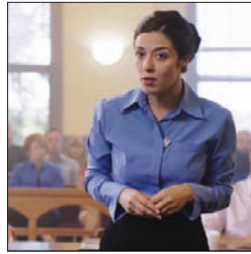
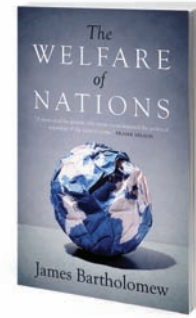




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# Cato Policy Report

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## Megaprojects: Over Budget, Over Time, Over and Over

BY BENT FLYVBJERG

President Trump has vowed to create “millions” of jobs building highways, bridges, airports, and other infrastructure, releasing a plan to spend a trillion dollars on infrastructure over the next 10 years. But Trump’s plan to lavish money on infrastructure is not a revolutionary idea—it’s part of a continuous worldwide trend to spend more and more on ever-bigger projects. The vast majority of these instances of billion-dollar spending—known as “megaprojects”—ultimately result in a net loss to economies. In fact, as megaprojects expert Bent Flyvbjerg explains in the following article, these grandiose projects operate by an iron law: Over budget, over time, over and over again.

Megaprojects are large-scale, complex ventures that typically cost a billion dollars or more, take many years to develop and build, involve multiple public and private stakeholders, are transformational, and impact millions of people. Examples of megaprojects are high-speed rail lines, airports, seaports, motorways, hospitals, national health or pension information and communications technology (ICT) systems,

national broadband, the Olympics, large-scale signature architecture, dams, wind farms, offshore oil and gas extraction, aluminum smelters, the development of new aircrafts, the largest container and cruise ships, high-energy particle accelerators, and the logistics systems used to run large supply-chain-based companies like Amazon and Maersk.

For the largest of this type of project,  
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**BENT FLYVBJERG**, a professor at Oxford University’s Said Business School, is the world’s foremost expert on megaprojects. This article is excerpted from his article in the *Project Management Journal*, published by Project Management Institute Inc., “What You Should Know About Megaprojects and Why: An Overview,” 2014.

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Wikipedia founder JIMMY WALES, pictured here on the Cato Daily Podcast, also delivered the first Joseph K. McLaughlin Lecture at Cato in November, where he discussed how Hayek has influenced his thinking. See page 17.

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costs of \$50–100 billion are now common, as for the California and UK high-speed rail projects, and costs above \$100 billion are not uncommon, as for the International Space Station and the Joint Strike Fighter. If they were nations, projects of this size would rank among the world's top 100 countries measured by gross domestic product. When projects of this size go wrong, whole companies and national economies suffer.

But megaprojects are not only large and growing constantly larger, they are also being built in ever greater numbers at ever greater value. The McKinsey Global Institute estimates global infrastructure spending at \$3.4 trillion per year for 2013 to 2030, or approximately 4 percent of total global gross domestic product, mainly delivered as large-scale projects.

#### **THE FOUR SUBLIMES**

Why are megaprojects so attractive to decision makers? The answer may be found in the so-called “four sublimes” of megaproject management. Karen Trapenberg Frick first introduced the term to the study of megaprojects, describing the technological sublime as the rapture engineers and technologists get from building large and innovative projects, like the tallest building or the longest bridge.

I proposed three additional sublimes, beginning with the “political sublime,” which is the rapture politicians get from building monuments to themselves and their causes. Megaprojects are tangible, garner attention, and lend an air of proactiveness to their promoters. Moreover, they are media magnets, which appeals to politicians who seem to enjoy few things better than the visibility they get from starting megaprojects—except maybe cutting the ribbon of one in the company of royals or presidents, who are likely to be lured by the unique historical import of these projects. This is the type of public exposure that helps get politicians reelected. They therefore actively seek it out.

Next there is the “economic sublime,”

“Cost overrun for the Channel Tunnel was 80 percent. For Boston's Big Dig, 220 percent.”

which is the delight business people and trade unions get from making lots of money and jobs off megaprojects. Finally, the “aesthetic sublime” is the pleasure designers and people who appreciate good design get from building, using, and looking at something very large and iconically beautiful, like San Francisco's Golden Gate Bridge or Sydney's Opera House.

Taken together the four sublimes ensure that strong coalitions exist of stakeholders who benefit from megaprojects and who will therefore work for more such projects. But in fact, conventional megaproject delivery—infrastructure and other—is highly problematic with a dismal performance record in terms of actual costs and benefits. The following characteristics of megaprojects are typically overlooked or glossed over when the four sublimes are at play:

1. Megaprojects are inherently risky due to long planning horizons and complex interfaces.

2. Often projects are led by planners and managers without deep domain experience who keep changing throughout the long project cycles that apply to megaprojects, leaving leadership weak.

