

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/347764604>

Moving Beyond the Planning Fallacy: The Emergence of a New Principle of Project Behavior

Article in IEEE Transactions on Engineering Management · December 2020

DOI: 10.1109/TEM.2020.3040526

CITATION

1

READS

266

3 authors, including:



Lavagnon A. Ika

University of Ottawa

66 PUBLICATIONS 1,524 CITATIONS

SEE PROFILE



Jeffrey K. Pinto

Pennsylvania State University

127 PUBLICATIONS 9,417 CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:



Normalization of Deviance [View project](#)



Gender bias [View project](#)

Moving Beyond the Planning Fallacy: The Emergence of a New Principle of Project Behavior

Lavagnon A. Ika , Peter E. D. Love, and Jeffrey K. Pinto 

Abstract—The question—what explains cost overruns and benefit shortfalls—remains an important conversation in project management. Two theoretical principles, the Planning Fallacy and the Hiding Hand, shed light on project behavior, that is how projects take different and complex out-turns. The Planning Fallacy denotes the tendency for forecasts of project schedules, costs, and benefits to be unrealistically close to best-case scenarios. The Hiding Hand, however, suggests that it is not always bad to overrate benefits and underrate costs and difficulties of the proposed projects as creativity may help succeed in unforeseen ways. This article focuses on the Planning Fallacy *versus* Hiding Hand or the Planning Fallacy debate. The bone of contention is whether the Planning Fallacy trumps the Hiding Hand and thus best explains project behavior and performance. We unravel the ontological, epistemological, theoretical, and methodological assumptions behind the debate. Then, considering these contrasting assumptions and the uncertainties and complexities that surround large-scale projects, we *complexify* the debate in line with the tradition of complexity thinking. In the face of the either/or framing that prevails, we propose a balanced theoretical approach that would accommodate both the Planning Fallacy and the Hiding Hand explanations of project behavior, to understand why projects experience cost overruns and benefit shortfalls. In so doing, we lay the foundations for the emergence of a new project behavior principle—*The Fifth Hand*. We conclude with a research agenda that highlights the key methodological challenges that need to be addressed to determine the presence of the Fifth Hand.

Index Terms—Benefit shortfalls, complexity, cost overruns, hiding hand, planning fallacy, project behavior.

I. INTRODUCTION

PROJECT-BASED-WORK is at flood tide as projects are being undertaken to levels previously unseen. Thus, there is a concomitant increase in scholarship. This is a testament to the sheer number of scholars from a variety of disciplines actively engaging and undertaking project management research from varying perspectives. Project management scholarship is, in essence, a conversation [33] often with “neighboring” fields of inquiry such as construction, strategy, organizational behavior,

human resources management, operations management, information systems, and innovation management [9], [26], [42], [45], [53].

Though enriching, this conversation with other fields of research may be challenging in light of the diversity of theories for the studies in, on, and around projects [17], [22]. Accordingly, there prevails a tendency for scholars to borrow hand-me-down theories from other disciplines [42], which, we contend, may not be able to *fully* deal with the uncertainties and complexities associated with getting the right projects right, particularly when they are of a large and/or complex nature [6], [9], [34], [36], [43], [45], [62]. Indeed, the shoehorning of these imported theories to project settings may create a false currency or prompt a debate based on misguided or misinterpreted assumptions. The upshot in this instance can be confusion, which can adversely impact decision-making and jeopardize the performance and practice of projects [57], [76].

Perhaps, the topic of conversation where the aforementioned challenges are acute concerns what explains cost overruns and benefit shortfalls. Prospect theory, for example, developed by the Nobel Laureate Daniel Kahneman with Amos Tversky [38], [71] is drawn upon by Flyvbjerg [15] to explain project performance using the Planning Fallacy principle. Under the banner of prospect theory, the Planning Fallacy emerges as a phenomenon whereby planners and managers display optimism bias during the framing and valuation phases of projects. The upshot is the tendency for forecasts of project times, costs, and benefits to be close to best-case scenarios [46]. This has been the case for a wide variety of projects such as the 2004 Greece Olympics, the Airbus A380 passenger aircraft [15], the Ciudad Real Airport in Spain and the Canadian Firearms Program [34], which all incurred cost overruns and benefit shortfalls. Consequently, planners and managers create a fertile environment in which projects—due to irrational or overoptimistic choices or unintentional or deliberate actions they take *a priori*—are bound to underperform.

