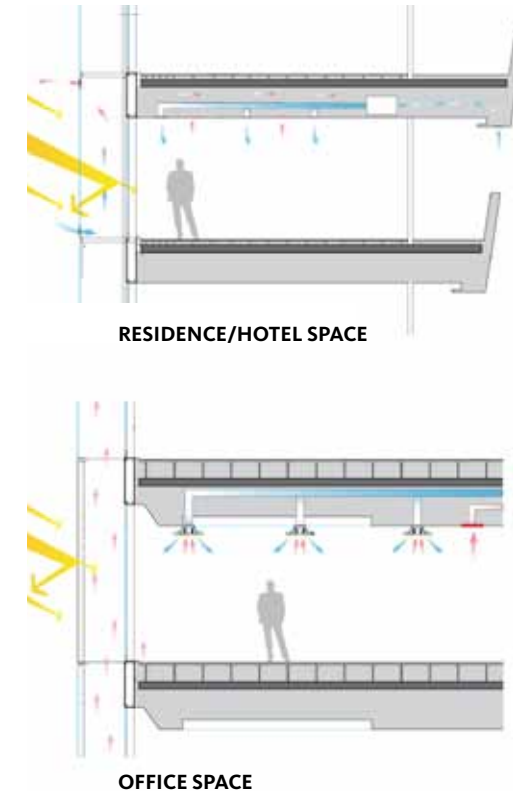
New methods, new possibilities

Gensler sees building architecture at a turning point. As Rob Jernigan observes, "Wherever you look today, there's a desire for higher performance. Our building architects have access to many more innovative materials and technologies than were on the market even 10 years ago."

The availability of sophisticated new building skins, systems, components, and strategies opens up an array of new possibilities when it comes to higher performance. At the same time, the increasingly technical nature of building design means that project teams have to stay abreast of a burgeoning number of innovations—including the ways in which they collaborate with others in an increasingly integrated design and delivery process. All of this makes up-front research more critical than ever, says Ken Hall. "We're informing design thinking with analytical thinking. That's changing the way that Gensler designs buildings."

The greatest departure from older practice involves energy modeling—computer simulation of building performance. While early generations of design software simply mimicked the process of designing by hand, building information modeling (BIM) enables designers to overlay three-dimensional building information with climate and other site-specific data to predict how a building will perform over time. For example, a building can be analyzed under scenarios for a year's worth of weather conditions, yielding a valuable prediction of its actual performance.

NARU TOWER, SEOUL, REPUBLIC OF KOREA



left:
This superhighrise concept combines high performance with high-amenity vertical neighborhoods that fit and reflect their different uses.

above:
The double-skin exterior is designed to perform optimally for both office and hotel-residential uses, with or without access to an interior atrium.

Hall gives an example of a California office complex. "If the building is five stories tall and it's in Santa Monica," he says, "given what we know about the weather in Santa Monica, how much energy is it going to use? What's its carbon footprint?" The results from energy modeling are fed back to the design process, where they allow architects to come up with better and more sustainable buildings. "The focus of Gensler's R&D effort on high-performance building design is to get this feedback loop going from day one," Hall observes. Knowing what strategies are possible lets designers make more informed decisions and encourages them to bring technical consultants into the design process sooner, adds Olivier Sommerhalder. "You know very quickly what the questions are, so you turn to specialists to address them in more detail. That used to occur later in the process, but now everyone is on board from the start."

Developing a high-performance toolkit

Gensler's two-year effort to create the toolkit began with research on the state of the art of high-performance

buildings and systems. Development of the toolkit followed. To beta-test it, Gensler held an in-house "straw-man competition" in the spring of 2010. Competing teams first analyzed typical 5- and 20-story office buildings in their regions' climate zones. A total of 12 climate zones were covered. Each team then applied the HPB toolkit to its straw-man (test) project. Energy modeling was carried out in parallel to validate the results. Following this field testing, the toolkit was rolled out to every Gensler office. Here are its features.

Environmental mapping provides up-front climatic data about the site and its environs. The mapping application also suggests favorable orientations, building envelope treatments, and thermal mass requirements. It can be tuned to regional differences that favor certain building configurations over others.

PRINCE JONAH KUHIO KALANIANAOLE (PJKK) FEDERAL BUILDING RENOVATION



APPLYING THE RESEARCH

Energy used to operate existing PJKK Federal Building

60 KBTU/SF

Renovated PJKK Federal Building will cut energy use by

39 KBTU/SF

FAÇADE
Upgrading to high-performance glass and frames cuts the associated energy load by

36%

SYSTEMS
Upgrading to variable air, efficient lighting, and advanced controls cuts overall energy load by

35%

WATER
Upgrading to water-efficient irrigation, plumbing, and controls cuts water use by

32%

top:
Inserting a full-height atrium in the 1970s PJKK Federal Building in Honolulu brings daylight and cross-views into the office floors.

left:
The atrium is one of several new amenities that reposition the building as a modern workplace for federal agencies.

High-performance case studies address systems, components, elements, and materials. A Gensler-wide initiative in 2010 began to pool knowledge “that was mostly in people’s heads,” Rob Jernigan explains. “Collecting it systematically and disseminating it widely makes it accessible to teams so they can come up with better solutions earlier in the design process.”

Future-context information gives building designers an immediate sense of likely influences, from potential carbon-footprint and energy-related regulation to end-user research like WPI that suggests how the building’s uses and activities may change in the future. The goal, Shawn Gehle says, is to give teams and clients a shared understanding of the building’s future context.

Performance modeling lets the team evaluate the performance of the evolving building design against the metrics that matter most to the client. Here, the toolkit exploits the integration and collaboration tools that are part of Gensler’s design-and-delivery approach. The analysis can be initiated by the core team or by specialist consultants, with the results shared by all.

“Performance is not just about operating efficiency,” notes Adams. “Human and organizational performance are even more important. Rising productivity is a potentially huge payoff.” For that reason, Gensler turns to tools like the Workplace Performance Index (WPI) and Activity Analysis to home in on the specific needs of the organization and the end users. “Connecting those findings with the other factors shaping the building spurs innovation,” Adams says.

A revolution in the making

“The building industry is clearly moving toward higher performance,” Adams adds. Gensler’s HPB research initiatives reflect the firm’s interest in helping to establish a new baseline standard. “There’s a convergence of factors that favor higher-performing buildings,” says Jernigan. “The tools and methods we’ve developed support their design and help clients to weigh the issues and make informed decisions. They make the process more transparent.”

The HPB toolkit that Gensler developed has already proven its worth, Adams feels. “Clients benefit when we can very quickly point to the opportunities and trends. They benefit when we can tie building performance to their business needs, end-user work or lifestyle choices, and other drivers.” Most important, he notes, Gensler’s approach is open-ended. “This is version 1.0. As new software and collaboration tools come online, as the cutting edge of building technology shifts, as client and end-user needs evolve, our tools and methods will change, too.”

Mara Hvistendahl is a Rotterdam-based writer on science and technology. She also writes for the *Financial Times*, *Science*, *Scientific American*, and other publications.

MICKEY LELAND FEDERAL BUILDING RENOVATION



Gensler’s comprehensive renovation of the 22-story Leland Federal Building, which first went into service in 1983, will be phased while it stays in operation. A new façade cuts heat gain and brings daylight to the interior. New HVAC, lighting, and photovoltaic systems improve

energy performance. A new entry pavilion secures the building and gives it civic presence. The design team began using energy modeling and other tools in the proposal stage to test strategies and hone its approach.

above left: Leland will get a new exterior skin with shading elements that respond to building orientation.

above right: The new secure entry pavilion and parking garage walkway will have green roofs.

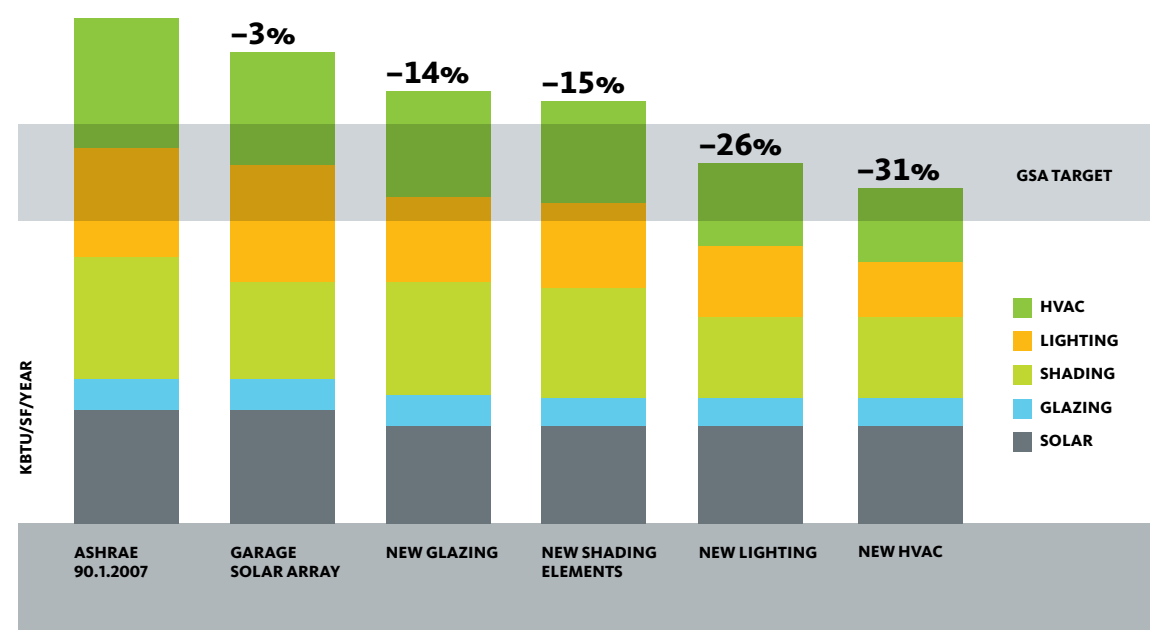
APPLYING THE RESEARCH: ENERGY MODELING HELPS GSA HIT TARGET

Gensler used energy modeling to show GSA how different renovation options cumulatively improved the Leland Building’s energy performance relative to a baseline: meeting ASHRAE 90.1.2007. The final result hits GSA’s own target zone of 40–50 KBTU/SF/YR.