3. Decision making, planning, and management are typically multi-actor processes involving multiple stakeholders, public and private, with conflicting interests.

4. Technology and designs are often non-standard, leading to “uniqueness bias” among planners and managers, who tend to see their projects as singular, which impedes learning from other projects.

5. Frequently there is overcommitment to a certain project concept at an early stage, resulting in “lock-in” or “capture,” leaving

alternative analysis weak or absent, and leading to escalated commitment in later stages.

6. Due to the large sums of money involved, principal-agent problems and rent-seeking behavior are common, as is optimism bias.

7. The project scope or ambition level will typically change significantly over time.

8. Delivery is a high-risk, unpredictable activity, with overexposure to so-called “black swans,” that is, extreme events with massively negative outcomes. Managers tend to ignore this, treating projects as if they exist largely in a deterministic Newtonian world of cause, effect, and control.

9. Statistical evidence shows that such complexity and unplanned events are often unaccounted for, leaving budget and time contingencies inadequate.

10. As a consequence, misinformation about costs, schedules, benefits, and risks is the norm throughout project development and decision making. The result is cost overruns, delays, and benefit shortfalls that undermine project viability during project implementation and operations.

#### **THE IRON LAW OF MEGAPROJECTS**

Performance data for megaprojects speak their own language. Nine out of ten such projects have cost overruns. Overruns of up to 50 percent in real terms are common, over 50 percent not uncommon. Cost overrun for the Channel Tunnel, the longest underwater rail tunnel in Europe, connecting the UK and France, was 80 percent in real terms. For Boston's Big Dig, 220 percent. The Sydney Opera House, 1,400 percent. Similarly, benefit shortfalls of up to 50 percent are also common, and above 50 percent not uncommon.

As a case in point, consider the Channel Tunnel in more detail. This project was originally promoted as highly beneficial both economically and financially. In fact, costs went 80 percent over budget for construction, as mentioned above, and 140 percent for financing. Revenues have been half of those forecasted. The internal rate of return on

“Approximately one out of ten megaprojects is on budget, one out of ten is on schedule.”

the investment is negative, with a total loss to the British economy of \$17.8 billion. Thus the Channel Tunnel detracts from the economy instead of adding to it. This is difficult to believe when you use the service, which is fast, convenient, and competitive with alternative modes of travel. But in fact each passenger is heavily subsidized. Not by the taxpayer this time, but by the many private investors who lost their money when Euro-tunnel, the company that built and opened the channel, went insolvent and was financially restructured. This drives home an important point: A megaproject may well be a technological success but a financial failure, and many are. An economic and financial ex post evaluation of the Channel Tunnel, which systematically compared actual with forecasted costs and benefits, concluded that “the British economy would have been better off had the tunnel never been constructed.”

If, as the evidence indicates, approximately one out of ten megaprojects is on budget, one out of ten is on schedule, and one out of ten delivers the promised benefits, then approximately one in a thousand projects is a success, defined as on target for all three. Even if the numbers were wrong by a factor of two, the success rate would still be dismal. This serves to illustrate what may be called the “iron law of megaprojects”: *over budget, over time, over and over again.*

#### **HIRSCHMAN'S HIDING HAND, REVISITED**

One may argue, of course, as was famously done by Albert Hirschman, that if people knew in advance the real costs and challenges involved in delivering a large project, nothing would ever get built—so it is better not to know, because ignorance helps get projects started. A particularly candid articulation of the nothing-would-ever-get-built argument came from former California State Assembly speaker and mayor of San Francisco Willie Brown, discussing a large cost overrun on the San Francisco Transbay Terminal megaproject in his *San Francisco Chronicle* column:

News that the Transbay Terminal is something like \$300 million over budget should not come as a shock to anyone. We always knew the initial estimate was way under the real cost. Just like we never had a real cost for the [San Francisco] Central Subway or the [San Francisco-Oakland] Bay Bridge or any other massive construction project. So get off it. In the world of civic projects, the first budget is really just a down payment. *If people knew the real cost from the start, nothing would ever be approved.* The idea is to get going. Start digging a hole and make it so big, there's no alternative to coming up with the money to fill it in [emphasis added].

Rarely has the tactical use by project advocates of cost underestimation, sunk costs, and lock-in to get projects started been expressed by an insider more plainly, if somewhat cynically. The argument is deeply flawed, however, and thus deserves a degree of attention and critique.

Hirschman observed that humans are “tricked” into doing big projects by their own ignorance. He saw this as positive because just as humans underestimate the difficulties in doing largescale projects, they also underestimate their own creativity in dealing with the difficulties. He called this the “principle of the Hiding Hand.” John Sawyer similarly identified what he called “creative error” in project development as the “miscalculation or sheer ignorance” of the true costs and benefits of projects, with such miscalculation being “crucial to getting an enterprise launched at all.”

