

The money pit

Stuck with 19th-century management techniques, the construction industry is outlandishly unproductive **BY CHARLES EUCHNER**

RESIDENTS OF MASSACHUSETTS do not need to be reminded just how expensive construction can be. Now practically as famous as the Freedom Trail or the Red Sox, the Big Dig has come to represent everything good and bad about the Bay State. Once estimated to cost \$2.2 billion, the tunnel and highway project cost more than \$15 billion by the time it opened—and it almost immediately revealed terrible construction flaws, like the roof panels that fell and killed a Jamaica Plain woman in July 2006.

The Big Dig is just the biggest and baddest example of cost overruns and inadequate workmanship. Everything seems to cost too much to build. Sports stadiums, museums, government offices, affordable housing, market housing, commuter trains, bus shelters—you name it, and the chances are it cost lots more to build than originally budgeted.

The problem is systemic. Productivity in the non-agricultural sector has more than doubled from 1964 to 2003, but it has actually declined in the construction industry. A 10 percent increase in construction productivity would instantly boost the GDP by \$123 billion; that single-year sum, compounded annually at 3 percent for 30 years, would produce \$273 billion—perhaps enough to save the Social Security system. Boomers, pay attention.

The usual explanation for the industry's sluggishness is that housing and other structures get built on land, a finite and immovable resource. It's true that we can only build on one Manhattan Island, and building costs more in coastal cities like New York, Boston, and San Francisco. But projects are completed late and over budget *everywhere*. Why?

A prominent housing developer in Boston used to tell me that construction is so costly because "every piece of dirt is different." Every project requires lengthy negotiations involving hordes of lawyers and bankers, bondsmen and activists, and government officials of all stripes. Once everyone agrees on plans, new rounds of jostling begin. Any player can hobble the whole process with a trivial

dispute. In effect, each project must start from scratch, with no business templates or standard procedures to work from.

Builders and policymakers respond to this state of affairs in two ways. Most accept it as the cost of doing business and try to be as clever as



possible to get projects through the pipeline. Others, and I count myself among this crowd, complain that building codes and local zoning statutes create an absurd obstacle course that imposes unnecessary costs. The only way to ease the construction process is to strip away the contra-

dictory, redundant, and absurd regulations and let builders be builders.

BUT A THIRD perspective comes from an attorney who has spent much time in the absurd labyrinth. Barry LePatner is a New York lawyer specializing in construction, and he's seen every aspect of the industry. In *Broken Buildings, Busted Budgets*, published in October by the University of Chicago Press, he shows how the whole outdated business works—how project bidders lowball their costs knowing they will make profits with change orders, how architects and builders pad budgets to cover cost overruns, how project adjustments hold up a whole line of building partners, and how as little of one-third of a construction worker's time is spent actually working.

Doing better is a matter of some urgency. In the next generation, the US will spend \$25 trillion to build homes, schools, hospitals, arenas, colleges, factories, warehouses, and public works facilities. In 2030, almost 60 percent of the nation's building stock—427 billion square feet—will have been built since 2000.

The construction industry, LePatner points out,

has stagnated because of a basic paradox of capitalism. According to Econ 101 texts, markets work best when many producers compete for customers. The lower the entry barriers, the more firms, competition, innovation, and cost-cutting. A dozen groceries or clothiers in a community are more responsive to consumers than is one.

But the construction industry defies this basic Smithian truth. With so many players in the construction industry, huge amounts of time and money get wasted coordinating the efforts of architects, draftsmen, lawyers, bankers, investors, builders, and public officials. Rather than working together under one roof, like the manufacturers of cars or appliances, the producers of buildings and public works operate apart from each other.

Interestingly, that's how things once worked in other industries. In 1876, for example, the Winchester Repeating Arms Company brought together a dozen contractors—each of which hired their own subcontractors—to manufacture guns. “The inside contracting system produced many fine weapons, but productivity lagged over time because of high internal coordination and control costs,” LePatner writes. “For example, contractors deliberately hid productivity improvements, or limited productivity

to begin with, so that Winchester could not cut its piece rate.” Not until World War I did Winchester buy out its subcontractors and bring the whole production process under strict corporate control.

The answer for construction, LePatner writes, is the same as it was for gun manufacturing and countless other industries: vertical integration. Only when the construc-

We need megafirms to squash the little guys.

tion industry brings together disparate processes under one roof will it be able to produce efficiently. In other words, everyone has to become part of the same process. Construction needs a handful of megafirms to squash the little guys and impose some order. That's when we will get the wonders of *real* competition—a battle of companies with real capacity.

Right now, construction is anything but consolidated. In February 2007, 7.65 million workers were employed in the industry. A dozen firms employed 1,000 or more people. Fewer than 1,000 firms employed more than 250 people. Over 90 percent of all contractors employed fewer

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than 20 people. Close to 2 million people in the business were self-employed.

None of the biggest American firms (like Skyline, Centex, Toll Brothers, and Fleetwood) operate all over the country. Toll Brothers is the leader, with projects in 18 states. Only Centex is traded on the New York Stock Exchange. Habitat for Humanity, an operation of volunteers, builds more units of housing than all but 16 construction companies—an inspiring fact for do-gooders, but a damning one for the industry as a whole.