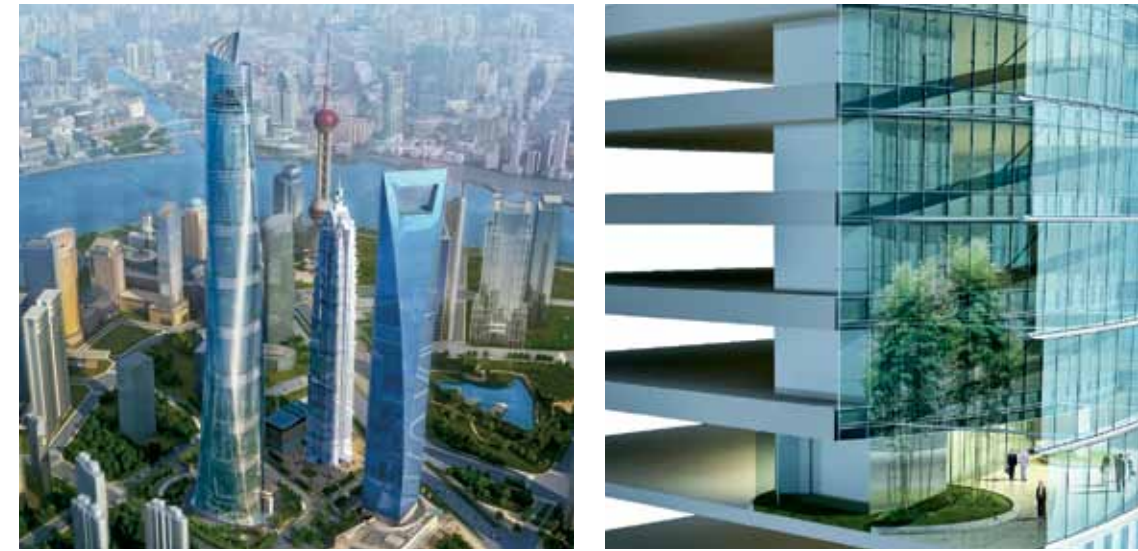
Cumulative energy consumption is lower than ASHRAE 90.1.2007 by

31%

CUMULATIVE IMPACT OF RENOVATION OPTIONS ON ENERGY USE



SHANGHAI TOWER : SUSTAINABLE SUPERHIGHRISE



Gensler’s Shanghai Tower is a breakthrough, 121-story superhighrise project that combines structural and exterior façade innovations to reduce overall weight and provide sky gardens for its vertical neighborhoods. Gensler’s Shanghai-based design team used ongoing computer-based

modeling to support wind-tunnel testing of the overall tower form and the detailed development of the exterior façade. Building information modeling (BIM) software and plug-ins generated the data needed for real-time analysis of how potential design

choices would impact energy performance and human comfort. Now under construction, Shanghai Tower is scheduled for completion in 2014.

APPLYING THE RESEARCH

The tower is targeted to reduce water consumption by

40%

The tower is targeted to reduce energy use by

21%

Façade and structural innovations cut tower wind loads by

32%

Total reduction in the tower’s carbon footprint, in metric tons per year, due to these strategies

36,000



above left: Shanghai Tower completes the world’s first transit-served superhighrise precinct.

above right: The tower structure permits a lightweight exterior skin, defining sky gardens as amenities.

left: Sky gardens serve as gathering places for each of the tower’s vertical neighborhoods. Naturally ventilated, they also provide an energy-conserving thermal barrier.

MADE TO MEASURE

BY RUSS MITCHELL

Until Gensler launched its Workplace Performance Index measurement tool, getting the full picture of workplace performance was notoriously difficult. WPI helps define client expectations, prove their delivery, and benchmark clients against their peers.

Workplace Performance Index Development

Questions: What is the best way to extend the geographic range and client relevance of WPI? What issues are driving law firm real estate programs and decision-making?

Impacts: Broadens survey coverage and reporting of WPI findings to new geographic markets, and establishes a Legal WPI survey and planning/design tool specific to law firms.

Gensler's WPI revealed that office work falls into four categories—learn, collaborate, focus, and socialize.

LEARN
Working to acquire knowledge through education or experience.

COLLABORATE
Working with another person or group to achieve a goal.

FOCUS
Working individually with concentration on tasks or projects.

SOCIALIZE
Interacting to foster collegiality and productive relationships.



Vitra's Joyn office system supports a variety of work modes (photo courtesy of Vitra).

Gensler's Workplace Performance Index (WPI) is one of the firm's most important tools. WPI makes it possible to understand how people work within organizations and how their activities can best be supported by workplace strategy, planning, and design. WPI lets those same organizations measure the effectiveness of new and renovated work settings, and benchmark how that performance measures up—before and after a project is completed—against their top-performing peers.

How WPI came to be

In 2005, a team at Gensler's Washington, DC, office—led by Elizabeth Reardon and Andreas Andreou—developed a new pre-/post-occupancy evaluation tool. The goal was to understand how work settings contributed to people's sense of effectiveness, their ability to interact and collaborate with others, their job satisfaction, and other measures of workplace performance.

The tool proved to be robust, allowing the team to develop metrics for the qualitative aspects of the workplace that were missing in action in most assessments. A notable exception to this was the 1980s work of Michael Brill and his colleagues at BOSTI, a workplace research think tank affiliated with the State University of New York at Buffalo. Brill, a longtime friend of the firm, was intensely interested in getting beyond cost and area per person workplace metrics.

With the pre-/post-occupancy tool in hand, Gensler's team—now enlarged to include a group of workplace practice leaders across the firm led by Janet Pogue and Jim Williamson—asked if they could put the tool to work to consider a much larger sample of office workers in organizations and work settings.

FOUR WORK MODES IDENTIFIED BY GENSLER RESEARCHERS

LEARN

In today's economy, people's success is determined not just by what they know, but how fast they can learn. The demand for new higher skills means that learning has to be integral with the workplace. Workers at top companies spend 80 percent more time learning than their peers in average companies.

COLLABORATE

Open sharing, connecting, and building on ideas through a group process speeds innovation and productivity. Proximity and visual contact help people interact. At top-performing companies, workers see collaboration as being twice as important (104 percent) as their individual focused work.

FOCUS

Focused work is still important. To focus effectively, people need to be free of distractions and interruptions. When the workplace provides for this, they will reallocate their time accordingly. At top companies, workers spend 21 percent less time on focused work than their peers in average companies.

SOCIALIZE

Social networks help organizations solve problems, learn, innovate, and adapt. The resulting sense of community creates pathways of information sharing and helps align values, culture, and mission. At top-performing companies, workers socialize 16 percent more than their peers at average companies.



Avid Technology, Inc., Burlington, MA.

An early survey of 200 middle and senior managers in the UK got the ball rolling. A US workplace survey, developed with the WPP Group's Added Value, quickly followed, reaching a much larger sample of companies and office workers—mirroring the different sectors of the US economy. The size and diversity of the sample have grown steadily. Some 50,000 respondents from more than 100 companies and other organizations have participated in WPI surveys. What the findings consistently demonstrate is that leading organizations score substantially higher in workplace performance than their “average” peers. High scores for organizational performance tallied closely with high scores for workplace effectiveness and employee satisfaction.

Most leading organizations view the workplace as a strategic asset. Understandably, they care about its performance. That means looking beyond conventional real estate metrics. “They’re easier to get, so everyone measures them,” Pogue notes. “They’re important, but they don’t give organizations a full picture of workplace performance.” Adds Diane Hoskins, “People say intangibles are hard to define, but a lot of what we think of as intangibles can be measured.”

Putting WPI to work

Using objective data drawn from a client’s employees, the WPI pre-/post-occupancy tool shows how employees actually work and how effective the office environment is in supporting them. These findings are used to define workplace design requirements and measure the increased performance attributable to a new or renovated workspace compared to the one it replaced. The new or renovated workplace is informed by a detailed pre-design online employee survey. A post-design survey, conducted along with a walk-through three to six months following occupancy, measures how well the new workplace is performing against the client’s criteria.

An early application of WPI was the redesign of McDonald’s global headquarters workplace in Oak Brook, Illinois. A major goal was to encourage collaboration. Using WPI to compare the finished design with pre-design

GAUGING SPACE

Gensler’s Activity Analysis tool speeds evaluation of space usage



above: Gensler’s Activity Analysis app makes real-time space-use data collection fast and wireless.

Excellent workplace design relies on a thorough understanding of how a company’s workforce uses its space productively. To streamline the collection of space utilization and occupancy data, Gensler’s Consulting team developed an Activity Analysis application for the iPod Touch, iPhone, and iPad. For the first time, users can input real-time activity data that is immediately and wirelessly uploaded to our database.

This is a major step forward in providing a quantitative assessment of the way people interact with their environment over time. Our Activity Analysis tool converts raw data into valuable information. We compile thousands of data points and combine them with other data sets such as schedule and furniture inventory. By interpreting quantitative data through a qualitative filter informed by surveys, focus groups, or interviews, we gain insights that can be translated into action. The benefits to clients include space savings, improved space allocations, timely refreshes of furniture and equipment, and accurate assessments of mobile readiness.

conditions, Gensler found that collaboration time shot up 34 percent—to more than one-third of the work week—and job satisfaction went up by 43 percent. A rebalanced mix of individual and collaboration spaces improved overall efficiency.