It is easy to understand why Hirschman's and Sawyer's theories have become popular. The theories encourage promoters and decision makers, like Willie Brown above, to just go ahead with projects and not worry too much about the costs or other problems. Michael B. Teitz and Andrejs Skaburskis follow the Hiding Hand logic when they ask of the huge cost overrun on the Sydney Opera House, “Did people really think that the Sydney Opera House would come in on budget? Or did we all agree to accept the deception and engage in wishful thinking in order to make something that we really wanted happen? . . . [D]o Australians really regret those dramatic sails in the harbour? Or would they have regretted more the decision [not to build] that would most reasonably have been based on a fair prediction of costs?”

The logic is seductive, yet precarious. In retrospect, of course, Australians do not regret the Sydney Opera House, given what it has done for Australia. Non-Australians may feel regret, however—for instance, the architect of the Opera House, what's his name? Does anybody know? Only a few do, which seems surprising given that he is the architect of arguably the most iconic building of the 20th century. And if anybody knows the architect is the Dane Jørn Utzon, why can they hardly ever mention another building designed by him? Because the overrun on the Opera House and the ensuing controversy destroyed Utzon's career and kept him from building more masterpieces. He became that most tragic figure in architecture, the one-building architect.

This is the real regret—and real cost—of the Sydney Opera House. After winning the Pritzker Prize—the Nobel of architecture—in 2003, Utzon again became widely acclaimed, even in Australia, where the Sydney Opera tour guides for years had been forbidden to even mention his name. But it was too late. Utzon was now 85 and had not built anything major for decades. So instead of having a whole oeuvre to enjoy, as we have for other architects of his caliber, we have just one

“These practices result in an inverted Darwinism, that is, the ‘survival of the unfittest.’”

main building. Utzon was 38 when he won the competition for the Opera House—how would the work of the mature master have enriched our lives? We will never know.

Hirschman’s and Sawyer’s theories are also flawed at a more basic level. A close look reveals the theories to be based on small samples and biased data. Hirschman studied only 11 projects, or a few more if we count subprojects; Sawyer 10 to 15. We now know that, while there may be elements of truth in these authors’ theories for certain types of projects, their samples and conclusions are not representative. In particular, their odd asymmetrical assumption that optimism would apply to cost estimates but pessimism to estimates of benefits has been solidly disproved. Errors of estimation do not cancel each other out, as Hirschman would have it; errors generally reinforce each other.

**SURVIVAL OF THE UNFITTEST**

Underestimating costs and overestimating benefits for a given project leads to two

problems. First, the project may be started despite the fact it is not viable. Or, second, it may be started instead of another project that would have shown itself to yield higher returns, had the real costs and benefits of both projects been known. Both cases result in the misallocation of resources and, for public projects, waste of taxpayers’ money. Thus for reasons of economic efficiency alone the arguments for cost underestimation and benefit overestimation must be rejected.

But the argument must also be rejected for legal and ethical reasons. In most democracies, for project promoters, planners, and managers to deliberately misinform legislators, administrators, bankers, the public, and the

media about costs and benefits would not only be considered unethical but in some instances also unlawful. Not only would economic efficiency suffer but also democracy, good governance, and accountability.

The common practice of depending on the Hiding Hand or creative error in estimating costs and benefits results in an inverted Darwinism, that is, the “survival of the unfittest.” It is not the best projects that get implemented, but the projects that look best on paper. And the projects that look best on paper are the projects with the largest cost underestimates and benefit overestimates, shortfalls, and risks of nonviability. Thus the projects that have been made to look best on paper become the worst, or unfittest, projects in reality, in the sense that they are the very projects that will encounter the most problems during construction and operations in terms of the largest cost overruns, benefit shortfalls, and risks of nonviability. They have been designed like that, as disasters waiting to happen. ■

# ‘Progress’ Makes Book of the Year

Cato senior fellow Johan Norberg’s latest book, *Progress: Ten Reasons to Look Forward to the Future*, was named one of the *Economist*’s best books of the year, in addition to being featured on the front page of Wikipedia for their “Did you know . . .” section. As Matthew Rees wrote in his review of *Progress* for the *Wall Street Journal*, “Swedish author Johan Norberg deploys reams of data to show just how much life has improved—especially over the past few decades but over the past couple of centuries as well.” Norberg was also featured in an August cover story for *The Spectator* of London, where he wrote, “If you think that there has never been a better time to be alive—that humanity has never been safer, healthier, more prosperous or less unequal—then you’re in the minority. But that is what the evidence incontrovertibly shows.”

