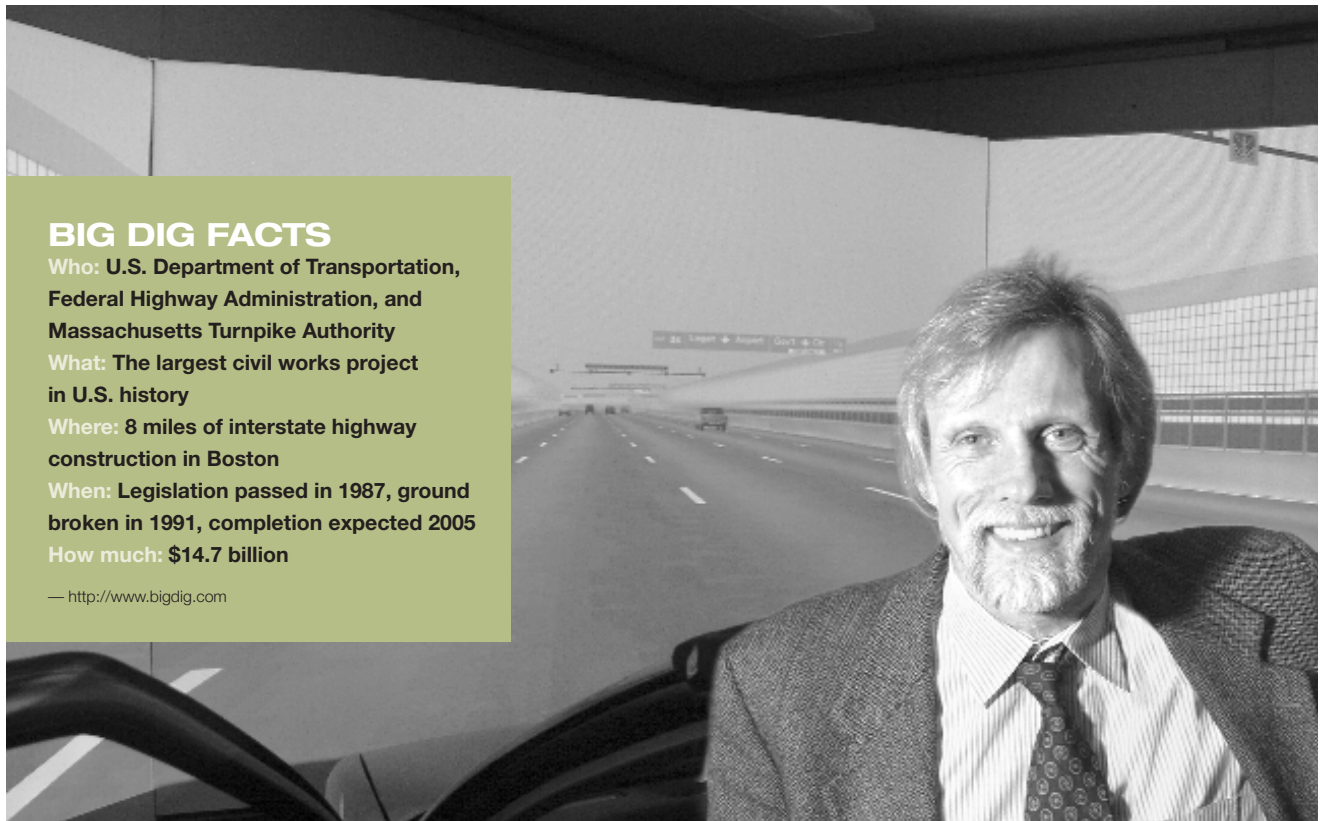


Virtual drive through the Big Dig

Boston commuters can hit the road before it's built



BIG DIG FACTS

Who: U.S. Department of Transportation, Federal Highway Administration, and Massachusetts Turnpike Authority

What: The largest civil works project in U.S. history

Where: 8 miles of interstate highway construction in Boston

When: Legislation passed in 1987, ground broken in 1991, completion expected 2005

How much: \$14.7 billion

— <http://www.bigdig.com>

Donald Fisher, standing in front of the driving simulator behind which the virtual world of the Big Dig is projected, thinks his research will help commuters adjust to new routes before they drive them.

Thanks to the efforts of a University of Massachusetts Amherst professor, commuters can test drive their routes through Boston's Big Dig before they even pull out of the driveway.