Other WPI applications

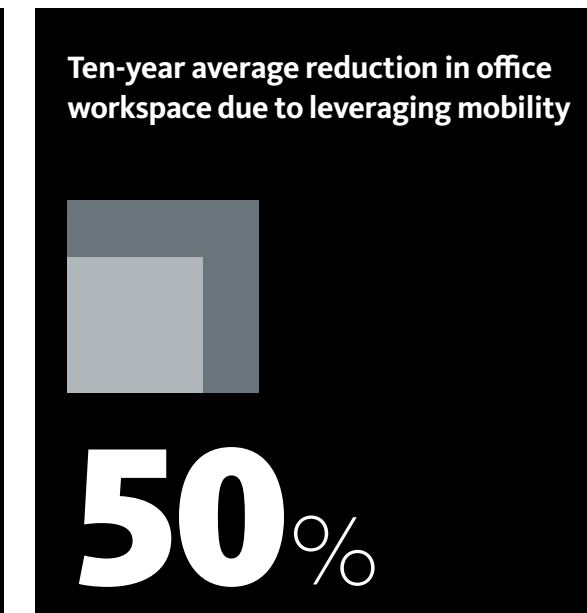
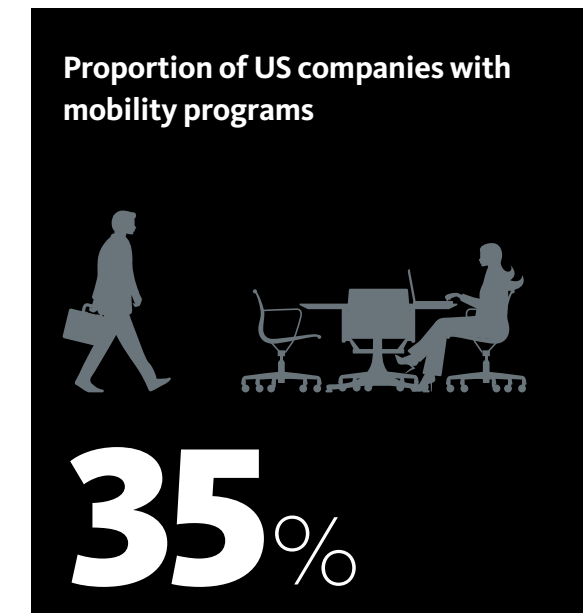
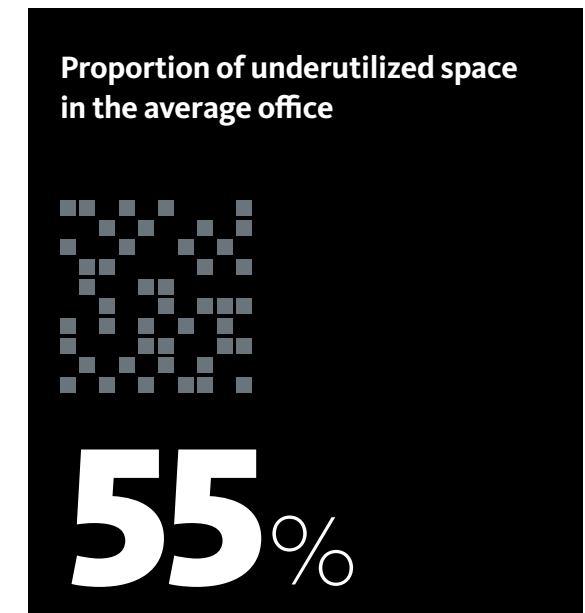
WPI also serves as a change-management tool. Transforming people’s work settings is inherently stressful, but asking them how they work and how office design can support them better enhances trust. “Instead of asking what employees want, we ask them how they work,” says Tom Mulhern. The question takes different forms to ferret out the priorities among focused work, face-to-face collaboration, learning, casual interaction, and other activities, and determine how well the existing workspace provides for them.

The results create a basis for more productive conversations between client decision-makers and the design team. The survey metrics serve as touch points for a more business-focused discussion, says Jim Williamson. “It brings the conversation back to work modes like focusing, collaborating, learning, and socializing. It puts the emphasis on performance, not aesthetics.”

“Business decision-makers needed a way to talk about workplace design that ties it back to real metrics,” says Janet Pogue. “WPI provided it.” By quantifying what was previously intuited but unmeasured, WPI made it possible to evaluate investments in the workplace in the same way as investments in technology, for example. “There’s much more clarity about the benefits,” adds Williamson. “The full value of a high-performance workplace is both seen and appreciated.”

KEY WPI FINDINGS

Worker mobility is shrinking real estate requirements and energy consumption



A mobile workforce

Organizations have approached mobility in different ways. While some recast their whole approach to the workplace around it, others set up mobile work centers or simply encourage people to work from home. To help clients better understand the relationship between mobility and an effective workplace, Gensler added a mobility module to the WPI survey in 2009. "Clients are often surprised how mobile their employees are," Randy Howder notes. "At any given time in a typical North American office workspace, 60 to 70 percent of the desks are empty. Showing a client evidence of this de facto mobility really opens up the conversation." Gensler's WPI mobility module is being used by Amgen Pharmaceuticals, Chevron, GSA, Hewlett-Packard, and others.

Hewlett-Packard worked with Gensler to develop a workplace planning approach around mobile work that can be extended globally. "The whole floor is my office" is the slogan, meant to convey the benefits of redefining what an office is and does. Instead of dedicated desks, there's a diversity of settings that let employees work fluidly based on their immediate needs. "There's less me space, more we space," Howder says.

The magnitude of any switch to office designs that accommodate mobile workers varies from company to company, influenced by employee and managerial readiness and even by corporate policies. WPI can help identify workers or departments eager to participate in proof-of-concept pilot projects. By quantifying the mobile needs of the workforce, WPI helps sway management to revise policies that make it harder for the organization to embrace and leverage mobility.

APPLYING WPI

More than 100 organizations have already put WPI to work

By January 2011, Gensler's WPI clients reached 104. That represents 50,387 respondents, drawn from organizations across the economy: aviation, biotech and pharmaceuticals, business services, consumer products, education, energy, finance and insurance, government, legal, media and creative, not-for-profit, and technology. They include leading global companies, professional services firms, universities, public agencies, and nonprofit organizations. WPI is part of their strategic arsenal—a way to understand how their people work and then align the workplace so that personal, team, and organizational goals can be measured and achieved.

WPI IN 2011



below:
Panduit's new five-story, 280,000-square-foot headquarters in Tinley Park, IL, reflects the importance its employees give to open, daylight-filled, tech-integrated work settings.



A healthy workplace

Sustainability—doing more with less, in environmentally sound ways—is another essential element in office design that WPI now addresses. WPI findings track GSA studies showing that high-performance buildings tend to be standouts in terms of employee satisfaction. Efficient use of the workspace can cut an organization's total space needs—and its carbon footprint. Understanding how the workplace supports employee health and well-being is the focus of the WPI sustainability module. The findings show that employees see lighting, temperature, and air quality as very important factors in their assessment of the workplace. Because office workers spend most of their days indoors, access to daylight has a high priority. "That's not just about building performance," says Katie Mesia. "People are happier and work better."

The Legal WPI

An important development of WPI took place in 2010, when Gensler developed a separate WPI survey for law firms. To date, some 1,200 attorneys and staff from leading US law firms have been surveyed. These are large firms with at least \$500 million in annual revenue. The Legal WPI found that while focused work continues to dominate the typical lawyer's workday, collaboration runs a close second, with 77 percent of attorneys seeing it as a critical activity. In top law firms, lawyers spend 36 percent of an average workweek collaborating. Provocatively, a 2011 survey of a large US law firm found that 80 percent of collaboration—among its lawyers takes place in their own workspace—private offices.

At a time when many law firms are trying to reduce the space allocated to private offices, this finding suggests that there are reasons to hold the line. While the existing technology lawyers use to collaborate in their offices works well, collaboration may be better served by making sure computer monitors can be viewed by more than one person.

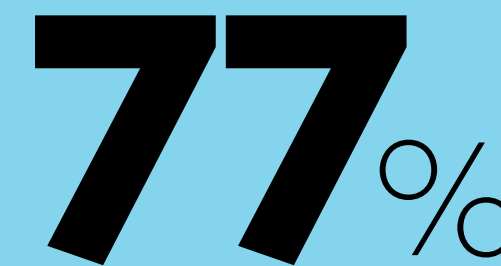
The 2010 Legal WPI included a separate survey of law-firm leaders. In overwhelming numbers—93 percent—they reported that pressure to reduce costs is their number one concern. In 2010, law firm consultants Hildebrand and Baker Robbins found that more than half of large law firms expect significant changes in pricing and staffing in the next three to five years. These findings may reflect the economy, but they have led to a heightened interest among law firms in leveraging mobility. Gensler has recently added the mobility module to the Legal WPI at the request of several law firm clients.

WPI doesn't replace other tools used in the workplace design process, but augments them by identifying the workplace attributes that are likely to provide the greatest return in terms of enhancing people's productivity and satisfaction. In a broader sense, the WPI surveys give organizations the means to evaluate how they're doing against the best in their own and other sectors. WPI's findings have been translated into Chinese, German, Japanese, and Spanish. Those findings will soon reflect respondents from client organizations in Asia and Latin America. The most visible of Gensler's R&D products, WPI exemplifies the firm's commitment to research-based design.

Russ Mitchell writes for *Business Week*, *Wired*, and other publications. He is based in Berkeley.

KEY LEGAL WPI FINDINGS

Collaboration is becoming more important for lawyers



of lawyers reported that collaboration is a critical part of their work

AT THEIR DESKS

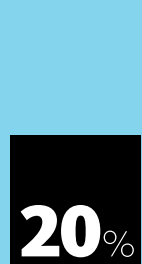
Portion of day lawyers collaborate in private offices



Most collaboration takes place in people's workspace

NOT AT THEIR DESKS

Portion of day lawyers collaborate in other settings



Source: Gensler Legal WPI surveys of large US law firms, 2010 and 2011.

below:
Vinson & Elkins is one of 104 Gensler clients that have used WPI to understand how their work settings contribute to higher performance.



Research topic:
AIRPORT
TERMINALS
Case no.

03

HIGHTECH, HIGHTOUCH

BY MATTHEW RICHARDSON

With technology advances promising to transform airports, Gensler designers are promoting a smaller, more efficient terminal paradigm: one that enhances the passenger experience of air travel.

Airport Terminal 2015 and API

Questions: How will technology reshape airport terminals in the near future? How well do terminals serve passengers and airport/airline staff?