Notwithstanding the contribution of the Planning Fallacy [15], the everlasting puzzle in project management research—what explains cost overruns and benefit shortfalls—remains a scholarly conversation “that has been stuck for more than 20 years” [27, p. 717]. Hence, the focus of this article is on the more recent yet enlightening debate over the significance of the Planning Fallacy [15], [16] [34], [49], [50], [51]. Remarkably, a leitmotiv that resonates throughout the literature is that project performance statistics are troubling, as planners and managers tend to overrate the benefits and underrate the times, costs,

Manuscript received July 1, 2020; revised October 13, 2020; accepted November 19, 2020. Review of this manuscript was arranged by Department Editor Y. H. Kwak. (Corresponding author: Jeffrey K. Pinto.)

Lavagnon A. Ika is with the Telfer School of Management, University of Ottawa, Ottawa, ON K1N 6N5, Canada (e-mail: ika@telfer.uottawa.ca).

Peter E. D. Love is with the School of Civil and Mechanical Engineering, Curtin University, Perth, WA 6845, Australia (e-mail: p.love@curtin.edu.au).

Jeffrey K. Pinto is with the Black School of Business, Penn State, Erie, PA 16563 USA (e-mail: jkp@psu.edu).

Digital Object Identifier 10.1109/TEM.2020.3040526

difficulties, and risks of their projects. Hirschman [30], however, considered this tendency to be good news in some instances, as planners and managers may also underrate their own creativity *ex-ante*, and once things take a wrong turn, they manage to get out of the shambles and “stumble into achievement” (p. 14). This is the case for projects such as the Danish Great Bell Toll Bridge, the German Karlsruhe-Bretten Light Rail Line [15], the Sydney Opera House in Australia and the US Hoosac Tunnel [34], which all experienced significant cost overruns and yet exceeded benefit expectations. Hence, the emergence of the Principle of the Hiding Hand [30] or the benevolent twin of the Planning Fallacy.

As a result of the work undertaken by Flyvbjerg and his colleagues on the causes of cost overruns [15], [17], we have witnessed an eye-opening conversation with the fields of psychology and economics and the extension of their behavioral theories such as optimism bias and/or strategic misrepresentation or the Planning Fallacy. The application of these theories to project settings has provoked a debate whereby the following holds.

- 1) Daniel Kahneman’s Planning Fallacy is pitted against Albert Hirschman’s Hiding Hand as the best theoretical explanation for project misperformance [15], [16], [34], [35], [49].
- 2) Bias (e.g., the Planning Fallacy) competes with error (e.g., scope changes, complexity, and uncertainty) as the root cause of project misperformance [16], [17], [48], [49], [50], [51].

Both conversations, while seemingly different, are part and parcel of what we call the Planning Fallacy debate. The bone of contention is notably whether the Planning Fallacy trumps the Hiding Hand or, put another way, whether bias trumps error [49]. In this article, however, we give pride of place to the first conversation as to whether the Planning Fallacy trumps the Hiding Hand. Complicating this peculiar debate has been a general unwillingness of scholars to seek a point of synthesis between these antagonistic positions. The academic debate has sponsored a rival camps approach, which has made it difficult for scholars to credit the veracity of other perspectives or propose a way forward that acknowledges the valid elements of alternative perspectives [48]. For example, according to Ika [34], the Hiding Hand should not be reduced to a mere ratio between benefit and cost performance and the all-important role that complexity, uncertainty, and creativity play in project management overlooked. Yet, the methodological approach taken by Flyvbjerg [15] espouses a narrow cost-benefit lens and discounts the complexity and uncertainty that prevail in the management of large-scale projects. In Flyvbjerg’s [15] view, human bias is the overarching cause of cost overruns and benefit shortfalls.

Drawing on insights from the fields of psychology and economics, we take project behavior to be the study of “how projects work” [16] or “behave” or take different and complex “out-turns” [75].¹ Specifically, project behavior consists of

“explaining and anticipating successes and failures, systematic veerings from preassigned paths, propensities toward specific difficulties, as well as opportunities for special payoffs” [30, p. 4]. Error refers to the use of imperfect techniques, making honest forecasting and execution mistakes, lacking experience, and having inadequate data [17]. Bias, however, means a systematic deviation between the (average) judgment of a person or a group and a true value or norm, or in most cases in the Planning Fallacy debate, a deviation from a statistical principle [25].

