The making and impacts of a classic text in megaproject management: The case of cost overrun research

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Abstract

This paper presents a case study of the making and impacts of a classic text in the field of megaproject management. It focuses on Bent Flyvbjerg, Mette Skamris Holm and Søren Buhl’s article Cost Underestimation in Public Works Projects: Error or Lie?, which was published in the Journal of the American Planning Association in 2002. The paper shows that classic texts can have a significant impact on megaproject planning theory and practice. Within the academy, classic texts are those that are widely cited and come to define the theoretical terrain, types of research questions that are asked and methods used in subsequent research. They also directly contribute to new megaproject planning methods and shape the public discourse on megaproject delivery. The paper concludes by identifying the key ingredients that make a classic text.

Keywords: Megaproject management; Infrastructure; Cost overruns; Classic texts

1. Introduction

This paper presents a case study of the making and impacts of a classic text in the field of megaproject management. In 2002, Bent Flyvbjerg, Mette Skamris Holm and Søren Buhl published the article “Cost Underestimation in Public Works Projects: Error or Lie?” in the Journal of the American Planning Association. Flyvbjerg and his colleagues’ article, which I will refer to subsequently in abbreviated form as Error or Lie?, became an instant classic in the field of megaproject management. Over the years since being published, the paper has been cited hundreds of times, and spawned an intense research agenda on the subject of cost overruns and project delivery failures. The academic impact of Error or Lie? is illustrated by the fact that many subsequent scholarly articles on cost overruns cite this seminal work as the prevailing theoretical contribution in the field to frame their own research questions and conceptual arguments (see: Love et al., 2014; Liu et al., 2010; Eliasson and Fosgerau, 2013; Lind and Brunes, 2015). And more broadly the paper has received extensive international media coverage, shaken up the public discourse on the patterns and causes of cost overruns, and brought about transformational changes in the ways that megaprojects are planned and delivered in many jurisdictions. Amidst the avalanche of research produced in the field of megaproject management every year, why did Errors or Lie? become a classic text for scholars and practitioners? And what have its enduring impacts been? These are the questions to be explored in this paper.

The answers to these questions are informed by the insights that Thomas Kuhn (2012) developed about the role of classic texts in scholarly disciplines, and the conditions that create them. According to Kuhn, classic texts play an important role in scholarly disciplines because they establish the foundations – the paradigms and exemplars – around which “normal science” is conducted. Paradigms sets out the terms of appropriate research questions, prevailing theories, accepted methodologies and applications that constitute ordinary work in a field. Over time, the literatures in normal science become increasingly technical and specialized, with a focus on solving well-defined problems.
Paradigms change, however, not through the long cumulative march of normal science, but rather through intense bursts of revolutionary research that confront old theories with new fundamentals. This groundbreaking extraordinary science typically occurs at moments of crisis where anomalies in the prevailing paradigm can no longer be ignored.

Importantly, for Kuhn (2012), the identification of paradigmatic research is a social process that is highly sensitive to context: it is a product of the persuasiveness of the science itself, and the response of the scientific and lay community at large. Research that trigger paradigm changes often builds upon strands of previous scholarship, and then reconstructs the field using new methodologies or theories to create knowledge that could not have been previously envisioned. And truly paradigm-shifting research results in a ‘change of world views’ amongst scientists and practitioners in the discipline, and possibly even society as a whole depending on the relevance of the innovation. All those embracing the change of paradigm will have a new feeling about how things work, notice new problems, ask different questions, and engage in the field in new ways. To seed such significant social transformation, a common feature of revolutionary paradigmatic research is that it focuses on topics of great societal significance, and is communicated in a form that is accessible to a broad audience (Gans, 2009; Glenn, 2009; Kuhn, 2012).

Based on Kuhn’s insights about paradigmatic research, in an applied academic discipline such as megaproject management, assessing the impacts of a classic text must capture the scholarly, professional and societal impacts of the work. These impacts can be measured in a variety of ways. Academic impact can be measured through the number of citations and the extent to which the scholarship influences future research questions and theories. Professional impact can be measured by the way that a classic text influences how project management policy is formed and practice is conducted. And one (though certainly not the only) measure of how a classic text contributes to popular discourses on a topic is the amount and prominence of media coverage it receives.

This paper will argue that Error or Lie? is a textbook case of the making of a classic text that has initiated a new paradigm in megaproject research and project delivery practice. The rationale for focusing specifically on Error or Lie? as a single case study is that Flyvbjerg, the paper’s lead author, is amongst the most cited scholars on megaproject management. And as of 2016 Error or Lie? is his most cited academic paper on the subject. As another sign of the scholarly significance of the article, it is amongst the five most cited papers published in the eighty year history of the prestigious Journal of the American Planning Association. The research has also directly contributed to shifts in megaproject management practice in a variety of countries, and garnered extensive media coverage worldwide (see Flyvbjerg, 2012). As such, Error or Lie? is being presented as an illustrative case of how a leading project management scholar created his most significant and impactful text in the field.