Impacts: Creates a new terminal paradigm offering higher performance and a stronger business case; establishes a tool for measuring performance and connecting it to terminal design.

below:
This proposal for a new European airport reflects Gensler's Terminal 2015 concept.



Compared to a conventional terminal of the same capacity, Gensler's Terminal 2015 concept reduces the building area by

22%

Since 2001, airports and air travelers have improvised heroically to multiple challenges. In response, Gensler's airport practice has focused its R&D efforts on developing the next generation of passenger terminals. To compare that future against the present, the practice developed two conceptual models of a terminal serving 10 million passengers per year. One concept reflects current assumptions, while the other anticipates what is likely to be in place in most airports in the second half of this decade.

Technology is the catalyst for contemporary airport evolution, practice leader Bill Hooper explains. He cites a 2010 survey of air travelers carried out by SITA, an air-transport communications specialist. "While online booking and check-in are nearing their full potential, there is now clear demand from the travelling public for self-service on other steps of the passenger journey," SITA found. Of those surveyed, nearly 70 percent said they are willing to use self-service devices to print bag tags, change flights, check bags, board planes, and purchase additional services like bag fees or meals.

That's a significant uptick from 2009, when only 58 percent of those surveyed indicated a preference for self-service technology. "Travelers are ready to take control of their journey—whether online, at terminal kiosks, or through their mobile devices," Hooper says. "As people self-direct their travel experience, airports will change—becoming much more user-friendly and efficient."

SITA's annual passenger survey is one of a number of sources that Hooper and his colleagues reviewed in developing a brief for the airport passenger terminal of the near future. Their research drew heavily on their own experience: Gensler's recent terminals shifted the paradigm by rethinking the departure sequence in light of security requirements. They also reflect the idea of common use—that the airlines share facilities that the airports own and control, rather than having an exclusive right to them.

BENEFITS OF GENSLER'S TERMINAL 2015 CONCEPT

Designed to reflect technology's liberation of air travelers, the new terminal cuts size and cost while delivering a much better passenger experience.

TODAY'S TERMINAL

The current terminal paradigm gives more room to ticketing, less to security and concessions.

TERMINAL BUILDING AREA

square feet

800,000

TICKETING & DEPARTURE LOBBY

square feet

32,000

SECURITY SCREENING

processing lanes

8

CONCESSIONS

square feet

44,000

TOMORROW'S TERMINAL

Gensler's Terminal 2015 triples security lanes, doubles concessions, and shrinks ticketing.

TERMINAL BUILDING AREA

square feet

625,000

TICKETING & DEPARTURE LOBBY

square feet

25,000

SECURITY SCREENING

processing lanes

24

CONCESSIONS

square feet

84,000

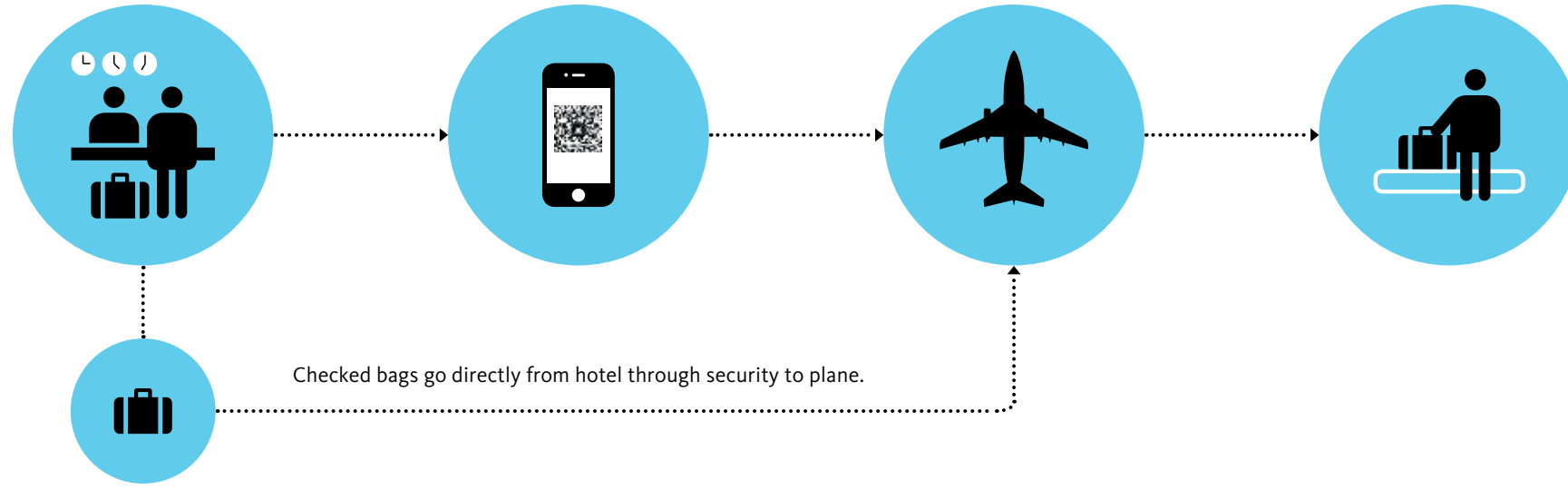
2015'S PASSENGER JOURNEY

Passengers check bags at hotel, take train to airport.

Travel documents are on mobiles: no ticketing, faster security, larger and better concessions.

Concessions are close to boarding areas, so dining, shopping, and mobile work are stress-free.

On arrival at destination, passengers pick up bags and find transit in the new welcoming hall.



2x

The 2015 terminal almost doubles the area for concessions

Tomorrow's terminal shifts space to where travelers and airports want it most. An expanded concessions program, including upgraded restaurant and retail offerings, enlivens the passenger journey, while generating more revenue for the airport.

Most of today's terminals reflect airline-centric priorities. With new technologies and the protocols they afford, airports stand to be less dependent on airlines for handling passenger processing in the future. Through common-use strategies, new or renovated terminals will become increasingly airport-centric, allowing airports to shape all facets of the passenger experience, short of flying the aircraft.

Tomorrow's airport journey

"Airports are at an inflection point," says Hooper's colleague and fellow practice leader Keith Thompson. "Technology will affect every aspect of flying." Along with the technology itself, change is being driven by new protocols like Common Use Passenger Processing Systems (CUPPS) and Common Use Self Service (CUSS). They will allow travelers to check in and tag and drop off bags at remote locations—hotels, convention centers, rental car centers, and airport parking garages, for example—using kiosks or their own mobile devices. Shifting to tablets and smart phones "will redefine notions of self-service," Thompson adds. "Until they board their planes, passengers will hardly need to interact with the airlines at all." Some international airports are already using the technology to some extent, but its full potential hasn't been realized.

"It will be a big gain for air travelers," Hooper says. "If they can handle most aspects of the preflight sequence before they get to the airport, they will have more time, less stress, and greater flexibility." Airports benefit from higher passenger capacity and lower pre-security congestion. And travelers who are at ease are more likely to take in the concessions rather than rush anxiously for their gates.

Imagining the 2015 terminal

These changes led Gensler's airport team to question the current passenger terminal paradigm. "The ticketing lobby gained prominence as the point of sale for the airlines," Thompson says. "Now that passengers are

pre-ticketed, the area is losing its marquee status. That the baggage claim area is below ticketing reflects the days "when it was simpler and cheaper to slide an enplaning bag down a shoot and drop off a deplaned bag on the ground floor," he adds. Given how technology is reshaping air travel, deplaning—arriving at your destination—may soon become a bigger event at airports than enplaning. "That has major implications for terminal layout and configuration," says Hooper.

Designed to accommodate 10 million passengers per year, Gensler's 2015 terminal breaks with the past by inverting the current two-level configuration in which baggage claim is stacked beneath a grandly scaled ticketing hall. To elevate the deplaning experience, baggage claim moves upstairs and grows about 40 percent bigger—a light-filled space that welcomes visitors to the city. With ticketing at the airport now a non-event, the pre-security aspects of enplaning relocate to a less-prominent area on the lower level. A third less space would be allocated to airline agent and baggage check-in positions.

Beyond inverting enplaning and deplaning, the reconfigured two-level terminal concept reconsiders other spaces, including security and concessions. Free of most airline-specific ticket counters and bag drops, the landside departure area can accommodate a larger number of airport-managed self-service kiosks for self-ticketing and bag-tag printing. More important, there's room for a very substantial increase in security lanes to speed passenger processing.

Gensler's 2015 terminal concept encourages a quick transition from landside to airside, recognizing that passengers will be more comfortable if they can clear security screening quickly and smoothly. Once past security, travelers can anticipate having additional time to enjoy a centralized and expanded concessions program with a wider variety of restaurant and retail options. The 2015 terminal concept almost doubles the size of

concessions compared to today's 44,000-square-foot average. "Human factors studies show that passengers want to stay within 250 feet of their gate," Hooper says. "Placing concessions in this crucial zone offers stores and restaurants more exposure to passengers. They in turn have more time to explore and enjoy." The waiting areas around the gates are almost 30 percent bigger, with the capacity to seat up to 75 percent of the passengers on an average flight.

Compared to today's model, Gensler's 2015 terminal is about 22 percent smaller while achieving the same capacity (10 million passengers per year). At a current construction cost of \$500 per square foot, that's a savings of about \$88 million. The building's carbon footprint is also correspondingly less.

Gensler's airport practice is actively discussing the 2015 concept with airport clients worldwide. "We expect to see technology take hold in airports by mid-decade," Thompson says. "Our concept anticipates that development, and offers a model ready-made to serve future requirements."

Hooper acknowledges that the concept is ideally suited to new terminals, but says there are myriad 2015 terminal elements that can be applied to existing airports. He points to Gensler's Aviation Performance Index (API) measurement and analysis tool as a means of discovering how an airline or airport authority can enhance an existing terminal. Modeled on Gensler's Workplace Performance Index (WPI), the API gauges airport terminal design effectiveness, evaluating passenger experience and operational efficiency from both airport employee and passenger points of view.

"Combined with our ongoing research, the API enables our airline and airport partners to improve terminal operations," Hooper says. "This not only presents opportunities to uncover untapped revenue, it elevates the airport experience, making the passenger journey as important as the destination."