This article seeks to dissect, complexify, and further the Planning Fallacy debate and thus propose a new principle of project behavior. We begin by shedding light on the significance of the debate for project management theory and practice. Then, we unravel the ontological, epistemological, theoretical, and methodological assumptions that lie behind the Planning Fallacy debate in the next sections of this article. Moreover, in light of these contrasting assumptions and the complexities and uncertainties surrounding projects [52], [58], [62], we also attempt to complexify² the Planning Fallacy debate based on Tsoukas’s [70] work on theoretical sophistication as a way to better cope with organizational complexity. Inspired by the disagreements between Gerd Gigerenzer and Daniel Kahneman on whether human decision-making is success-prone [25] or error-prone [37], we suggest building on the insights from Gigerenzer’s work and his theoretical sophistication [70] to further the Planning Fallacy debate. In the face of the either/or framing of the Planning Fallacy debate, we propose a balanced theoretical approach that would accommodate *both* the Planning Fallacy and the Hiding Hand explanations of project behavior, to understand why projects experience cost overruns and benefit shortfalls. More concretely, we lay the ground for the emergence of a new principle of project behavior, which would better reflect the lived experience of managing large and/or complex projects. In so doing, we reconcile the twin principles of the Planning Fallacy and the Hiding Hand. This article concludes with an agenda highlighting pertinent research and methodological challenges that will confront us as we strive to create a robust theory of how projects work.

II. WHY DOES THE PLANNING FALLACY DEBATE MATTER?

A cursory reading of the Planning Fallacy debate would oppose upbeat [32] and downbeat [31] observers about project performance [49]. At a time when there are calls for insightful

not how individuals, work groups or teams within the peculiar organizational contexts that are projects behave. Williams [75], an influential project complexity scholar, discusses the concept in light of cost overruns and in a true systemic modeling tradition, where projects are deemed complex systems that can behave in complex ways and take complex out-turns. Accordingly, project behavior is a “complex,” “counterintuitive,” and systemic phenomenon, which stems from “systemic interrelated sets of causal factors rather than tracing effects to single causes” (p. 499). We concur with this stance but turn to Hirschman’s [30] view of project behavior. After all, he is an early systems thinker and behavioral theorist in project management and, more importantly, the author of the Hiding Hand principle [35].

²In true spirit of complexity thinking, it is customary to distinguish between contrasting strategies for dealing with complexity such as complexity reduction *versus* complexity absorption [5], restricted complexity *versus* generalized complexity [54], or simplifying *versus* complexifying complexity [70]. In this article, however, we focus on Tsoukas’s [70] view on complexification of complexity.

¹Oftentimes scholars refer to the concept of project behavior but seldom do they define it. Here, we use the concept in the system behavior, not organizational behavior, sense. Thus, our focus is on how project systems as a whole behave,

theories [55] and thought-provoking academic conversations in the field of project management [22], this characterization is enough to convey the importance of the debate for researchers and practitioners alike [49]. Suffice it to say, a recurring and critical theme in project management theory and practice has been to address the continued difference between its idealized principles and the harder truths underlying its track record in numerous industries. Research in information technology projects, for example, offers dismal reading: one out of six has an average cost overrun of 200% [14]. Researchers for the *Chaos Reports*, studying some 50 000 projects worldwide, report that the average success rate for “business-critical” application development projects is 29%. Their statistics have remained remarkably steady since 1994 [12]. The nature of this challenge is critical as project-based work, as we noted, continues to fuel economic development, both in developed and developing countries. We are, therefore, at the juncture of a critical debate on the directions for project management theory and practice, at a time when its use continues to grow apace.