Mechanical and industrial engineering professor Donald Fisher and his assistants have created the Web Big Dig Drive, a virtual version of the Big Dig's tunnels and highways on the Web, so that drivers can feel confident about traveling their new routes when the massive highway project debuts this year. The Web site is the result of the university's collaboration with the Massachusetts Highway Department and the Massachusetts Turnpike Authority.

"Putting a test drive on the Web makes sense because it reduces the potential for accidents," Fisher said.

The virtual drive is part of Fisher's research at the Human Performance Laboratory, a facility that includes a driving simulator in which a sedan is placed before three screens, onto which highways and neighborhoods are projected. The "car" reads the driver's speed, direction, and eye movements.

To use the system, drivers log onto <http://www.ecs.umass.edu/hpl>, click on the Big Dig button, and then view their test drive.

The site shows all the details a driver will need, including signage, pavement markers, and side barriers.

"We've included not only driveable surfaces but also visible elements, so that driving a virtual car through the Web site will give people as realistic a sense of the new roadways as possible before they actually get there," Fisher said.

The Web site, which relies on streaming video, is particularly helpful in familiarizing drivers with interchanges that might otherwise be tricky during the first few drives.

"Roughly 250,000 people each day take Interstate 93 north to the Callahan Tunnel and Logan Airport. This route will no longer be available once the new construction opens. Those people need to know where they're going," said Fisher. "Drivers will go through a period of adjustment, getting accustomed to the new routes, entrances, and exits. This is an effort at helping them get comfortable with the details of those routes ahead of time. We want people to know the way without injuring themselves or others, or dealing with the inconvenience of missing an exit," he concluded.

Sonic Cruiser scrapped

Boeing bids farewell to its futuristic high-speed plane plan

In December of last year, Boeing announced it was dropping its plans to build the Sonic Cruiser — a high-speed passenger jet that would have flown 15 percent to 20 percent faster than current commercial airplanes.

Instead, the company will develop a more traditional but highly fuel-efficient airliner, Boeing commercial airplanes chief executive Alan Mulally told ABC News.com. "The real key is going to be the efficiency in terms of fuel burn. Everybody is behind us. . . . The airlines' response has been very enthusiastic," he was quoted as saying.

The unnamed mid-sized jet could be launched as early as 2004.

The Sonic Cruiser was envisioned as a mid-sized jet capable of carrying 250 passengers that would travel near the speed of sound and shorten international flights by two to three hours.

Steps to material handling success

Control systems can bridge operational gaps in and between organizations

1

Define business requirements. Examine your supply chain's business requirements and determine which processes help achieve the collective goals. Decide which processes need attention and where technology will create the most success.

2

Analyze technology options. Review the control and mechanical architecture components, ensure that interfaces connect, and consider an open system environment. Analyze the infrastructure and implement it redundantly to prevent disruption if a component is replaced.

3

Assess costs and savings. Determine where you can cut costs, save labor, and improve process workflows. Ensure that final workflows accomplish all business requirements and that technology and material handling solutions can be supported and operated.

— "Aligning Material Handling Control Systems with Your Supply Chain," Tompkins Associates

Safety milestone



One hundred dollars was the reward for each employee of the casters and wheels division of Milwaukee-based E.R. Wagner Manufacturing. Their accomplishment: two years without lost time due to injuries in the department. The milestone was the result of a safety program that included monthly meetings and quarterly quizzes. According to the company, worker's compensation insurance costs have been reduced by more than 50 percent because of the program.

NEWSMAKERS



◀ IIE member **Carter J. Kerk**, Ph.D., has been selected as part of OSHA's new National

Advisory Committee on Ergonomics. Kerk is an associate professor of industrial engineering at the South Dakota School of Mines and Technology. He holds both B.S. and M.S. degrees in industrial and management systems engineering from the University of Nebraska and a Ph.D. in industrial and operations engineering from the University of Michigan.



◀ **William E. Ellis** has been named general manager, Capital Programs,

for the Port Authority of New York and New Jersey's Port Commerce Department. A 24-year IIE member and 30-year Port Authority veteran, Ellis holds a bachelor's degree in industrial engineering and business administration from Rutgers University and a master's degree in management science from Lehigh University.



◀ The Educational Society for Resource Management designated IIE member **Jeffrey**

H. Miller, P.E., as certified in production and inventory management. To earn CPIM status, candidates must endure a rigorous curriculum and pass a series of five comprehensive exams. Miller is currently principal consultant for Productivity Engineering Services in Livonia, Mich.