Matthew Richardson is a senior editor with Gensler's communications team, based in Chicago.

APPLYING THE RESEARCH

Gensler has applied the Terminal 2015 concept to major airports in southwest Europe (left), China (top right), and Chennai, India (bottom right), where a new international terminal is now in construction.



THE WORLD OF DESIGN RESEARCH

BY VERNON MAYS

Design research is being done today by universities, government agencies, corporations, and practices. We asked 11 leading design researchers about their work—its goals, applications, and impacts.

A Survey of Design Research Leaders

Questions: What is the purpose of design research? How do the researchers select their topics and apply their findings? What are the benefits of design research for design's stakeholders?

Impacts: Design research speeds innovation to improve the built environment at every scale, so its settings are more effective for their intended purposes, and more sustainable.



James Timberlake
Kieran Timberlake

James Timberlake is a partner at KieranTimberlake and inaugural recipient of the Benjamin Latrobe Fellowship for architectural design research from the AIA College of Fellows. Gensler is working with his firm on the new US Embassy in London.

Not many architects engage in serious research. Why is it important to your firm?

James Timberlake: Our firm culture began with research 26 years ago, and continued to emerge until it was formalized in 1999. Five years ago, when we became ISO 9001-2000 certified, we established research processes in our firm's management system. The essence of performance-based architecture is founded in research. Without the proper queries, data, metrics, and facts, science cannot inform art in meaningful ways. Architecture, after all, is both art and science, no?

Would you call your research "scientific"?

JT: Yes. The research, whether applied or non-applied, covers a variety of topics, all of which are deeply informed by rigorous query. Many of our research initiatives are proprietary, but some in the public realm include the research and writing of *Refabricating Architecture*; the development of SmartWrap™; Loblolly House, and

Cellophane House™; and the design and monitoring of several high-performance building envelopes. The new US Embassy in London embodies numerous research initiatives that involve a variety of systems, applications, and technologies.

How will the outcome of your research benefit your clients?

JT: We believe that if we can improve building performance, encourage better social environments, and decrease the impact of our architecture on the environment, we will generate benefits not only for our clients, but for the advancement of architecture. Efforts such as our books and the fabrication of Loblolly House and Cellophane House are examples of applied results that have immediate measurable impact.

What is the thrust of your research? How do you select your topics?

Vivian Loftness: We have projects underway in intelligent workplaces, high-performance building design, and sustainability. Architecture affects my decision to pursue any research. We focus on improving the design, construction, and operation of buildings for end users and the environment. We observe building performance, find gaps in the disciplines that could compromise performance, and identify where innovation can make a measurable difference.

What are you working on now?

VL: We're working on Building Investment Decision Support, an investment decision tool that helps identify the true costs and benefits of sustainable features and the life cycle justifications for high performance and green design innovations. It shows that profitable investments are possible through a range of cost benefits—

from the "immediate dollars" of energy efficiency, waste management, and churn to the "long-term dollars" of improved indoor environmental quality, productivity, and health.

We also have quantitative before-and-after field studies underway in federal office buildings that link performance factors (such as health, productivity, and retention rates) to the quality of the physical environment. User satisfaction and performance studies reveal gaps between design intent and performance, such as the disconnect between thermal comfort standards set for 80 percent occupant satisfaction and the fact that only 40 percent of workers are happy. The thermostat cannot measure human perception. Lighting is another area where standards and reality don't always mesh. Paper-based reading levels are too high for computer-based work.



Vivian Loftness
Carnegie Mellon University

Vivian Loftness is a researcher and educator in environmental design, advanced building systems, and design for productivity. She leads research on the intelligent workplace for the Advanced Building Systems Integration Consortium, a university-industry partnership.

How would you characterize your research program at Cisco?

Rachael McBrearty: It's about how we can bring technology to bear to advance business. We take a user-centered design approach, which considers the needs, limitations, and expectations of our retailers' customers. We look through the eyes of those customers, using design thinking to deliver the right balance of functional, emotional, and aesthetic experiences.

Does that apply more to retail settings or websites?

RM: It's across multiple channels. It's not that different than writing a story—like a hero's journey. Imagine setting out on an adventure to buy a new camera or get an outfit. We look at how the customer thinks about achieving that goal, how you facilitate it, whether they're shopping on their mobile phone, online, or in the store. We think about all the touch points that journey can take.

What projects are you concentrating on now?

RM: Two areas are showing positive business results. We're exploring the concept of a remote expert. It's about scaling your experts to interact with the customers live, in-store, through high-definition video, online through shared spaces and shared content, or through Twitter. It is about bringing the human touch into the experience. The other new area is interactive signage. We have a pilot in which we're personalizing signage, so you tap a loyalty card to the sign and it gives you targeted recommendations and offers. We want to see if that drives sales. It's a way to leverage the data retailers already have in their customer relationship management software.



Rachael McBrearty, Cisco

Rachael McBrearty is global creative director of Cisco's IBSG Innovations Practice, which designs next-generation customer experiences by using technology to connect customers to employees and enable real-time interactions throughout the customer journey.



David Kirsh
University of California, San Diego

David Kirsh is a professor of cognitive science at UCSD. He sits on the board of the Academy of Neuroscience for Architecture (ANFA), which advances knowledge linking neuroscience research to an understanding of human responses to buildings.

How do your research interests overlap with those of the Academy of Neuroscience for Architecture?

David Kirsh: Reducing cognitive complexity and maintaining control over the structure of the workplace are themes of ANFA's research and my own. Many of our questions focus on spatial cognition, such as effective design that results in simple navigation of complex buildings. Cues, layouts, or constraints within a space can compensate for neural deficits, but architectural attributes are complicated stimuli. We use virtual environments to study spatial cognition, with the results evaluated through electrophysiological neural reading devices. Some Academy members study how spatial and other design attributes affect activity in everyday life.

My work focuses on this, too. We studied office workers by video to understand the effects of desk designs and workflow patterns. Was the messy desk or the neat desk better? We studied people's behavior, interruptions, and

the number of projects open on their desks at one time. That gave us a profile of the ways people relate to their desks.

Are you studying environments other than the workplace?

DK: Smart kitchens are also under investigation. Take recipes, for example. Recipe books are inefficient, causing the cook to look at them repeatedly, which ought to be unnecessary given their lack of complexity. A smart kitchen is not just about production, but also about organization. It uses context-aware intelligence and artifacts, perhaps a frying pan with sensors that recognize when the butter is ready or else is too hot—or a knife that recognizes the difference between slicing and chopping and signals the cook if something is wrong.

What are you seeking to achieve in your research program at CASE?

Jason Vollen: One of our goals is to accelerate the development and deployment of new technologies into the building sector. We're trying to position ourselves in a research, academic, and industrial alliance to get technologies to the marketplace faster. We're also focused on the building envelope, working to capture, transform, store, and redistribute the energy in and around the envelope.

Do design professionals shape your agenda? Or is it driven by the marketplace?

JV: It varies. Often we work alongside large firms and develop our technologies in parallel with large building projects, meaning that the research is not sacrificed for the building or vice versa. We see that to be mutually beneficial, because if the pace of development means the

new technology won't get applied on the first project, then it might get far enough along to be used on the second or third. It's a way to push the technology faster.

Tell us about one of your current projects.

JV: They're all important, but one is the Integrated Concentrating Solar Façade, which is both a daylighting system and a power generator. It's taking 60 to 80 percent of the energy off the envelope through either high-quality heat or photovoltaics. This has been made possible by great advances in high-efficiency solar cell technologies, combined with viewing the façade as an energy generator. We can actually focus light, turn it into heat energy, and then move the heat away from the building.



Jason Vollen
Center for Architecture Science and Ecology (CASE)

Jason Vollen is Associate Director of CASE, a research program co-hosted by Rensselaer Polytechnic Institute and Skidmore, Owings & Merrill. He focuses on such emerging technologies as energy-performative structural ceramics, environmental simulation, and digital fabrication.



Jeremy Watson
Arup

Jeremy Watson is Arup's director of global research. A chartered engineer, he is also a visiting professor at the Universities of Southampton and Sussex, and chief scientific advisor for the UK Department for Communities and Local Government.

Has research been a part of your firm culture from the beginning?

Jeremy Watson: Yes, going back to the Sydney Opera House, I think Ove Arup was pushing the boundaries and researching new means of developing the engineering around innovative design. We feel that research and design are the two key elements that differentiate us—and one feeds the other.

What research projects are you currently working on?

JW: Our most important projects are in the area of sustainable planning and development, including methodologies for city infrastructure. We're looking at the interplay between the infrastructure that gets built in cities and what benefits can be gained in energy terms, both embodied and operational, and in convenience for citizens. There are frequently places where energy, for example, is lost in one system where it could benefit another.

How has your research influenced your work?

JW: It has internationalized our research links through Arup's research champions and partners. A key example is the formation of Institutes for Sustainability in London and Shanghai. What we've done in London is to leverage money from Europe to do retrofit of existing buildings for energy efficiency and to then transmit the information learned from doing that to small- to medium-sized enterprises. In Shanghai, with Tongji University, we have set up a sister institute. The goals are different, because Shanghai is a "new building" environment. We are doing joint projects that have been instrumental in releasing quite a bit of money—\$1.5 billion—for regional development.



Anijo Mathew
Illinois Institute of Technology (IIT)

Anijo Mathew is an assistant professor at IIT's Institute of Design. He uses interactive design to study how information affects placemaking and how place affects information. In 2007, he was named New Researcher of the Year by the Architecture Research Centers Consortium.

What influences your decision to pursue one topic or another?

Anijo Mathew: My research is shaped by social evolution and the idea that people are starting to reconstruct notions of place through technology. The computer can turn data into physical and virtual feedback.

How does technology work to shape place?

AM: Placemaking is the notion that architecture shapes place, in the sense that people can come together and commune. Plazas, public spaces, and parks are an important aspect of urban space, rather than just buildings and streets. But now that information is so prominent in our lives, and we have moved to a transient point of view because of mobile devices, the idea of place becomes transient, too. Place can be shared with people who are not in the same physical location. So place is not just physical, it's also virtual. Using central

points and the concept of zero-zero grids, it is possible to understand the personality of both physical and virtual space constructed by the people passing through. Through virtual connections, digital devices can track who has come to a place and from where, how long they stay, and where they're going.