The paper proceeds in three sections. The first section examines the scholarly antecedents and key academic contributions of the article, demonstrating how it has become a classic text in the field of project management. Section two explores the response to the paper, within the academy and beyond, showing how research that reaches the level of a classic text matters to the scholarly field and practice of project management. Finally, the paper will reflect on the lessons that Error or Lie? provides about the making and impacts of classic texts in the field of megaproject management.

To be certain, this single case study of Error or Lie? is not the only path by which a classic text can be produced in the field of project management. There are undoubtedly a confluence of different contextual factors and strategic approaches that other project management scholars have followed to turn their own research into classic texts. Nevertheless, as Yin (1984) demonstrated, the objective of case study research is not necessarily to be universally generalizable to all future cases, but rather to provide a deep context specific description of a subject matter that can provide insights to inform future courses of action. It is in this spirit that Error or Lie? is presented as one important model for making a classic text.1

2. The making of a classic text

2.1. Antecedents

Bent Flyvbjerg did not discover that large, complex transport, energy, military, social and information technology megaprojects chronically experience cost overruns. Nor did he and his colleagues pioneer research on the topic. For centuries, there have been cost overruns on high profile megaprojects — from Haussmann’s redevelopment of Paris and the building of the American transcontinental railways in the 19th century, to the construction of the Sidney Opera House and the Eurotunnel in the 20th century. Frequent cost overruns have raised the ire of the political and industry sponsors of megaprojects, and befuddled those responsible for project management and delivery (Hall, 1982). The mass media has further made the issue of cost overruns a topic of general public interest, by reporting accounts of budget bursting megaprojects. Cost overruns are thus a major public policy concern because they burden their public and private sector sponsors with significant unexpected additional costs, put the financial viability of major projects at risk, and can be politically embarrassing for all involved with the project (Flyvbjerg et al., 2003; Siemiatycki, 2009).

For more than four decades, cost overruns on megaprojects of all kinds have been a frequent topic of academic study. Over the years, a burgeoning body of scholarly articles, books, and reports have sought to measure the frequency, magnitude, causes and cures of cost overruns on megaprojects (See: Tihanski, 1976; Merewitz, 1973; Hall, 1982; Gehring and Narula, 1986; Pickrell, 1992; Nijkamp and Ubbels, 1999). Prior to Error or Lie?, the prevailing paradigm in the fields of study most closely associated with the theory and practice of delivering megaprojects — engineering, project management and construction management — was that when cost overruns occur, they are primarily

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1 The approach that Flyvbjerg and his colleague’s followed to create a classic text out of Error or Lie? is broadly applicable beyond megaproject management to a wider range of scientific fields. Indeed, Flyvbjerg has followed a similar recipe to turn his book Making Social Science Matter into a classic text in the philosophy of science.
caused by a suit of technical challenges with project delivery. Technical causes of cost overruns can be summarized as follows:

- Predicting future costs is plagued by uncertainty, poor forecasting methodologies, and inaccurate or incomplete data.
- Projects may proceed before technical studies are completed due to expedited timelines, leading to rising costs as more detail about the project is confirmed.
- The scope of the project often increases in midstream, adding costs to the budget.
- Coordination challenges between the facility designer and multiple contractors on a worksite can result in errors and disputes about change orders that add costs.
- The use of ‘traditional’ design-bid-build procurement models create weak incentives for firms to deliver projects within budget (Robinson, 1987; Naoum, 1994)
- Weak risk identification and management results in unforeseen events such as unexpectedly poor soil conditions or pollutants, undocumented utilities that need to be moved, or construction accidents (Akinci and Fischer, 1998). These unexpected events add costs to the project.
- Inflation in material, labor and financing costs, which typically occur when projects are built during periods of strong economic growth and tight employment.
- Project delays such as strikes, challenges sourcing materials or contractor disputes that disrupt tight project timelines.
- Poor project reporting and performance monitoring to track contractor performance as the job is progressing, and inform the selection of contractors for future work that have a record of quality performance.

The emphasis on technical explanations for cost overruns within the scholarship produced from the engineering and project management disciplinary perspectives was supported by the methodologies and data sources employed in these studies. This research typically used surveys and interviews with project delivery practitioners and relatively small sample size case studies of projects that experienced large cost overruns. The case studies often focused on cost overruns in a single city or country. And in a number of instances, researchers conducted studies in collaboration with or funded by organizations that deliver megaprojects, providing a privileged perspective on the internal causes of cost overruns (Daoud and Azzam, 1999; Avots, 1983). Thus the main scholarly disciplines interested in megaproject management have tended to emphasize that project cost overruns, when they occur, are caused by honest errors in project cost estimation and delivery.