◀ The HIPAA Summit has given its first Extraordinary Achievement Award to

Steven S. Lazarus, Ph.D., for facilitating the development and implementation of the HIPAA law and regulations. President and co-founder of the Boundary Information Group, Lazarus holds a B.S. in industrial engineering, an M.S. in industrial engineering and operations research, and a Ph.D. in business administration.

(Continued on page 14)



Bob Phelan, Photomasters

The University of Missouri-Rolla

Educating across engineering disciplines

Aided by a \$100,000 planning grant from the National Science Foundation, the University of Missouri-Rolla is embarking on a novel approach to engineering education — one that cuts across engineering disciplines.

The program, called interdisciplinary engineering, will allow students “to work as design engineers at the boundaries of two or more traditional engineering disciplines,” according to Robert B. Stone, Ph.D., assistant professor of basic engineering at UMR and the project leader. The program would also provide flexibility for students interested in working in emerging fields that require a broader set of engineering skills than one specific discipline can provide.



The University of Missouri-Rolla interdisciplinary engineering program, lead by Robert Stone, will prepare students for emerging professional fields.

Possible emphasis areas could include energy systems and the environment, industrial automation and control, robotics and control, and project design.

“Today’s brightest engineering students prefer to have some control over the courses they take,” said Stone. “The proposed program takes this idea one step farther by allowing students to define a meaningful engineering program that bridges traditional departmental boundaries.”

The plan is to develop an undergraduate degree in interdisciplinary engineering, which would be the first program of its kind in Missouri and one of a handful in the United States. In developing the curriculum, UMR faculty members are consulting industry representatives and engineering education experts.

OBITUARY

John M. Gilbreth

John M. Gilbreth, 10th of the 12 children born to industrial engineering pioneers Frank and Lillian Gilbreth, died Dec. 25, 2002. He lived in West Caldwell, N.J. He is survived by his children, Peter, James, and Deborah, their spouses, three grandchildren, and siblings Ernestine Cary, Jane Heppes, and Fred, Daniel, and Robert Gilbreth. He is also survived by many nieces and nephews.

Innovation stagnation

Ideas are great, but what happens next is often little or nothing

RESOURCES
 Invention Dimension
<http://web.mit.edu/invent/>
 Innovation Network
<http://www.thinksmart.com>
 Canada Foundation for Innovation
<http://www.innovation.ca/>

Most CEOs recognize that innovation—in the form of new products and services, better business models, and original processes—is a key competitive strategy. But often, innovation stops at the idea stage.

An Accenture survey of executives found that two-thirds of the CEOs cited innovation as one of the five most important factors required to succeed and sustain competitive advantage. But only one in eight of the CEOs questioned felt strongly

that their company excelled at implementing innovative ideas.

The same survey found that companies commercialize less than one in five promising ideas. Even the most innovative companies were found to commercialize fewer than 60 percent of their most promising ideas.

BOOK OF THE MONTH

Approaching the whole

Systems engineering offers a way to manage difficult projects

Written for a wide spectrum of readers, *Managing Complex Technical Projects* presents complete coverage of the subject. The book presents the solution to delivering projects on time and within budget, avoiding failure and inefficiencies through the application of systems engineering practices.

Written By R. Ian Faulconbridge and Michael J. Ryan of the University of New South Wales, Sydney, Australia, the book takes a top-down approach that presents the philosophical aspects of systems engineering. Beyond theory, the authors present a plethora of important terms, standards, and practices, covering key systems engineering issues in a way that promotes individual thinking and unique approaches to varied projects.

Managing Complex Technical Projects is published by Artech House Publishers (\$79).



QUOTE, UNQUOTE

Plummeting production

“Back in 1996 our industry was growing on the civil side by almost 40 percent per year. That growth has gone down and down, and now it’s contracting at a rate of almost 30 percent per year. The production of large civil airplanes in this country has gone from well over 600 a year to down somewhere between 250 and 300 next year [2003]. This is where the real crisis is developing for manufacturers.”

— John W. Douglass, president and CEO of the Aerospace Industries Association, in a Dec. 11, 2002 year-end forecast

Why do the elderly fall?



Test subjects in harnesses that contain monitoring sensors were put through the paces of walking and slipping. The harness prevented them from falling.

Falls are the leading cause of accidental death among people over the age of 75 and the second leading cause for those aged 45 to 75, according to the National Safety Council. Although the consequences of falling are well known, the relationship between aging and falling is still a mystery.

