THE CALTRAIN CORRIDOR VISION PLAN

Appendix C

Megaplanning for Mega and Mini Projects: Common Challenges and Ways Forward

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The Caltrain Corridor Vision Plan details multiple projects and programs across several transportation modes that range from individual large scale undertakings, known as megaprojects, to those smaller in nature — mini projects. These interrelated parts when combined will require the San Francisco Bay Area and State of California to undertake a multi-year megaplanning effort that is laser focused on the Caltrain Corridor while looking outward to the broader region, megaregion and state to connect people, places, goods and services. To accomplish the vision plan, project sponsors and key actors would be well served to recognize common challenges in project planning and delivery. They also should consider the following recommendations from practice and scholarship to improve project management and performance as a way forward through challenges and harness pathways to innovation.

Common Challenges

Large-scale infrastructure endeavors often have characteristics I have identified as the "7 C's of Megaprojects." They tend to be *colossal, costly, captivating, controversial* and *complex*. They are laden with issues of *control* over financing, design and project development because multiple layers of key actors must interact across many sectors, public and private. As a result, they also are in need of much *communication* between key actors, the media and the public as there often is lack of transparency and accountability built into processes.[1] These characteristics in combination complicate project timelines, cost estimates and other outcomes in the public's interest. Smaller projects can have similar characteristics, even taking on a colossal nature relative to initial conception when projects spiral into

[1] Trapenberg Frick, K. 2016. *Remaking the San Francisco–Oakland Bay Bridge: A Case of Shadowboxing with Nature*. Oxfordshire: Routledge.

more intensive efforts than expected or costs increase substantially.[2] For projects of any size, scope creep may occur where additional elements are added along the way[3] or unanticipated issues arise.

Unfortunately, project sponsors may take the "inside view," only considering circumstances of the project at hand and not systematically investigating project examples for patterns in cost, project delivery schedules and risks. They may be overly optimistic or may deliberately misrepresent estimated project cost and benefits, often referred to in the literature as "optimism bias" and "strategic misrepresentation."[4] They also may not have sufficiently trained staff and management to discern the nuances, complexities and risks of megaprojects or developed corresponding contingency budgets to cover increased costs. Further, project sponsors often do not provide substantial time or funds to support in-depth planning and public outreach or rigorous cost estimating, engineering and design. Transaction costs typically are not accounted for, including costs of contractual arrangements and lawsuits, financing, and public involvement and environmental processes. This can lead to poor initial estimates in cost and project delivery timelines. Subsequently, public discussion of cost does not have the benefit of full disclosure and contemplation of such information, particularly financing costs which can double the project cost.[5]

These first out-of-the-gate cost estimates lead to "cost anchoring" — akin to anchoring a boat but weighing the project down to become a sinking ship as cost and time estimates woefully miss the mark. These low front-end estimates can lead project sponsors and policymakers to pursue projects they would not have otherwise had they known the overall costs. [6] Decisions at this point and during key project milestones create "lock in," where project sponsors feel obliged to continue to implementation even as costs and difficulties surface.[7]

Ways Forward

While these typical project characteristics and challenges may seem daunting, project sponsors, researchers and others around the globe have been working to improve large-scale project management, delivery and performance. First, with respect to managing cost, researchers and governments in the United Kingdom, European Union, Australia and the Asia Pacific look to a method of cost estimating called reference class forecasting to combat many of the challenges. This entails taking an "outside view" by statistically comparing the project under consideration to numerous similar projects, particularly cost and delivery timelines.[8] Researchers further recommend that analyses explicitly factor in the full range of transaction costs. Such investigations aid in confronting optimism

[2] Odeck, J., 2014. Do reforms reduce the magnitudes of cost overruns in road projects? Statistical evidence from Norway. *Transportation Research Part A: Policy and Practice*, *65*, pp. 68-79.

[3] Greiman, V.A., 2013. *Megaproject management: Lessons on risk and project management from the Big Dig*. John Wiley & Sons.

[4] Flyvbjerg, B. 2014. "What You Should Know About Megaprojects and Why: An Overview," *Project Management Journal*, pp. 6-19.