From a practical viewpoint, the approach of planning one’s work and then working one’s plan that often holds sway in traditional practice may fall short for large and/or complex projects characterized by high levels of novelty, complexity, and uncertainty and a considerable need for creativity, experimentation, and iteration during their execution [9], [34], [45], [62]. This is the case of radical innovation projects [45], which in contrast to those of an incremental nature such as small product changes [36] or “routine execution projects” [43] delivered in low technology or market uncertainty settings, are not well handled by traditional risk management approaches [75]. Such projects are likely to require managing according to their uncertainty profile [10], [28], dealing with unwelcome surprises [6], [7] and, above all, managing in a flexible and adaptive way [36], [62]. In this instance, the Hiding Hand offers a compelling alternative to the Planning Fallacy, owing to the kind of entrepreneurialism characterized by risk-taking and creative problem-solving behavior that these projects often require. Conversely, the Planning Fallacy may prevail when promoters engage in profiteering and corruption as they maneuver to take advantage of information asymmetries and other market and governance failures. Consequently, the Hiding Hand and the Planning Fallacy may explain project behavior in different circumstances [2], [3].

While the Hiding Hand brings to the fore creative problem-solving behavior during project execution [45], the (intentional) Planning Fallacy is a step further to the notion of a willful ignorance or the suppression by promoters of the negative aspects of projects while accentuating the positive [58]. The Planning Fallacy, whereby project planners and managers tend to overpromise and under-deliver, is notably the result of a combination of an awareness of fuller knowledge and willful underestimation of project complexity and thus includes the manipulation of cost and benefit estimates [2], [3]. Noteworthy, the Hiding Hand and Planning Fallacy are not merely focused on the project planning phase. Quite the contrary, they both concern the upstream, midstream, and downstream of projects [45]. Indeed, the Hiding Hand is characterized by cost overruns

and benefit *overruns* and the Planning Fallacy by cost overruns and benefit *underruns* [34]. Neither the Hiding Hand nor the Planning Fallacy or any other principle for that matter can alone account for underperformance in large-scale projects [11].

Furthermore, the Planning Fallacy debate is significant as it addresses whether ignorance is good or bad for projects and whether human bias trumps competing explanations of cost overruns such as scope changes, complexity, and uncertainty [49]. The debate may help planners and managers understand the ignorance that may have set a project in motion when it should not have been undertaken [15]. Alternatively, they may appreciate how ignorance can beneficially hide difficulties and eventually bring about unexpected success [34]. The debate is also consequential for how best to avoid cost overruns and benefit shortfalls by ensuring the accountability of decision-makers or applying best practices in project management [18], [48]. Last but not least, from a theoretical standpoint, the Planning Fallacy debate matters in that the project management field lacks a theory of project behavior to better understand how projects take complex out-turns and, in particular, the circumstances under which the Planning Fallacy and the Hiding Hand work [3]. In what follows, we turn our attention to the content of the Planning Fallacy debate and position the protagonists at its forefront.

III. WHAT IS IN THE PLANNING FALLACY DEBATE?

The Planning Fallacy debate [15], [34] centers around two contrasting positions [41]. Let us first consider their underlying theoretical and methodological assumptions.

A. *Planning Fallacy Debate: Theoretical and Methodological Background*

As noted earlier, the Planning Fallacy debate is theoretically articulated around the Planning Fallacy and the Hiding Hand principles [30], [37] and methodologically on an (economic) cost-benefit lens [15] in contrast to a project management lens [34]. Here, we solely focus on the latter two contributions as they are the only ones that have empirically provided insights into whether or not the Planning Fallacy outweighs the Hiding Hand.

1) *Planning Fallacy Trumps the Hiding Hand Position*: In an article published in the *Project Management Journal*, Flyvbjerg [14] lamented a “break-fix” model of megaprojects where it is first necessary that they reach a break point before planners and managers attempt to fix the issues that confront them in a desperate move to win some sort of success. This tendency of weak upstream planning and poor downstream management, he claims, underlies his so-called iron law of megaprojects: that is projects run over budget, over and over again.

