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Major Engineering Project Performance

Cost and time performance of major projects

As we have learned, major projects are very large investment projects that tend to be massive, indivisible, and long-term artefacts. The academics, Miller and Lessard, provide us with a good description of major projects. They say, the "effects of megaprojects are felt over many years, especially as auxiliary and complementary additions are made." Furthermore, public policy strongly affects the performance of public major projects. Despite their fundamental economic and social role, major projects are extremely risky, and are often implemented after a weak, or sub-optimal, phase of project planning. This leads to project costs being underestimated and benefits being overestimated.

In his book, 'Industrial major projects: concepts, strategies, and practices for success', Merrow presents an analysis of a database of 318 major projects. And shows that the vast majority of these projects might be considered a failure in terms of meeting the schedule, budget, and benefit in operation. A recent review about projects running over budget is found in my own paper called, 'Corruption in public projects and mega-projects: there is an elephant in the room!' Here, I show how major projects in the transportation sector run over budget all over the world regardless of the technology, culture, and stakeholders involved in the project. Indeed, a budget excess of 30 percent, 40 percent is typical. In extreme cases, such as the high-speed railway in Italy, the project cost could be double than budgeted for, or even more. Cost escalation is common even for projects which are unique and iconic planned over a long period and worth several billion dollars. For example, the cost of the Eurotunnel linking the UK to France increased by 59 percent alone, or by 69 percent if we take into account related projects.

Several arguments can explain why infrastructure projects go over budget. The first is technical. That may include forecasting errors, including price rise, poor project design, and incompleteness of estimations. Or scope changes, uncertainty, inappropriate organisational structure, inadequate decision making process, and inadequate planning process. Another reason we can consider is the

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deliberate underestimation of cost. This could be due to the lack of incentive and resources, inefficient use of resources, lack of dedicated funding process, poor financing or contract management, or strategic behaviour. There are also psychological reasons including optimism bias among local officials, the cognitive bias of people, and cautious attitude towards risk. And finally, there are political reasons such as deliberate cost underestimation, and the manipulation of forecasts. As my research has shown, the problem of projects running over budget is systemic and shows little improvement over time. This seems to be an example of what Professor Pinto calls tolerance for deviation. This is when people within an organisation become so used to a deviant behaviour that they accept it as being normal. In particular, we see how politicians work to keep important contacts and maintain support for projects even in spite of poor project management. Even in the energy sector, the project management performance of major projects is quite poor.

I invite you to read the paper from Dr Atif Ansar and Professor Bent Flyvbjerg called, 'Should we build more large dams? The actual costs of hydropower megaproject development', to explore this in more detail. This is one of the most relevant recent studies since it analyses the budget and schedule performance of 245 large dams built between 1934 and 2007 on five continents in 65 different countries. It was found that three out of four large dams suffered a cost overrun. The actual costs were on average 96 percent higher than the estimated cost and the median was 27 percent. Moreover, this was a common occurrence with little difference across the regions. Here, you will also see that the project types, for example, if we are building an hydropower, irrigation, or multipurpose dam, or the wall type, for example, if it's earth fill, rockfill, or concrete arch, does not influence cost overrun. Irrespective of the year or the decade in which a dam is built, there are no significant differences in forecasting error, showing that there is little learning from past mistakes. Quite remarkably, the only statistical significance is that cost overrun percentages increase with the increase in the dam size, the size being measured either in installed hydropower generation or wall height. You will also note that the same pattern is repeated when considering the project's schedule. The authors proposed to use the reference class forecast to improve the performance in cost and schedule estimations. I will introduce you to this method for cost estimation in this unit, and you can also read about it in the papers written by Professor Flyvbjerg. So we can see that major projects are usually delivered over budget and late. Please read the papers that I have recommended to you, as

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these will help you to understand how common this phenomenon is and will allow you to identify the key reasons for this.

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