Normal science research conducted within this paradigm focused on better identifying the specific causes of cost escalations on megaprojects that are internal to the project planning process and project delivery organization (Jahren and Ashe, 1990). An extensive literature has also been produced that develops more advanced forecasting techniques and strategies to improve project planning and management methods (See: Steuer, 1987; Stevens, 1986; Al-Bahar and Crandall, 1990). As is common in mature disciplines, the scholarly research on cost overrun prevalence and causes was highly technical and targeted primarily at a specialist audience. This academic paradigm is consistent with the general perspective of project delivery practitioners and their trade organizations towards cost overruns. For them, cost overruns are commonly seen as unexpected occurrences on large complex projects that are caused by bad luck, in spite of the professional skill of the project delivery team involved (Flyvbjerg, 2012).

During the same period, a small body of scholarship produced mainly by social scientists that were outsiders to the project management disciplinary establishment took an alternative perspective and sought to understand the role that deception in forecasting and decision-making plays in megaproject cost overruns. Peter Hall’s 1980 book Great Planning Disasters establishes the foundation for this discourse by analyzing how the self-interested decisions of a complex set of political, bureaucratic and civil society actors involved in five megaprojects set the course for major planning failures (Hall, 1982). Pickrell (1992) extended this research trajectory by providing empirical evidence of systemic cost overruns on a sample of 20 large American urban rail projects, and implying that a prime cause was deception on the part of forecasters and decision-makers. And Wachs (1986, 1990) and Kain (1990) added significant focus to the research by documenting, through small sample sized studies, the specific mechanics, motivations, and political-economic contexts in which deceptive cost estimates are produced. This contention that cost overruns are caused by deceptive practices challenged the dominant paradigm that cost overruns were a product of technical challenges and honest mistakes. Yet this social science research was conducted and published outside of the main engineering and project management venues, and the two discourses rarely intermixed either in written communications or at scholarly conferences.

Therefore at the turn of the 21st century, the literature on megaproject cost overruns suffered from two key anomalies, as Kuhn (2012) called them, which were potential sources of a breakdown in the dominant paradigm. First, challenges collecting data on the performance of a large sample of projects created methodological limitations that made it difficult to conclude with statistical significance whether cost overruns on megaprojects are in fact a systemic problem, or the product of selective memory and a biased sample (Skaburskis and Teitz, 2003, 430; Siemiatycki, 2009; Dantata et al., 2006). Within this void of large sample size research, conflicting findings abounded. Relatively small sample sized studies by Merewitz (1973), Pickrell (1992) and Bacon and Besant-Jones (1998) documented a prevalent pattern of cost overruns on megaprojects. While as late as 1999 Nijkamp and Ubbels argued based on their small sample size study of road projects in the Netherlands and Finland that “in general cost estimates tend to be rather reliable.” The need for statistical clarification about the frequency and magnitude of the cost overrun problem on megaprojects was increasingly pressing, especially as it pertains to variations by project geography, asset type and date of the project.

Second, it had been difficult for scholars to collect much of the primary information that would be required to prove the causes of megaproject cost overruns for a large sample of projects, and in particular whether they are explained by Error or Lie?
includes access to the various original design plans and cost estimates as the project evolves over time; documents enumerating change orders; detailed breakdowns of the contractor bid prices; internal staff and interoffice communications between project planners and contractors, consultants and politicians; in camera political and planning meetings; and on-the-record interviews with public and private sector practitioners involved in planning and delivering the project. In the absence of this information being available for careful study on a large sample of projects, findings that deception on the part of project promoters and planners is a significant cause of cost overruns could be largely dismissed as anecdotal.

2.2. Novelty of Error or Lie?

The academic novelty of Error or Lie? is that in one paper it addresses two key outstanding questions in the scholarship on cost overruns: how big is the problem and what are the underlying causes. While answering these questions is not in and of itself unique, the key scholarly contribution of Errors or Lie? is that Flyvbjerg et al. (2002) spent four years compiling the largest dataset of its kind on estimated and actual megaproject construction costs. Specifically, their dataset included a portfolio of 258 transportation megaprojects with a capital value of $90 billion, with project construction costs ranging from $1.5 million to $8.5 billion. The projects were located in 20 countries in both the global North and South. The dataset covered multiple project types, including highways, bridges, tunnels, urban rail, conventional interurban rail and high-speed rail. The projects were built between 1927 and 1998, providing a historical framework that would make it possible to examine whether project budgeting has become more accurate over time. Importantly, the researchers applied a standardized definition of the two points at which data was collected for all projects: the estimated cost of the project at the time of decision to build and the actual completed construction cost. The compilation of such a robust dataset permitted statistical assessments of the patterns and causes of cost overruns that had not been possible in previous research.