Working in his Locomotion Research Laboratory at Virginia Tech, Thurmon Lockhart is determined to solve this mystery. “Fifty percent of people over 75 will either die or be forced to enter institutional care because of falls,” he said. “What I want to find out is why these falls happen.”

Lockhart, an assistant professor of industrial and systems engineering with a research background in biomechanics and human motor control, also wants to learn how to help prevent falls.

Funded by a grant from the Centers for Disease Control and Prevention and the National Institutes of Health, Lockhart is suiting up young and old volunteers in a harness and a network of sensors that test musculoskeletal and neuromuscular changes and biomechanical responses during slips and recoveries.

As a test subject walks back and forth along a platform, the sensors monitor muscle and joint activities in the feet, ankles, legs, hips, and arms. At a randomly chosen moment in the test, a student assistant stealthily pours a slippery solution of liquid

detergent and water behind the subject. On the way back, the subject slips and goes through the motions of recovery (an actual fall is prevented by the harness).

Data from the monitoring sensors is fed into a computer model, providing information to the researchers about the subject’s gait while walking and the body motions involved during slipping and recovery. Lockhart and his students are conducting tests on volunteers divided into three age groups—18 to 35, 40 to 55, and over 65.

There’s more to Lockhart’s study than investigating the mechanics of walking, slipping, and recovering.

“Another important factor is understanding the intrinsic changes to gait and balance brought about by aging,” he said. For example, as people age, their walking gait tends to change. “We may take slower and shorter steps, making a higher velocity contact impact with our heels—which in turn seems to make slipping more likely. Why does this happen?”

Also as we age, Lockhart noted, sensory factors such as vision, inner ear, and touch sensitivity decline. “These changes make us less able to detect that we’re slipping until it’s too late.”

Lockhart’s tests include strength measurements taken while subjects are recovering from slips. Understanding the mechanics of recovery could help the researchers learn how to prevent slips from becoming falls.

In addition to these phases of the research, Lockhart plans additional investigation.

“I want to develop intervention strategies,” said Lockhart, who also is affiliated with Virginia Tech’s Center for Gerontology. “For example, after our modeling helps us understand the mechanics of falling, we might be able to develop special shoes, strength training routines, or environmental and flooring designs that will help prevent falls among the elderly.”

Lockhart and Stefan Duma, an assistant professor of mechanical engineering, already have a provisional patent on a hip pad they created that can reduce impact injuries from falls. Based on air bag technology, a sensor device triggers deployment of the bag when the wearer takes a fall.

FALL COSTS

By 2020, the direct cost of fall injuries in the United States is expected to reach \$32.4 billion, according to the Centers for Disease Control and Prevention.

NEWSMAKERS

(Continued from page 11)



General Electric has named **Dee Mellor** vice president and general manager, global

supply chain at GE Medical Systems. A 24-year GE veteran with the Aircraft Engines and Medical Systems divisions, Mellor earned her B.S. in industrial engineering and operations research from the University of Massachusetts before joining the company in 1978.



Autoliv Inc. has elected ALFA Chairman and CEO **Dionisio Garza Medina** to its board

of directors. Medina holds a master’s degree in industrial engineering from Stanford University. In addition to serving on the boards of many prominent Mexican companies, he sits on several key advisory committees, including the Advisory Committee of the New York Stock Exchange.



Stanford University student **Sweta Sarnot** was named a 2003 Siebel Scholar

for her work while pursuing a graduate degree in industrial engineering. Sarnot is an alumnus of the prestigious Indian Institute of Technology and was selected for the Asia-Pacific Scholars’ Program. She now does consulting work for her alma mater with McKinsey and Co.



Fernanda Pompa of the University of Arizona, Tucson will be studying industrial

engineering in France courtesy of a scholarship from ABB and the Global Engineering Education Exchange. The program seeks to increase the number of women in the field of engineering and to create global engineers by granting scholarships for study abroad.

A plan for boosting restaurant efficiency

Cornell researchers have developed an analytical approach to assessing productivity



Dennis Reynolds

There's help for restaurants that are losing customers and revenues because they don't work as efficiently as they could. A team of Cornell researchers has developed a process to help restaurant operators isolate and assess the management decisions that lead to productive—or unproductive—restaurant operations.

A three-step process developed by Dennis Reynolds and Gary Thompson, two hospitality operations faculty members at Cornell University's School of Hotel Administration, allows productivity to be compared at restaurants. Using this information, they can assess the management decisions that enhance or interfere with productivity.