How are you applying these ideas?

AM: We are working on developing protocols with IBM to use published data for mapping the visual construct of a city. Imagine walking around with a mobile device, seeing a building, checking out its history, who designed and occupied it, then peeling back layers and looking at mechanical systems or energy consumption or structural components—all the invisible stuff.

How does the City of Los Angeles support your research?

Dana Cuff: LA is our backyard, so we use it as a lab. The post-suburban city is one of our research initiatives, which stems from cityLAB's location in Los Angeles, the mother of all suburbs. In 2009, we launched a design competition called "WPA 2.0" that addressed federal policy about how design might be part of bailout policies to improve America's infrastructure. At the end of the Great Depression, the government subsidized infrastructure projects that both created jobs and left a lasting design legacy. So "WPA 2.0" looked at how current federal spending on infrastructure could contribute more to local communities by investing in the design of bridges, roads, schools, water projects, and so on.

density. Thanks to California legislation that enables second units to be built on single-family lots, new affordable backyard houses can be built. You could house a returning college student, older parents, a caregiver—or create a rental unit to help subsidize your mortgage. It's a more ecological use of land, and it doesn't change the character of the neighborhoods. CityLAB has developed a number of strategies for accomplishing this. It fundamentally shifts the way we think about urban growth, putting focus on the existing fabric rather than the periphery. Working with people in the city's Planning Department and with Daly Genik Architects, we have developed a prototype. So now we just need to build one of these units, either as a demonstration house, as a Habitat for Humanity backyard solution, or for a willing person with a backyard.

Which projects of yours have implications for new paradigms in urban design?

DC: The project we've been working on longest is "Backyard Homes," which looks at doubling R1 zoning



Dana Cuff
University of California, Los Angeles (UCLA)

Professor, author, and practitioner Dana Cuff is co-director of cityLAB, a UCLA think tank focusing on research and design demonstrations that promote new ideas about architecture in the city. Her work addresses affordable housing, the suburbs, and the politics of place.

What are the roots of Gensler's research program?

Christine Barber: It's focused on solving the real questions and issues faced by our clients using the important combination of design and research as a way to add value to the client engagement. It's also rooted in innovation. When it is informed by research, design becomes a vehicle for addressing problems in new and different ways that lead directly to innovative ideas and solutions.

research projects involves the development of tools and frameworks that designers can apply in their work. Such tools allow us to quickly generate insights that can inform design and provide proof that the design strategy has met client goals. The third piece is trend research—it's a way to anticipate how big shifts and changes are going to impact our clients' businesses and what the implications might be for design solutions.

What kind of research is Gensler doing now?

CB: Different design challenges require different approaches. Since the research program spans all of our practice areas and our delivery infrastructure, the simplest way to talk about what we're doing is to describe the three main categories our research covers. Many projects fall into the category we call original research, which is focused on generating new knowledge. These projects often are grounded in linking design to human, building, or business performance. A second group of

Once the research is complete, how do you share the findings?

CB: Learning is a vital component of the program. And once the research is complete, the research teams conduct educational sessions to reach designers across the firm. We also focus on sharing our research with clients through meetings, seminars, and conferences, and by publishing many of our findings in research reports and white papers. The true value of research is in sharing it with those who can apply the knowledge to its best benefit.



Christine Barber
Gensler

Christine Barber is director of research at Gensler, where she oversees initiatives designed to deliver strategic insight to clients and provide a broader context for design direction. Recent projects focus on design and business performance, trends in global real estate portfolio management, and workplace mobility.



Egon Terplan
San Francisco Planning + Urban Research Association (SPUR)

Egon Terplan is SPUR's regional planning director. His research combines planning and economics and addresses topics such as city/suburb competition for jobs, commute patterns and transit ridership, and local/regional collaboration on infrastructure.

What is the thrust of your research program?

Egon Terplan: Our research program touches on urban planning and governance issues. We pick topics that are both challenging to work on and are not being addressed effectively by others.

What projects do you have in progress now?

ET: One project, called The Resilient City, examines how we prepare for and respond to disasters such as earthquakes. It explores how to prevent the worst aspects of a major earthquake, as well as how to rebuild afterwards. Another project, The Future of Work, focuses on changes to the organization of the workplace and the extent to which future jobs will be clustered in dense, transit-served centers. We're exploring questions about how to retrofit the corporate campuses of Silicon Valley and how to shift more commuting onto sustainable modes of transit. Designers at Gensler are deeply involved in this project.

What conclusions have you made as a result of your research?

ET: We have the opportunity to make the Bay Area a model of sustainability and economic inclusion and do not have to wait for policy makers in Sacramento or Washington, DC, before we make progress regionally. Our research shows that there are cost-effective ways to reduce driving by shifting commuters towards transit and other modes and that there are sufficient infill sites to accommodate all future growth. We also have the ingredients for a competitive and diverse regional economy that provides sufficient employment for all who seek it.



Shari Tishman
Harvard University

Shari Tishman directs Project Zero, an interdisciplinary project at Harvard's Graduate School of Education that examines how learning and teaching are shaped by globalization, digital technology, mind/brain research, and other forces.

One of the key questions you address at Project Zero is how and where learning thrives. What have you learned about that?

Shari Tishman: One of the ways that learning thrives is in settings that make thinking and learning visible. What's really important to underscore is the emphasis on process, not product. It's not just that the products of thoughts are displayed, but rather that we engage dynamic forms of representation that show your thinking as it evolves. We're particularly interested in collaborative settings where people can look at the synergies between their ideas and others' ideas and see how knowledge evolves as a shared, open-ended structure, rather than something that's finite and objective. Learning environments that embody knowledge-developing ideas like this are particularly well suited to the 21st century.

Can you describe a scenario that illustrates this idea?

ST: A low-tech example would be a group of children at a museum having a conversation about a work of art. Maybe the kids are writing their thoughts on Post-its and putting them up on a wall and then moving them around as they talk. So what was a question now becomes part of an interpretation. They see the link between their ideas as they go along—making a visible representation that can be manipulated as they talk. Another of our projects emphasizes photographic documentation, perhaps taking pictures of people as they're talking, and then reflecting on those pictures. Just by creating artifacts that can be text-based, visual, or sound-based—even tactile—we find they contribute to the building of understanding.

Vernon Mays is an editor-at-large at *Architect* magazine.

Practice area:
HEADQUARTERS

Case no.

05

RESEARCH PAYS DIVIDENDS

BY ANNIE SIMPSON

With the highest concentration of LEED Platinum facilities ever awarded to a single site, the Johnson Controls, Inc. headquarters exemplifies high performance—and the client benefits of applied research.

Headquarters Modernization

Question: How can a 1960s-era headquarters be renovated and expanded as a showcase for the energy-efficient building solutions Johnson Controls provides its customers?

Impact: Garnering global attention as a “Four-LEED Platinum campus,” the Johnson Controls headquarters makes the business case for high-performance building solutions.



As the first multi-building campus in the world to achieve LEED Platinum certification, and the highest concentration of LEED Platinum buildings in the world, Johnson Controls Inc.'s Glendale campus is a game changer. It proves that both new construction and retrofitted buildings can achieve energy efficiency, at the very least, and energy independence, at best. Johnson Controls has doubled its square footage while realizing a 21 percent decrease in energy use, and incurring only a 25 percent increase in operating costs, demonstrating the fiscal soundness of sustainable architecture. The sum of all renewable improvements will pay for themselves in savings over the course of just eight years.

The new campus comprises five main buildings, three of which are new construction. In addition to the Corporate Center renovation, two existing office buildings (Corporate North and Corporate South) totaling 160,000 square feet were re-clad in glass and gutted, creating light-filled, open-plan workspaces. A 32,000-square-foot multipurpose Amenities building was erected in the heart of campus. A 115,000-square-foot Power Solutions headquarters building houses the company's battery business. Gensler also installed a four-level parking structure with dedicated space for plug-in hybrids, and completed the renovation of the existing battery laboratory.



Years of service of the oldest buildings when the campus reopened in 2009

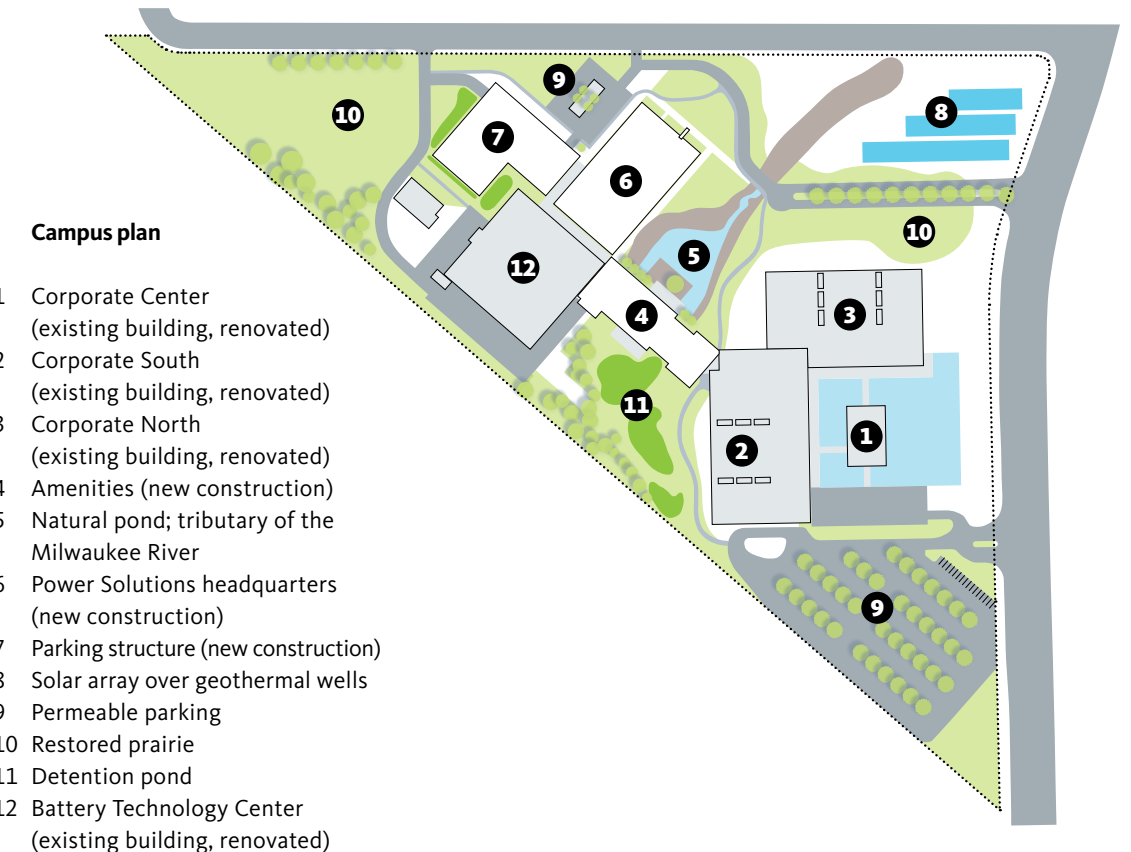
44

Instead of an all-new campus, Johnson Controls renovated buildings, some dating from 1965, to modern sustainability standards. Johnson Controls has been a leader in building performance since 1885, when it launched the first electric room thermostat.