The research findings presented in Error or Lie? statistically confirmed the results from previous studies, and provided eye-catching figures about the frequency and magnitude of the problem with megaproject cost overruns worldwide. In particular, the results showed the following headline results:

• Construction costs are underestimated in 90% of projects in the sample. The average cost overrun is 28% above the estimated project cost. Cost underestimation is far more frequent than cost overestimation, and the size of the underestimates are far larger than when costs are overestimated.
• Project type has a statistically significant impact on the size of cost overruns. All project types systematically experience cost overruns, but the largest cost overruns were experienced by rail projects (44.7%), followed by fixed link bridges and tunnels (33.8%) and then roads (20.4%).
• The size of cost overruns vary by geographic location of the project. In particular, cost escalations are significantly larger for projects conducted in the Global South as compared to the North.
• Cost overruns have challenged megaproject delivery consistently over the past 70 years. Project cost estimates have not become more accurate over time.

Taking their research a step further and into a territory that no other scholars had previously tread, Flyvbjerg et al. (2002) applied their empirical data to statistically test whether cost overruns are caused by honest error or strategic misrepresentations and deception. Here their findings contradict the generally accepted paradigm for explaining forecasting errors in the project management literature: that overruns are caused by honest errors. Flyvbjerg and his colleagues dismiss the common argument made in the project management literature that cost overruns are caused by technical challenges with forecasting an unpredictable future and delivering complex megaprojects. While acknowledging that these challenges are very real, they argue that if cost overruns were truly caused by simple mistakes and technical errors, then it would be expected that a roughly equal number of projects would go over budget and under budget. But that is not the case: cost overruns are far more likely and larger than projects completed below their budgeted cost. Moreover, despite the substantial body of research conducted and resources expended to improve forecasting and project delivery techniques over a number of decades, the frequency and size of cost overruns have not diminished over time.

A second type of explanation for the prevalence of cost overruns that Flyvbjerg et al. (2002) dismiss is that forecasters suffer from various forms of appraisal biases that lead to a systemic pattern of overly optimistic forecasts. According to this psychological explanation for cost overruns, during the project assessment and planning phase project promoters are overly optimistic about the outcomes of the project and the likelihood that everything will go right to deliver it within the lowest possible budget. Appraisal biases that result in subsequent cost escalations are thus a form of naivety and self-delusion that is not deliberate. Yet Flyvbjerg and his colleagues dismiss this explanation too as a leading explanation for cost underestimation, on the grounds that forecasters are professionals who would be expected to learn from past experiences and improve their forecasting methods to account for over optimism and appraisal biases over time. Yet this has not occurred, as the data presented in Error or Lie? shows that cost estimates have not become more accurate over the 70 years of projects studied.

Rather, the authors point squarely at various forms of economic and politically motivated dishonesties and willful misrepresentations as the best fit to explain the data on the patterns of cost overruns presented in the paper. “If we now define a lie in the conventional fashion as making a statement to deceive others” Flyvbjerg et al. write (2002, 288), “we see that deliberate cost underestimation is lying, and we arrive at one of the most basic explanations of lying, and of cost underestimation, that exists: Lying pays off”.

Economic motivations highlight how various stakeholders involved in project delivery have a rational self-interest in purposely presenting underestimated project costs during project planning. Key stakeholders such as engineers and construction...
firms make money when the projects they are involved in are approved and built. As such they may have an economic rationale to present their projects during the planning phase in the most favorable light, with the lowest costs and the greatest benefits, in order to increase the chances of approval. Likewise, as Pickrell (1992) observed, city officials applying for discretionary state or federal government grants that are applied on a competitive basis may be inclined to underestimate the costs of their preferred project. This would make their proposed project look better and improve its chance of being awarded the funding.

Similarly, political explanations point to power and profit as the cause of cost overruns. Politicians and project promoters announce projections based on the “All-Goes-According-to Plan Principle”, disregarding known risks that will likely add subsequent costs to the project as it proceeds. In other cases forecasters purposely adjust their cost estimate downward to maintain favor with the public officials that commissioned the study and want to give their preferred project the best chance of being approved. Flyvbjerg et al. (2002, 280) make clear that their article does not provide “final proof that lying is the main cause of cost underestimation” because their research did not involve a large number of forecasters completing surveys or interview that express consistent reporting of dishonesty in their forecasting. Nevertheless, the authors conclude, “[t]he use of deception and lying as tactics in power struggles aimed at getting projects started and at making a profit appear to best explain why costs are highly and systematically underestimated in transportation projects.”

2.3. Research designed for impact

In a cluttered research environment where thousands of articles on project management are published every year, what makes one paper stand out from the crowd? The case of Error or Lie? illustrates that classic texts are not simply discovered, they are actively manufactured. In the case of Error or Lie?, qualities of the article itself as well as dissemination strategies explicitly designed by the authors to maximize research impact explain how the article became a classic text in the study of megaproject management.