[5] Siemiatycki, M., 2013. "Public–private partnerships in mega-projects: successes and tensions. In Priemus, H. and van Wee, B. *The International Handbook on Mega-Projects*. Cheltanham, UK: Edward Elgar; Whittington, J., 2012. When to partner for public infrastructure? Transaction cost evaluation of design-build delivery. *Journal of the American Planning Association*, *78*(3), pp. 269-285.

[6] Welde, Morton & Odeck, James. 2017. Cost escalations in the front-end of projects – empirical evidence from Norwegian road projects, Transport Reviews, DOI: 10.1080/01441647.2016.1278285

[7] Cantarelli, C.C. and Flyvbjerg, B., 2013. Mega-Projects' Cost Performance and Lock-In: Problems and Solutions. In Priemus, H. and van Wee, B. *The International Handbook on Mega-Projects*. Cheltanham, UK: Edward Elgar.

[8] Cantarelli, C.C. and Flyvbjerg, B., 2013. Mega-Projects' Cost Performance and Lock-In: Problems and Solutions. In Priemus, H. and van Wee, B. *The International Handbook on Mega-Projects*. Cheltanham, UK: Edward Elgar.

bias, strategic misrepresentation, lock in and poor front-end anchored estimates, as project sponsors must publicly disclose the costs and timelines of comparators.

To correct underestimated costs and project contingency budgets, an "optimism bias uplift" dollar amount is added to a project's estimated cost based on similar projects to account for inevitable project uncertainty and difficulties.[9] In tandem, project management and optimism bias analyses benefit from explicit identification of a "time-to-completion uplift." A more realistic timeframe can then be developed based on reference projects to allow for adequate front-end planning. This also would allow time to address the unpredictable even if the specifics of predicting the unpredictable could not be scoped at the beginning. Thus, appraisals would account for a "cost uplift" *and* an explicit "schedule uplift." Of course, care should be taken to ensure that uplift dollar costs are not assumed as immediately available for project spending.[10]

Second, with adequate and clear expectation setting of project time-to-completion, project sponsors can pursue the necessary front end planning[11] to carefully establish an appropriate multi-level governance structure and public engagement process. This would also entail transportation and other planning, system design and engineering, and evaluation of financing, contracting and delivery options. From the onset, robust risk assessment should be included that examines internal and external risk factors, such as consideration of regulatory, economic, political, environmental and social risks, as well as game changer and "black swan," scenarios in line with best practices as recommended by leading managers with the French National Rail Corporation (SNCF). [12]

Third, megaproject practitioners and researchers recommend establishment of internal and external oversight in tandem with external independent peer review.[13] For the Caltrain Corridor Vision Plan, institution of these management mechanisms would assure continuation of the "outside view" and uncover when lock-in and bias cloud project sponsors' judgment. These bodies can also be attuned to ensuring that key project social equity, environmental, safety and other public interest goals remain at

[9] Cantarelli, C.C. and Flyvbjerg, B., 2013. Mega-Projects' Cost Performance and Lock-In: Problems and Solutions. In Priemus, H. and van Wee, B. *The International Handbook on Mega-Projects*. Cheltanham, UK: Edward Elgar.

[10] Flyvbjerg, B., Hon, C.K., Fok, W.H. 2016, June. Reference class forecasting for Hong Kong's major roadworks projects. In *Proceedings of the institution of Civil Engineers–Civil Engineering*. Vol. 169, No. 6, pp. 17-24. Available at https://www.researchgate.net/profile/Bent_Flyvbjerg/publication/305820925_Reference_class_forecasting_for_Hong_Kong's_major_roadworks_projects/links/57c9895408aedb6d6d97bc05.pdf; Trapenberg Frick, Karen. 2008. "The Cost of the Technological Sublime: Daring Ingenuity and the New San Francisco-Oakland Bay Bridge." In Decision-making on Megaprojects: Cost Benefit Analysis, Planning and Innovation, edited by H. Priemus, B. Flyvbjerg, and B. Van Wee. Cheltenham, UK: Edward Elgar

[11] Evans & Peck, Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects — Final Report, December 2012, p. 46. Available at http://www.parliament.vic.gov.au/images/stories/committees/paec/reports/20121217_PAEC_Final_Report_-_Updated.pdf; Parliament of Victoria (2012). Inquiry into effective decision making for the successful delivery of significant infrastructure projects. Public Accounts and Estimates Committee, Melbourne, p. 241. Available at http://www.parliament.vic.gov.au/papers/govpub/VPARL2010-14No205.pdf