"The idea behind our model is to identify the best practices of the most productive restaurants and apply them to the less-efficient operations," said Reynolds.

The researchers' analytical approach to assessing productivity is a shift from past practices in which restaurant operators have measured efficiency mainly by ratio of sales per labor hour and other similar input-to-output comparisons.

A restaurant's success depends in part on controllable decisions—the number of servers on a given shift, for example. But restaurateurs must also account for uncontrollable factors such as the size and location of the restaurant and the number of local competitors.

The researchers' model is innovative in that it allows them to take both sets of factors into account but also to separate the effects of uncontrollable, external factors from the results of internal decisions. This gives a truer picture of the effectiveness of those decisions in diverse restaurant operations.

Making use of a technique known as data-envelopment analysis, which allows simultaneous consideration of multiple factors, their process can test which factors influence restaurant performance measures; it analyzes only external, uncontrollable factors as they relate to those performance measures; and it helps assess the effects of the remaining, controllable factors on a restaurant's comparative efficiency so that best practices can be determined.

The report on the study, "Multi-unit Restaurant-Productivity Assessment: A Test of Data-Envelopment Analysis," can be found at <http://www.hotelschool.cornell.edu/chr>.

SITE TO SEE

Great meeting expectations

The EffectiveMeetings.com resource center covers the spectrum of topics related to meetings. From the most mundane (choosing the right projector) to the most insightful (strategies to overcome dangerous scenarios), the dozens of articles on the site make up a well-rounded body of meeting knowledge.

Advice from the site's spiritual guide—the Meeting Guru—is lighthearted but sage.

Found at <http://www.effectivemeetings.com>, the site is certainly bookmark-worthy.





UNCOMMON IE

Optical visionary

Douglas Anderson
 Founder and vice chairman
 Optos
 Dunfermline, Fife, Scotland

When Douglas Anderson's son Leif lost sight in one eye because a spontaneous retinal detachment went undetected, Anderson took action — not in a courtroom, but within his own company. He used his industrial engineering experience to design a more thorough and practical eye examination. In 1994, Anderson and his engineering team created the Optomap retinal exam using the first ophthalmic device that produces a single, high-resolution ultrawide-field image of the retina without dilating the pupil. With his discovery, Anderson founded Optos, which is based in Scotland and Marlborough, Mass. Anderson, whose work was influenced by his studies in ergonomics and human engineering, is pleased with Optomap's impact, but he believes its use should be even broader to help more people circumvent avoidable vision loss.

IIE: Tell me about your responsibilities at Optos.

Anderson: My responsibilities today focus on promoting the value and wider acceptance of Optomap examination internationally in the screening for and early detection of retinal disease. At the risk of sounding a bit pretentious, my mission is to try to establish the Optomap exam as the standard of care within primary care and thereby improve preventive care such that ultimately Optos may make a useful long-term contribution to protecting more patients from vision loss. I also seek to identify and develop ways in which the Optomap technology platform may be extended to form the basis of improved clinical applications that will ensure its usefulness in post-detection disease management and treatment.

IIE: How does Optomap work and how is it used?

Anderson: For reasons of best preventive care and the long-term protection of vision, primary care professional bodies in the United

States recommend everyone have a fully dilated retinal exam every year. In practice, this does not happen. In the United States, less than 50 percent of patients have an eye exam every 18 months and less than 50 percent of these have a dilated exam — and the trend is downward. Put another way, less than 25 percent of patients get an annual dilated exam, and even this figure overstates the true number when non-compliance is taken into account. The situation is worse in every other country. The prime reasons are the skill required and the high level of patient cooperation necessary.

Today, the dilated binocular indirect retinal exam with scleral depression is the most sensitive exam... and better than Optomap on cooperative patients. But the practitioner is left with no record of what he saw other than notes. This will not matter for patients that are put off by the intrusiveness of the exam such that they do not come back. But for the rest, the absence of image-based documentation of the wider retina detracts significantly from providing the best preventive care and leaves the clinician exposed should a patient claim malpractice.

With Optomap exams, the best and least skilled practitioners in terms of manual techniques are on a very level playing field when it comes to interpreting Optomap image content and making a diagnosis. An independent clinical study showed no statistical difference between doctors as regards diagnostic sensitivity when reading Optomap.

Basically a conventional dilated exam is not patient-friendly and the better (more thorough and careful) the manual examination is, the less friendly it is. Optos seeks to make the Optomap exam clinically as good as and ultimately better than the dilated conventional exam for the detection of eye disease.