With regards to the qualities of the article itself, Gans (2009, 125) contends that paradigmatic research starts from studies that are “eye-opening: original, insightful, and attention-attracting empirical and theoretical research on topics useful and relevant to all parts of the general public.” Error or Lie? fits this description. The article effectively articulates why cost overruns on billion dollar megaprojects are a critical issue for policymakers and the public interest. In identifying lying and deception as the primary causes of cost overruns, the paper draws conclusions that are highly provocative and contradict the generally accepted technical and psychological explanations put forward by most scholars, practitioners and politicians. The conclusions are based on exceptionally high quality scholarship, which add weight to the contentious findings. The research reports on the largest sample size study of transportation megaprojects, and heading off any questions about the study methodology, the paper includes a two and a half page appendix that details the specific data collection and analysis approach. And right from the catchy title, the paper is written in a clear, unambiguous manner that is accessible to a wide audience. This differentiates the paper from many other articles from the engineering, project management and social science disciplines that are highly technical and packed full of jargon. In Error or Lie?, the authors confidently assert based on the statistical data that cost overruns are caused by lying and deception. Thus readers are not forced to struggle with interpreting the research results, but rather are left to engage with their validity and implications.

Beyond the qualities of the article itself, Flyvbjerg as the lead researcher on Error or Lie? undertook two key strategies to raise awareness about the groundbreaking findings of the research with scholars and practitioners. First, to amplify the scholarly impact of the research within the academy, Flyvbjerg extended the groundbreaking research reported in Error or Lie? into a full-blown “normal science” research agenda and publishing program. Since Error or Lie?, Flyvbjerg along with various coauthors published the findings of many more detailed studies of cost overrun patterns and causes in the transportation sector, broadened the focus of empirical work to include other project types, and proposed strategies to reduce the incidence of cost underestimation in megaprojects (See for example: Flyvbjerg et al., 2004; Flyvbjerg and Ansar, 2014; Flyvbjerg, 2006; Flyvbjerg and COWI, 2004).

Importantly as a step towards building a broad audience for the research, Flyvbjerg’s follow-up studies on cost overruns have been strategically published in high-ranking journals in a range of project management, business and social science venues (See for example: Flyvbjerg, 2005a, 2005b, 2009; Flyvbjerg and Budzier, 2011). In these articles, Flyvbjerg and his coauthors connect the issue of cost overruns to the key themes of interest to each disciplinary audience.  Flyvbjerg et al. (2003) further expanded the reach of the research findings in the accessibly written book Megaprojects and Risk: An Anatomy of Ambition. This broad academic dissemination strategy made Flyvbjerg the most recognized scholarly authority on the topic of megaproject management and cost overruns. And his extensive body of research was positioned as a type of crossover that spoke to scholars in the project management and engineering disciplines as well as social scientists — two fields that studied the same topic but rarely interacted.

Second, Flyvbjerg, Holm and Buhl undertook an explicit strategy to impact public debate and policy practice regarding megaproject planning with the research findings published in Error or Lie? As Flyvbjerg (2012, 170) explains, disseminating the findings through the mass media was critical to their approach. In liberal democracies, the mass media plays a dominant role in shaping public discourse, and therefore “Zero Public Exposure

2 Flyvbjerg’s articles often have provocative and memorable titles that immediately connect the topic of cost overruns to the disciplinary focus of the journal’s audience. This includes “Design by Deception” for the Harvard Design Review (Flyvbjerg, 2005a, 2005b), “Machiavellian Megaprojects” for the critical “Left-wing geography journal” Antipode (Flyvbjerg, 2005a, 2005b), “Survival of the unfittest” for the Oxford Review of Economic Policy, and “Why Your IT Project May Be Riskier Than You Think” for the Harvard Business Review (Flyvbjerg and Budzier, 2011).
Equals Zero Public Impact. As such the authors actively implemented a strategic international media campaign in order to raise awareness about the research results. This was intended to leverage the findings into the public and political consciousness so that decision-makers could not ignore them, even if they found the critical conclusions of the study to be disagreeable.

The basis for the success of this media campaign was that the research was newsworthy, complete with a tinge of conflict and controversy because the assertion that cost overruns are caused by deception contradicted the common explanation of bad luck provided by politicians, bureaucrats and corporate leaders (Flyvbjerg, 2012). This point of tension between the research findings and the claims of megaproject proponents made the story of great interest to the media and the public. To capture media interest, the authors wrote press releases, cultivated relationships with local journalists, and negotiated the global media release of the study through exclusive features in the New York Times and the Sunday Times. This coverage in high profile media venues attracted many other national and regional media outlets to pick up the story. Overall, Flyvbjerg (2012, 175) reflects that “[w]orking with media like this is what transforms the research from knowledge sitting in academic planning publications to knowledge that impacts practice.”

3. Impact of Error or Lie?

This section explores the impact of Error or Lie? within the academy and in professional practice, demonstrating how it fits the criteria for being a classic paradigmatic text. Kuhn (2012, p. 111) suggests “paradigm changes do cause scientists to see the world of their research-engagement differently...after a revolution scientists are responding to a different world.” As will be shown, in response to Error or Lie? and the efforts of the authors to achieve societal impact with their work, some parts of the world involved in studying and delivering megaprojects have changed more than others.