[12] LeBoeuf, Michael and Morel, F.. Forecasting for High Speed Rail: An Operator's Perspective on Risk Reduction through Informed Use of Forecasting. In Henríquez, B.L.P. and Deakin, E. eds., 2017. *High-Speed Rail and Sustainability: Decision-making and the political economy of investment*. New York: Routledge; also see Beckers, F. et al., 2013. A risk-management approach to a successful infrastructure project: Initiation, financing, and execution, McKinsey Working Papers on Risk, No. 52, Available at http://www.mckinsey.com/~/media/mckinsey/dotcom/client_service/Risk/Working%20papers/52_A_risk-management_approach_to_a_successful_infrastructure_project.ashx

[13] Cantarelli, C.C. and Flyvbjerg, B., 2013. Mega-Projects' Cost Performance and Lock-In: Problems and Solutions. In Priemus, H. and van Wee, B. *The International Handbook on Mega-Projects*. Cheltanham, UK: Edward Elgar; Greiman, V.A., 2013. *Megaproject management: Lessons on risk and project management from the Big Dig*. John Wiley & Sons.

the forefront. They can recommend the necessary data to collect before, during and after implementation to allow for robust project evaluations. In so doing, project sponsors could consider a community advisory board like those established in large infrastructure projects, such as the reconstruction of the Cypress Freeway/Interstate 880 in Oakland. This body could contribute insights on key project aspects, including development of community metrics and data considerations developed through local knowledge.[14] Such review groups can facilitate full disclosure of key information to increase transparency and accountability. This is critical for decision-making and building an informed citizenry, and well worth the investment in time and transaction costs. The further down the road a project's scope changes, the higher potential for increased costs and time delays.[15]

These oversight mechanisms are consistent with recent California legislation (SB 969 Of 2014, DeSaulnier) that requires peer review and risk analysis for megaprojects starting at $2.5 billion. With the vision plan's multiple constituent components, only specific projects might fall within the threshold. However, akin to portfolio management, the overall plan should be implemented through a multi-level governance approach that includes oversight, peer review and risk analysis to facilitate cohesion for reaping maximum benefits in the public interest.

Fourth, with a forward-looking approach to confronting challenges and risks, vision plan project sponsors and key actors can free up time and attention to uncover opportunities to harness innovation in tandem with cultivating capable management and staff. Recent practice and scholarship suggests much promise with the institution of innovation development centers housed within projects and leadership academies to strengthen staff capabilities. For example, in the United Kingdom, project sponsors of Crossrail in London — a new 60-mile rail line under construction, one of Europe's largest infrastructure projects at nearly $18 billion — instituted a special innovation unit to foster significant improvements in project design and delivery. This unit's funding comes from Crossrail and industry partners and is a partnership with the private sector, Imperial College London and University College London. In addition, the U.K government, through University of Oxford, offers a Major Project Leadership Academy for senior project officials, which sponsors suggest has led to improved project implementation. Given the Bay Area's strong social equity focus, community-based organizations and leading local leaders could take part in such an academy, in addition to project staff, if instituted in tandem with vision plan development. The Caltrain Corridor's embodiment of innovation and proximity to leading universities and Silicon Valley provide natural conditions for the vision plan to be a living laboratory of experimentation and learning to fuel engagement of the public, nonprofit and private sectors.

While these identified avenues are not a cure-all, they would improve performance and public deliberation about megaplanning and major infrastructure while challenging past practices in the region and state. Project sponsors should start carefully instituting these four steps forward. With mounting congestion and increasing transit ridership, social and environmental pressures, we have no time to wait.

[14] University of California, Berkeley, Department of City and Regional Planning, Planning Studio 218. 2016. "The Third Crossing: A Megaproject in a Megaregion." Available at www.thirdcrossing.org

[15] Evans & Peck, Inquiry into Effective Decision Making for the Successful Delivery of Significant Infrastructure Projects — Final Report, December 2012, p. 46. Available at http://www.parliament.vic.gov.au/images/stories/committees/paec/reports/20121217_PAEC_Final_Report_-_Updated.pdf