opposite:
View from a corner office in Corporate North.

above:
The new Amenities building.

The 33-acre Johnson Controls campus comprises five main buildings, three of which are new construction. Along with Conservation Design Forum, the Johnson Controls–Gensler team restored 13 acres of natural prairie and the original creek that runs through the site to the Milwaukee River.



Productivity gain attributed by staff to sustainable features

30%

Energy use reduction achieved despite doubling building square footage

21%



Perhaps most importantly, the new campus bolsters the reputation, brand identity, and shareholder value of Johnson Controls and each of its three business divisions. “It will be easier for our own customers to see value in this approach, when we can show how well we’re putting it into effect here at home—and how we’re doing it cost effectively,” says Ward Komorowski, the company’s director of facilities and building services. “This campus is a powerful statement about how Johnson Controls is committed to sustainability.”

the landscape in between all were reconsidered in light of major generational and technological shifts within the company and the world.

Since re-opening in 2009, the Johnson Controls campus has become a public destination. More than 6,000 campus tours have been given to high school and elementary school students, MBA classes, customers, potential recruits, business partners, and the curious public.

The project benefited considerably from open-ended roundtable discussions held early in the process. Ten to 20 people attended each meeting, including Johnson Controls–Gensler team members, as well as multiple consultants and project stakeholders. Sustainability goals became more ambitious than anyone in the room had ever considered for this sort of project. “Our team recognized the potential for leading-edge technologies here, and Johnson Controls afforded us the opportunities and capabilities to implement them,” says Gensler’s Brian Hungerford. “We looked for innovation in every corner of the work, determined to reach 75 percent energy efficiency over current practices.”

A progressive prototype

When architect Steve Meier and design director Jason Hall first visited the campus in Glendale, Wisconsin, they were impressed by the poetry of the Corporate Center building, an elegant international-style edifice floating above a broad reflecting pool. Once inside, the architects still saw opportunity in the building’s reality: wood paneling, southwestern-style patterned carpet, light-obstructing interior partitions added over time, and a two-story auditorium with actual seats from old cars filled the headquarters of one of the world’s most progressive players in the automotive and building industries.

Over the course of the initial boardroom renovation and subsequent master planning effort, the relationship flourished between Gensler and the Johnson Controls team, helmed by Debrah Vander Heiden, the company’s on-site project manager. Gensler became a trusted advisor to the Johnson Controls executive suite and to Vander Heiden—who described the early design process as being the “most integrated” of any she’s encountered in her 20-year career. “With complex and sprawling projects like this, there is always an owner’s representative, but not usually from so deep within the organization,” she explains. Both the CEO and CFO of Johnson Controls understood that the campus needed to be a showcase for the company’s technologies.

Meier and members of the Johnson Controls Global Workplace Solutions team jointly considered the functionality of the building—its recruiting potential, business development uses, and meeting areas. “In its existing state, as Johnson Controls knew, the Corporate Center no longer communicated the company’s world-class standing among the Fortune 100.”

A shared vision

Although Gensler’s original engagement was to be limited to a boardroom renovation, the scope and complexity of the project soon expanded. Meier and Johnson Controls assembled a multidisciplinary team, mobilizing the company’s engineering expertise and extensive building technology capabilities in order to make the campus a model of sustainable development. The Johnson Controls–Gensler team envisioned a wholly reimagined global headquarters campus where staff and visitors would “live the brand.” Midcentury office buildings, parking lots, and

Living the brand

The initial renovation of the Corporate Center was nothing less than transformational: as the threshold to the new campus, it announces the company’s 21st-century capabilities to visitors, staff, clients, and competitors, alike. Gensler opened up the structure by removing interior partitions and other additions to Douglas Drake and Chuck Harper’s 1965 design, revealing elegant sightlines through the structure to the reflecting pond and surrounding landscape. A largely solid brick exterior was ripped out and replaced with high-performance glass that performs better thermally, admits daylight, and provides views of the campus. New gallery space off the lobby holds an exhibition designed by Gensler detailing the long history of innovation at Johnson Controls, including its 19th-century investigations into what eventually became the automobile.

Reduction in annual interior water usage (in millions of gallons)

1.73



Number of private homes that the campus’s solar collection strategies can power on a sunny day

40

Reduction in annual greenhouse gas emissions (in millions of pounds)

857



Clockwise from top right: Innovative building technologies define the Johnson Controls campus, from the historic Corporate Center (top right) and its renovated lobby (center) to new buildings like Power Solutions (bottom right and left, and top left).

WPI POST-OCCUPANCY SURVEY

72%

of Johnson Controls employees believe their new workplace has had “a positive to extremely positive impact on their job satisfaction”



The cafeteria in the Amenities building.

The new Amenities building, which links the renovated corporate offices with the new Power Solutions headquarters building and four-level parking structure, straddles the creek running through the center of campus. Facilities include a market-style cafeteria, an associated coffee bar, a fitness center, an auditorium, a mailroom, concierge services for staff and visitors, and two sprawling outdoor decks overlooking the natural surroundings. “Employees at our downtown Milwaukee office want to be here,” says Vander Heiden. “The campus setting, convenient access, amenities, everything—it really works, whether you’re a Gen-Y, a Gen-X, or a boomer.”

The heart of campus shifted from the formal reflecting pool in front of the Corporate Center to a natural pond near the Amenities building—the restored natural creek and an underground culvert. The Johnson Controls–Gensler team, working with Conservation Design Forum, restored 13 acres of natural prairies, as well as the original creek running through the site. Indigenous prairie grasses and foliage change with the seasons, inviting a variety of local wildlife to a new habitat.

A 30,000-gallon cistern captures rainwater from roof surfaces and drain tiles on new buildings for reuse, reducing potable water consumption for new bathroom fixtures by 77 percent or more than 595,000 gallons. Low-flow fixtures in campus lavatories save an additional 1.138 million gallons of water.

Rooftop solar thermal systems supply more than 40 percent of the hot water on campus (3,000 gallons per day). Atop the Amenities building, a green roof absorbs 60 to 100 percent of rainwater. Rainwater harvesting relieves stress on the local sewer system. The green roof, which has twice the expected lifespan of a typical roof, also insulates the building from extreme temperatures in summer and winter. On a sunny day, the field array of 1,452 photovoltaic panels, combined with solar films installed on the rooftop of Corporate North, generate

20 percent of the electricity needed to run the whole campus—enough to power 40 private homes a day. Beneath the photovoltaic field array, 272 geothermal wells heat the building in winter and cool it in summer. “We designed a campus with sustainable features integral to the buildings, not bolted on to them,” says Gensler’s Brian Vitale. “These features became the defining elements of the design, which besides saving energy, also contribute to the campus’s beauty.”

Inside the corporate offices, daylighting plays a key part in staff satisfaction and productivity levels. All fixed and enclosed workspaces and facilities have been shifted to the building’s core; and workstation panel heights were lowered, but offer seating-height privacy, allowing daylight (and clear views of the surrounding landscape) to permeate all areas of the workplace. “Front porch”

spaces—informal meeting areas—are zoned throughout. Newly installed floor-to-ceiling windows, dozens of skylights, the use of LED lighting, light monitors, and occupancy sensors also achieve a 49 percent average savings in annual lighting energy costs. “My productivity has improved by at least 30 percent because of the good lighting and ergonomic space,” wrote one staff member in response to Gensler’s WPI post-occupancy survey of the campus.

Here’s how Gensler’s Len Sciarra sums up the benefits of the Johnson Controls building management system: “By monitoring everything, you can optimize everything.” Greenhouse gas emissions have been reduced by 857 million pounds; nitrogen oxide, by 2,000 pounds. Winter heating costs have fallen 29 percent and chiller operating costs have been reduced by 23 percent.

Building for tomorrow
Johnson Controls wanted a campus that would become the ultimate showcase for its building efficiency technologies: Gensler delivered a bellwether project for the company that reflects its commitment to environmental responsibility. In an interview with *Fast Company* in April 2010, Clay Nesler, the vice president of global energy and sustainability at Johnson Controls, noted that “there can’t be a smart grid until there are a lot of smart buildings connected to it.” The company’s headquarters campus exemplifies for others how to accomplish this. It also shows how organizational performance and personal performance benefit when work’s settings are healthy, open, and light-filled.

Annie Simpson is a Chicago-based writer and a regular contributor to *Dialogue*.