3.1. Shifting the academic paradigm?

The publication of Error or Lie? set off a tidal wave of academic interest in the study of megaproject management and cost overruns, initiating a new generation of highly specialized “normal science” within the field. Indeed, the paper has become a key example of what Kuhn (2012) calls “paradigmatic research.” Error or Lie? set a new methodological standard for conducting research on the prevalence of megaproject cost overruns, transforming a field that had previously been studied primarily through small sample sized studies, to a scholarly discipline where it is increasingly common to examine large datasets of projects to identify patterns and trends. It also came to define the theoretical terrain and research questions posed in subsequent studies.

In the years following the publication of the article there has been a burgeoning wave of empirical research exploring whether the pattern of systemic cost overruns observed by Flyvbjerg and his colleagues are replicable in other samples of infrastructure projects. Siemiatycki (2009) identifies more than 10 studies conducted by scholars (other than Flyvbjerg and his associates) and government auditors with sample sizes bigger than 50 projects, and some as large as 3000, that have sought to measure the frequency and magnitude of cost overruns on transportation projects. Every study confirmed Flyvbjerg et al. (2002) finding that megaproject costs are systemically biased towards underestimation. Similarly, large sample size studies conducted in other infrastructure sectors have all drawn the same conclusions that cost overruns are systemic on large infrastructure projects (Sovacool et al., 2014).

More broadly, the research published in Error or Lie? and Flyvbjerg’s subsequent articles have spurred intense focus in the scholarly literature about the causes of megaproject cost overruns, and in particular the salience of lying and deception as opposed to honest errors caused by technical challenges or optimism biases. As is a feature of paradigmatic research, the publication of Error or Lie? reset the basic theoretical terms of the debate about the causes and cures for cost overruns. The findings forced researchers coming from both the project management and social science disciplines to more explicitly consider political economic deceptions and optimism bias based delusions in their studies as possible explanations for cost escalations than had previously been the norm (see: Chevroulet et al., 2012; Love et al., 2012; Lind and Brunes, 2015; and Park and Papadopoulou, 2012).

Nevertheless, the dominant paradigm for explaining the causes of cost overruns has remained largely unchanged, especially in the engineering and project management disciplines. It is striking that since 2002 exceedingly few published studies outside of those authored by Flyvbjerg and his associates have identified purposeful deception as the main cause of megaproject cost overruns through empirical research (See Siemiatycki, 2009; Park and Papadopoulou, 2012; Barinov, 2007; and Koch, 2012). This holds equally for studies of the causes of cost overruns on megaprojects built in the Global North and South (see: Chevroulet et al., 2012; Baloyi and Bekker, 2011; and Kaliba et al., 2008).

On the contrary, numerous studies have explicitly refuted the salience of deception as a leading explanation for cost overruns (Love et al., 2014, 2012; Liu et al., 2010; Eliasson and Fosgerau, 2013). The key distinction with Error or Lie? is typically in the way that the analysis is focused. Most of the recent scholarly research on cost overruns tends to focus on the internal dynamics of megaproject planning and the delivery process itself, where strategic misrepresentation may in fact be limited or is difficult to uncover methodologically because key project documents are unavailable and practitioners could be unwilling to admit to any dishonesty in interviews. Conversely, in their research Flyvbjerg and his colleagues typically situate the internal processes of megaproject planning within a broader policy and political economic context of decision making, thereby highlighting key points where strategic misrepresentation and optimism biases can originate. In sum, while Error or Lie? has changed the theoretical terrain for explaining megaproject cost overruns, the weight of empirical evidence being produced continues to identify various forms of honest errors, such as appraisal or optimism biases and technical challenges, as the primary reasons for cost underestimation.
Finally, the publication of Error or Lie? has catalyzed an intensive research agenda focused on identifying applied strategies to reduce the prevalence of cost overruns on megaprojects. For instance, Flyvbjerg (2006, 2009) proposes a model to improve cost estimates known as “reference class forecasting.” In this approach, greater accuracy is achieved by taking an “outside view” towards the cost of a given project based on the performance of a similar reference class of projects. This method avoids the challenges of optimism biases and strategic misrepresentations that plague conventional forecasting techniques that take an inside perspective. Odeck et al. (2015) find that introducing a quality assurance program where all cost estimates were reviewed by an external advisor prior to receiving final approval reduced cost overruns on road projects in Norway. Siemiatycki (2010) shows that enhanced project monitoring, data reporting and information sharing can be used to support the introduction of procurement models that reward firms for good performance, and thus create incentives to deliver projects on time and on budget. And an extensive scholarly literature has examined whether the better allocation of risk, accountability and reward through public-private partnerships can cut down on the prevalence of cost overruns (Siemiatycki and Farooqi, 2012; Grimsey and Lewis, 2004; Hodge and Greve, 2010).

