

Perspective: Building megaprojects on time and under-budget

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A Perspective sheds light on why megaprojects take so long and cost so much—and what can be done to prevent the problem. Why did Boston's "Big Dig" building project go 19 billion dollars over budget and take nine years longer than anticipated?

Globally, between \$6 trillion and \$9 trillion is spent on megaprojects every year, including everything from space telescopes to wind farms. In the United States, the recently passed \$1 trillion infrastructure bill means a new era of megaprojects is at hand.

In a Perspective, published in *PNAS Nexus*, Guru Madhavan and colleagues review the causes behind ballooning [costs](#) and extended timelines for such megaprojects. Problems include premature initiation, the unpredictability inherent in complex designs, engineers' lack of experience in megaprojects, and red tape. In addition, the awe people feel about massive technological objects can cloud their ability to make rational decisions. Looking forward, the authors identify key possibilities that could help large engineering projects escape bloat.

Among their recommendations: designing to reduce complexity; using modular systems to avoid emergent issues; building in more than typically generous [design](#) margins; connecting and aligning design and build teams; using integrated engineering, procurement, and contracting (EPC) contract structures; peer reviewing [project](#) designs; and fostering a constructive culture emphasizing curiosity, humility, continuous learning, innovation, and adaptability.

To learn from past megaprojects, the authors call for a repository of lessons learned that engineers can study. According to the authors, in an age of megaprojects, the entire engineering profession must rise to the task.

More information: Guru Madhavan, Delivering Effectively on Large Engineering Projects, *PNAS Nexus* (2023). [DOI: 10.1093/pnasnexus/pgad281](#)

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