SUSTAINABILITY IS EVIDENT AT THE JOHNSON CONTROLS HEADQUARTERS CAMPUS



Landscaping

Size in square feet of rain gardens that will cleanse pollutants from runoff before it reaches open bodies of water

32k



Photovoltaic (PV) solar array

Tons of greenhouse gas–equivalent emissions reduced annually

413.5



Limestone rainscreen system

Improvement in thermal energy performance

10%



Daylighting

Average annual lighting energy savings attributable to floor-to-ceiling windows, skylights, light monitors, and occupancy sensors

49%

LEVERAGING SUSTAINABILITY TRENDS FOR CLIENT BENEFIT

Sustainable design has become an imperative for businesses and institutions—both as a way to protect the environment and to reduce long-term operating costs. To help our clients make better informed decisions about their sustainability strategies, Gensler conducted a comprehensive research study of sustainability trends. The study addresses a broad range of practice areas/building types.

Led by sustainable practice leader Anthony Brower, we analyzed more than 400 Gensler-designed sustainable projects. The pool of projects used for the study represents more than 98 million square feet of space, valued at more than \$18 billion in construction cost. The research uncovered patterns in design decisions made frequently by our clients across a broad spectrum of practice, market, and industry groupings. The analysis not only reveals the strategies most frequently applied in various industries, but it begins to establish minimum guidelines for achieving LEED certification.

The study found that hospitality clients are putting their emphasis on high-efficiency core building systems, says Brower. “They are choosing more sustainable sites. And they are paying greater attention to water efficiency inside their buildings.” He also notes that professional services firms are hungry for this type of information. “Law firms are immensely interested in what their competitors are doing, especially where it impacts employee retention. And sustainability is already at the forefront of today’s generation entering the workforce.” The data enables Gensler to analyze what a client’s peers are doing, without disclosing confidential information. This helps clients identify areas where they may be excelling or cases where they may be falling behind.

The scope of the data also gives Gensler designers a window into the appropriate sustainable design strategies that a client might choose to pursue across an entire portfolio or when implementing a large-scale project.

400+

LEED-registered projects designed by Gensler were analyzed to determine prevailing sustainable design trends

“For clients that are trying to implement sustainable design guidelines, we can steer them in the right direction,” says Brower. “The study taps into our global experience applying these strategies. It’s a valuable tool that enables us to tailor our approach to each client’s specific needs.”



Stormwater management

Gallons of water runoff reduced annually by 125,000 square feet of permeable pavers

2.6mil



Water savings and reuse

Gallons of exterior water usage reduced annually by native landscaping and 80,000-gallon rainwater cistern

309k



Solar thermal collection

Tons of greenhouse gas–equivalent emissions reduced annually

15.1



Prairie restoration

Acres of native prairie vegetation, including more than a half mile of walking trails

13

news+ views



GREEN GEM PNC PLACE WASHINGTON, DC

Located just two blocks from the White House, overlooking Farragut Square and Lafayette Square, the 12-story PNC Place office building holds the northwest corner of 17th and H Streets, a short distance from the Farragut West Metro station. Owned by the PNC Financial Services Group, the Gensler-designed PNC Place reflects its namesake's well-known commitment to sustainable design—it's the first LEED Platinum among more than 100 LEED certifications for PNC. It's also just the third LEED Platinum office building in Washington, DC.

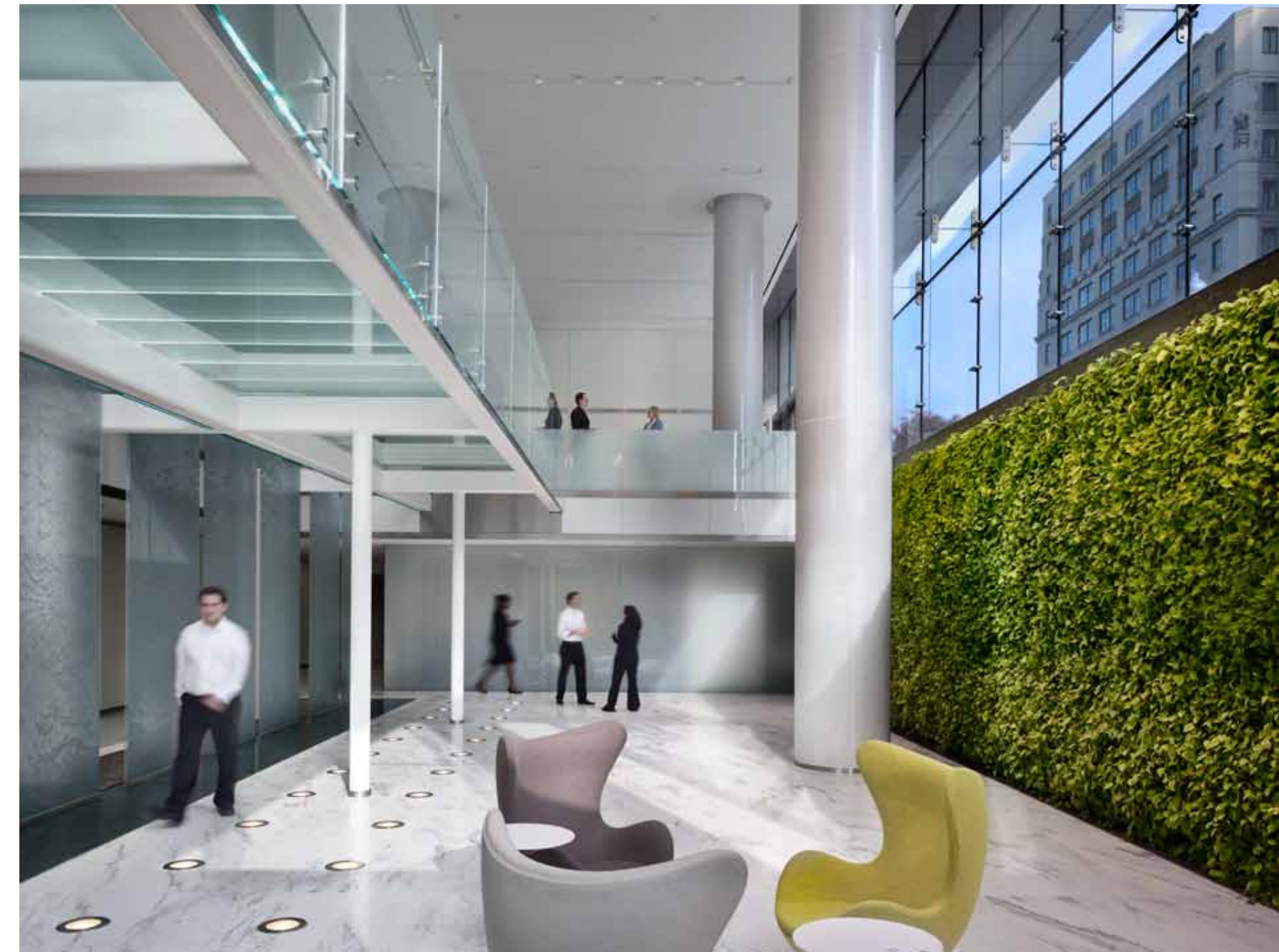
PNC Place's elegant profile evolved from an ideas competition within Gensler, juried by PNC. One concept that emerged is the eco-lobby, a dynamic and

multilayered reinterpretation of what most office buildings treat as transition space. It features a climate wall—a three-story waterfall of chilled water that cascades down a stretched mesh screen of stainless steel to offset heat gain and maintain humidity levels in the double-height, glass-enclosed lobby. A glass bridge runs alongside it, overlooking a lower-level open concourse and a garden wall.

A 15,000-square-foot roof garden covers half of PNC Place, reducing energy use and water runoff. Recycled water is used in the eco-lobby and elsewhere in the building to reduce the building's impact on the city's infrastructure. The beautifully detailed curtain wall uses high-efficiency glass to provide stunning views of the surrounding city and its key monuments.



above and below:
PNC Place's two-level eco-lobby integrates an entry bridge with such sustainable features as the climate and garden walls that help keep it naturally cool.





STAR POWER WAITROSE COOKERY SCHOOL LONDON, UK

Waitrose is the first UK supermarket to open a cookery school. Building on its loyal customer base, Waitrose has created a place for hands-on learning for those who share the brand's passion for food. The school's professional chefs—including two veterans of Michelin Star restaurants—deliver that experience in an engagingly non-institutional setting that makes full use of Waitrose's array of fresh and special ingredients and home chef-friendly equipment.

Gensler designed the 4,600-square-foot cookery school with the sociable ambience of a communal kitchen. Offering daytime and evening programs, the school's 12 cooking stations can accommodate as many as 24 people cooking at the same time. It also has a 40-seat demonstration theater, floor-to-ceiling shelves of cookbooks, a wine display, a bar, and a dining area to sample the delicious results. With its master chefs in attendance, the school's November 2010 opening drew scores of food writers and bloggers. Their wildly positive response has helped make the school a destination and social hub for food lovers in London.



**MOUNTAIN GATEWAY
JACKSON HOLE AIRPORT
TERMINAL EXPANSION
JACKSON HOLE, WY**

As the gateway to two national parks, Grand Teton and Yellowstone, the newly expanded and renovated Jackson Hole Airport terminal establishes a rich dialogue between the interior and the world outside—mediating between the logistics of air travel and the sublime mountain landscape that awaits the traveler. Its low silhouette gives pride of place to the Teton Range, offering a breathtaking first and last view of one of North America's more spectacular vistas.

For the only US airport located in a national park, Gensler eschewed log cabin and saloon aesthetics in favor of an urbane, regionally sensitive design. The terminal's wood-framed glass walls open up the terminal to expansive east and west views of the Snake River Valley and the surrounding mountains. Polished concrete floors and weathered-steel entry portals recall the industrial heritage of the Western states. Rough-hewn stone walls, warm-toned exposed wood, and muscular steel structural details give the terminal the character of a mountain lodge while providing the functionality of a well-planned, LEED-certified 21st-century airport.



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Dialogue is produced by Gensler Publications. © 2011 Gensler. To comment or request copies of the print edition, please write to us (dialogue@gensler.com).

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- 6,846** gallons of waste water





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Commercial Office Buildings
Consulting
Education
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Headquarters
Hospitality
Mission Critical

Mixed Use & Entertainment
Planning & Urban Design
Product Design
Professional Services Firms
Retail
Retail Centers
Science & Technology
Sports
Workplace

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