3.2. Impact on practice and public discourse

Outside of the academy, Error or Lie? is the rare case of an academic paper that has significantly changed the public deliberations and management practices on megaprojects. Indeed, the response to the publication of Error or Lie? was swift and significant. A most immediate response was that it sparked intense debate and rejoinders towards the authors. As Flyvbjerg (2012, 177) explains, “[t]he people and organizations who benefit from the practices you problematize are likely to bite back.” Many politicians, megaproject managers and industry stakeholders saw the research findings that cost overruns are systematic and caused by willful deception as an affront to their integrity and interests. In response, key industry stakeholders undertook a range of measures to challenge the research findings and blunt their public impact. Industry stakeholders published letters of response in the Journal of the American Planning Association refuting the interpretation of the findings in Error or Lie?⁵ Some industry stakeholders sought to discredit or downplay the research findings in the media. And Flyvbjerg (2013) reports that the American Planning Association, which owns the journal where Error or Lie was published, took active steps to impede the distribution of the study findings to the media, because they felt the research negatively depicted their membership of planners.

Despite the elevated level of critique towards the authors, the vigorous public response was also a sign that the research had struck a nerve and could be a catalyst for change in megaproject management practice. In fact, Flyvbjerg and his colleagues strategically used the increased awareness of their work as a lever towards developing a global role in informing the debates and delivery practices on megaprojects (Flyvbjerg, 2012). Since Error or Lie? was published, Flyvbjerg and his colleagues have engaged productively with professional associations and public agencies to reform the way that megaprojects are planned and delivered in a variety of countries. Flyvbjerg (2012) reports that the following changes in megaproject planning practice have occurred directly in response to the research first presented in Error or Lie? and subsequent methodological proposal for reference class forecasting to improve cost estimation:

- The United Kingdom, Denmark and Switzerland have made it mandatory for megaproject managers to use the research and methods developed by Flyvbjerg and his colleagues when planning large projects
- In the United States, South Africa, the Netherlands and Sweden, governments are using the research selectively to inform megaproject policy and procurement practices.
- The American Planning Association (2005) officially endorsed the use of reference class forecasting as a technique that should be followed to improve megaproject cost estimation.⁴

The public exposure that Error or Lie? attracted through the mass media also led the research to have indirect impacts on the public deliberations and practice of project delivery. With a high level of media reporting and public interest, cost overruns are increasingly coming to be seen as a political risk for megaproject planners and politicians. In this context the political and policy calculus of megaprojects appears to be starting to shift in some jurisdictions. The standard formula of strategically underestimating costs to get projects approved is slowly and unevenly giving way to a period where political gain can be had by taking substantial measures to avoid actual cost overruns, as well as the perception that project costs have escalated.

In countries such as Britain, Australia and Norway, government agencies responsible for megaproject planning have adopted strategies to improve forecasting accuracy, including Flyvbjerg’s reference class forecasting and mandatory independent peer reviews. These techniques are showing signs of improving the accuracy of infrastructure construction cost estimates, though they do not guarantee accuracy in all cases⁵ (see: Flyvbjerg, 2006; Odeck et al., 2015; Liu et al., 2010). In the United Kingdom, in particular, new institutions and planning policies have been developed by the Cabinet Office at the highest level of the national government to respond to a history of weak megaproject procurement. This includes the inauguration of the Major Project Leadership Academy to provide mandatory skills

⁴ In trying to explain why the APA endorsed reference class forecasting after expressing discomfort with the results of Error or Lie?, Flyvbjerg (2012, 176) explains that the association appeared to be more able to support the authors constructive solution oriented work than their critical problematization of the cost overrun issue.

⁵ In one high profile example, Flyvbjerg (2009, 356) reports that the Edinburgh tram project was the first to use the reference class forecasting method and an uplift factor was applied to arrive at a more accurate estimate. Yet once under construction, a significant additional cost overrun occurred, resulting in a reduction of the tramline scope (Koch, 2012).

³ Flyvbjerg, Holm and Buhl responded to each letter refuting the specific critiques of their research and reinforcing the accuracy of their original findings.
training to all government managers of megaprojects, and the launch of the Infrastructure and Projects Authority which provides an independent peer review of megaproject plans through delivery confidence assessments.

Finally, governments around the world have embraced the use of public-private partnerships as a strategy to eliminate cost overruns by transferring risks to the party that has the greatest incentive and ability to manage them. In this procurement model, significant “risk premiums” are paid like an insurance policy to private sector contractors to assume risk and ensure that projects are delivered on time and budget (see: Edwards et al., 2004; Blanc-Brude et al., 2009). Whether public-private partnerships provide value for money continues to be a topic of intense study, but they have proven politically popular in part because many more megaprojects are now announced as “on-budget” (Siemiatycki and Farooqi, 2012; Boardman and Vining, 2012; Hodge and Greve, 2010). This points to the need for “normal science” on cost overruns to evolve with the state of practice to examine both the relative size of cost overruns, and also how these relate to the cost per unit of delivering various types of infrastructure (see: Flyvbjerg et al., 2008).