It's not uncommon for 50 or more firms to participate in big projects such as sports stadiums and college campuses. The whole process resembles a perverse, and costly, version of the children's game of telephone. With so many actors to coordinate, construction projects waste vast amounts of time waiting for signals and communicating basic instructions. Like the military, construction can be a "hurry-up-and-wait" business; a 2005 article in the *Journal of Construction Engineering and Management* ("Quantifying Levels of Wasted Time in Construction with Meta-Analysis") surveyed the available data and concluded that workers spent only about half of their time on construction sites involved in actual work.

Without vertical integration, construction companies cannot coordinate the many diverse activities of building. Contractors follow their own idiosyncratic approaches to building. They use different computer systems, hiring procedures, budgeting methods, purchasing practices. Because they all speak different languages and answer to different bosses, they never work closely together. LePatner calls for a major restructuring of the industry, with more large-scale, vertically integrated companies that can coordinate everything from marketing to design, from permitting to construction. Construction will not become efficient, he says, until every phase of projects get coordinated under one roof.

The problem is not just a disjointed production process, but also a lack of management expertise. The construction industry has simply not developed the class of middle managers that other industries take for granted. Why would management superstars work in construction when they're lucky to have a few hundred people working under them, with little real means of controlling the process? Why not work for megafirms like Coca-Cola or Johnson & Johnson?

Lack of scale aggravates other problems, too. Without scale, the private sector doesn't have the resources or incentive to invest in research and development—which means that builders follow the same routines, generation after generation. The industry also has a negligible impact on training architects, engineers, and builders. As a result, these professions act like separate guilds, without any ability to speak to each other out in the real world.

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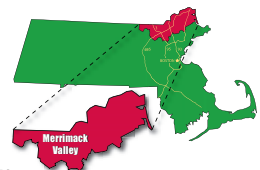
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ONE MORE THING. Ultimately, productivity depends on good and timely information. When everyone on a project plays by different sets of rules, it's hard to gather and crunch numbers. By contrast, LePlatner points to the gonzo architect Frank Gehry as the management model for the construction industry.

When Gehry completed the Guggenheim Museum in Bilbao, Spain, in 1997, the titanium-skinned structure immediately attracted global attention for its unorthodox design. The bulging panels of metal embodied a post-modern ideal of chaos and dynamism. Vaguely resembling a ship, the building captured the sunlight and fit into the rugged context of the port city. The museum might be the most original artistic statement of an architect in a generation. And it prompted MIT to hire Gehry to design and build the \$280 million Stata Center, which houses computer science and engineering projects. Like the Bilbao museum, the Stata Center looks like a pile of shiny, misshapen blocks that ooze and melt into each other. Gehry has likened the structure to "a party of drunken robots."

The mad appearance of Gehry's projects disguises the hyper-rational process that he uses to build them. In fact,

his most enduring influence might be found in the management of his larger-than-life projects. Beginning with the Guggenheim Museum, Gehry has used three-dimensional computer software (known as CAITA) to develop plans that specify the size and curves of building pieces down to millimeters. This software not only documents each piece of the structure (in Bilbao, there were 7 billion of them), but also shows instantly how every piece affects all the others. Changes to the 3-D imaging also automatically produce changes to the databases for materials and budgets.

That software has helped Gehry build his masterpieces

Job estimates seem about as rational as voodoo.

on time and on budget, a rarity for construction of all kinds. Jobs as simple as bathroom renovations and as complex as major campuses and public works almost always run over budget. (Reached by telephone, LePlatner says precise numbers are hard to come by because clients are often embarrassed by the final cost of a project and "want to hide it.") Overruns are so common in the \$1.23 trillion



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construction industry that estimates seem about as rational and scientific as voodoo spells.

Unlike most architects and builders, Gehry enjoys significant autonomy on his projects. He's a master of his art who creates unique structures, and he gets complete control. But rather than justifying inefficiency as the price of genius, Gehry has shown that even the most complicated projects can be managed efficiently. CATIA connects everyone into a vast system, coordinating every decision with unheard-of precision and quickness, and Gehry estimates that the software reduces the number of change orders by at least half.

Of course, sophisticated management cannot solve every problem. In November, MIT sued Gehry for defects in the Stata Center's drainage system. The project's construction company alleges that Gehry refused to make changes that would have prevented the problems. As good as Gehry's management system might be, his independence and complex design demand virtually perfect management and oversight. Even with CATIA, Gehry was probably too clever and independent for his own good. Even with great data systems, the builder needs to pay attention to danger signs.

For many people, databases and number-crunching evoke dread because they remove the "human element" from ancient professions. The dread extends far beyond the construction industry. For years, Boston and other city governments have resisted adopting CitiStat and other database management systems. The fear of losing control is understandable, especially in the political world of folklore and cronyism. But the public deserves strong, consistent, informed management. Anything less constitutes malpractice.

In the next generation, such data systems should become standard operating procedure for the construction industry. At the same time, the construction industry is sure to see a major shakeout. Firms will get bigger and projects more streamlined. The question is whether that shakeout will be big enough to transform the construction industry—and how policymakers respond to the bigger, bolder firms. Long dominated by small builders, state and local boards have been suspicious of anything they consider "foreign." States and localities must find ways to welcome big builders rather than obstruct their paths.

LaPatner does policymakers a great service by directing our attention inside the black box of the construction industry. As he shows, the housing crisis and other problems in the construction industry stem not just from a lack of public investment or too many rules, but the very structure of the industry. **CW**

Charles Euchner, a New Haven writer, was the executive director of the Rappaport Institute for Greater Boston at Harvard University from 2000 to 2004.



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