4. Concluding remarks and lessons learned

As the above discussion illustrates, Error or Lie? has clearly reached the status of a classic text in the field of megaproject management. It is widely recognized by scholars and practitioners in the field as the definitive article on a major issue in project management: the patterns and explanations for cost underestimation. The impact of Error or Lie? and subsequent research by the authors and their associates has been far reaching. Within the academy, the article has spawned a burst of study on cost overruns, and is widely cited by scholars to frame “how things are done in the discipline” in terms of the theoretical terrain, types of research questions that are asked and methods that are used. In project management practice, the research has contributed to the introduction of new project management methods designed to improve the accuracy of cost estimation. And the research has contributed to shaping the public discourse on megaproject delivery, spurred by extensive coverage in the mass media internationally.

An important conclusion to be drawn from this case study is that the elevation of Error or Lie? to the status of a classic text did not happen by accident. This was not research based on the modest objective of incrementally advancing the science of project management. Flyvbjerg and his colleagues explicitly set out to undertake path-breaking research that identifies “tension points” where systems of power, replete with questionable practices and contestable knowledge, are vulnerable to change. This was research aimed at transforming megaproject management theory and practice (Flyvbjerg, 2012). The authors proceeded accordingly to realize this goal. The case study of Error or Lie? points to five key takeaway lessons about the ingredients and impacts of a classic text, all of which are consistent with the recipe outlined by Kuhn (2012).

First, novelty is not required to be revolutionary. Classic texts often build on existing ideas, while conceptualizing and studying them in new ways to transform how they are understood. Error or Lie? focused on the topic of megaproject cost overruns which had been studied for decades, but applied a new conceptual framework and methodology. This highlighted statistically how endemic cost overruns are on megaprojects, and pointed to the significance of strategic misrepresentation as a cause.

Second, effective communication is a key feature of classic texts. As Kuhn (2012) explains, the making of a classic text is about both the quality of the scholarship and the way it is communicated to and received by its audience. Material that is eye-catching and accessible to the largest possible audience (be it of specialists in the academic field or the general public) has the best chance of becoming a classic text, with impact within the academy and beyond (Gans, 2009). Error or Lie? covers a thought provoking topic, comes to a controversial conclusion that is unequivocally stated, is clearly written and based on solid research. These ingredients gave the article the best chance of becoming a classic text amongst scholars and project management practitioners.

Third, paradigm-shifting research depends on widespread awareness of the work amongst relevant scholars in the field. Without awareness, there can be no impact. In a crowded academic field, active dissemination strategies are now especially important for scholars to raise awareness of their research amongst a broad academic audience. Following the publication of Error or Lie? Flyvbjerg and his colleagues undertook an extensive dissemination strategy that was tailored for scholarly impact. They authored many subsequent journal articles that re-examined their original research findings through a lens that would be interesting to the disciplinary audience of each specific journal. In this way, the research became widely known and cited by scholars across a wide variety of disciplines.

Fourth, dissemination of research in the mass media is an effective technique to increase the impact of megaproject management research on practice. Coverage of research in the mass media attracts extensive public and practitioner exposure to the work. It also makes it harder for those in positions of power to ignore findings that may be uncomfortable or contradict their interests. As Flyvbjerg (2012) illustrates, following an active strategy to gain media attention, including the issuing of press releases and working with journalists to provide exclusive access to research findings, increases the impact of media coverage. Research that focuses on provocative topics with counterintuitive or potentially controversial findings are most likely to be newsworthy and of interest to reporters.

Fifth, expect pushback from the standard bearers of the established paradigm. Classic texts in megaproject management,

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6 The Major Projects Leadership Academy was created and delivered by Bent Flyvbjerg and his colleagues at the Said School of Business at Oxford University, in partnership with Deloitte and the UK Cabinet Office.

7 Kuhn’s groundbreaking book The Structures of Scientific Revolutions is a perfect example of the importance of clear and accessible writing on complex topics. The 171 page book popularized the esoteric field of history and philosophy of science, went on to sell over 1.4 million copies, and gave birth to the ubiquitous term “the paradigm shift.”

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when successfully disseminated, can have a profound impact in reshaping scholarly discourses, public deliberations and megaproject management practice. Yet classic texts are often based on revolutionary research that is positioned in opposition to an existing paradigm, be it in academia or the public domain.

Therefore, along the path to texts becoming classics in the field of megaproject management, scholars can expect a vigorous response from their academic colleagues that disagree with the findings, and interest groups in the public sphere that benefit from the existing order.

In sum, the lessons distilled from Error or Lie? highlight one pathway that can be followed to produce a classic text in the field of megaproject management. Of course, this recipe is not a guarantee for success; there can only be so many paradigm-shifting classics in any given discipline. Nevertheless, there is a benefit to more scholars following the effective communication and broad dissemination strategies applied by Flyvbjerg and his colleagues, whether conducting revolutionary research or normal science. They point to a combined set of approaches to produce scholarly research that is relevant, accessible, and can make a difference in the applied field of megaproject management.

Conflict of interest

There are no conflict of interest associated with this paper.

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