Along with the megaproject paradox where projects tend to fail yet remain sought after, the break-fix model leads to a preference for those that look economically and socially viable on paper. In this process of gaming the system or presenting the project based on best case or even fraudulent information, Flyvbjerg [14], argues that the overarching rule for their selection is often survival of the unfittest, a phenomenon that is explained by

TABLE I
PLANNING FALLACY OUTWEIGHS THE HIDING HAND

Project Type	Cost Overrun		Benefit Overrun		p^*
	N	Average cost overrun (A/E)	N	Average benefit overrun	
Dams	243	1.96	84	0.89	<0.0001
BRT †	6	1.41	4	0.42	0.007
Rail	264	1.40	74	0.66	<0.0001
Tunnels	48	1.36	23	0.81	0.015
Power plants	100	1.36	23	0.94	0.0003
Buildings	24	1.36	20	0.99	0.01
Bridges	49	1.32	26	0.96	<0.0001
Roads	869	1.24	532	0.96	<0.0001
Total	1603	1.39/1.43‡	786	0.9/0.83‡	<0.0001

*The p -value of the test with the null hypothesis that benefit overrun is actually larger than cost overrun, using Mann–Whitney test (smaller p -values are better).

†Bus rapid transit.

‡Weighted and unweighted average, respectively.

Adapted from Flyvbjerg [15, p. 182].

ignorance, power imbalances, and psychology. Thus, he asserts that the Planning Fallacy outweighs the Hiding Hand.

“The iron law of megaprojects, . . . , trumps Hirschman’s Hiding Hand at a high level of statistical significance, and we know why. The Hiding Hand is itself an example of optimism and does therefore not capture the reality of megaproject management. For such capture and true explanatory power, we must turn to theories of optimism bias, the planning fallacy, strategic misrepresentation, and principal-agent behavior” [14, p. 14].

At best, this claim that the Planning Fallacy is being played out in projects calls for further investigation considering the inherent flaws in the supporting data [48]. If, however, we are to accept Flyvbjerg’s [14] view, then the corollary is that the Planning Fallacy and the Hiding Hand become two competing theoretical principles of project behavior [35]. The Planning Fallacy rests on two hypotheses. Simply put, the delusion hypothesis relates to optimism bias or the belief that decision-makers are less likely to face risks, difficulties and failures than statistical reality warrants; hence, the *honest* Planning Fallacy [8]. The deception hypothesis, however, relates to strategic misrepresentation, which suggests that decision-makers intentionally decide to undertake projects based on deliberately manipulated cost and benefit estimates [15], [17], leading to the *intentional* Planning Fallacy [8].

Flyvbjerg [14] understands that statistical evidence outperforms that of an anecdotal nature. Thus, to further his case for the Planning Fallacy principle, Flyvbjerg [15] undertook a statistical test of the Hiding Hand with a larger sample, a database of

2062 projects, of which 327 had data for both cost and benefit performance. In his conclusions, Flyvbjerg [15] summarizes Hirschman’s Hiding Hand as being a “disastrous” explanation of optimistic business cases and a “fallacy of beneficial ignorance” as it sets in motion projects that should not have been undertaken (p. 176).

From a methodological viewpoint, Flyvbjerg [15] takes an economic view, focuses on decision-making, uses a cost-benefit lens, and conjectures that if the Hiding Hand were at work, then on average, benefit shortfalls would exceed cost overruns. These are considered to be ratios of actuals over estimates at the time of the decision to build (final business case) in real terms (pp. 182–187). In Flyvbjerg’s [15] paper, cost-benefit ratios are calculated in absence of full life-cycle costs and benefits, and based on actual costs that are assessed as outturn construction costs and actual benefits as first-year benefits. As the Hiding Hand fails to fit Flyvbjerg’s [15] data, as presented in Table I, he observes, “on average not only is benefit overrun not larger than cost overrun, as the Hiding Hand says it would be, but there is no benefit overrun at all. Instead, we find the opposite, namely a benefit shortfall (benefit overrun < 1)” (p. 182). Flyvbjerg’s [15] statistical test shows that the Planning Fallacy outweighs the Hiding Hand by a factor of four to one and reveals that it occurs in 80% of the projects.

In sum, Flyvbjerg [15] rejects explanations involving the Hiding Hand and concludes that the average project experiences a “double whammy” of significant cost overruns and benefit shortfalls. In so doing, he argues that the Planning Fallacy is

TABLE II
PLANNING FALLACY DOES NOT OUTWEIGH THE HIDING HAND

Project management failure but project success or the Hiding Hand	Project management success but project failure or “The Operation was a success but the patient died”
Descriptive statistics:	Descriptive statistics:
Number of cases: 21 out of 161 in total or 13%	Number of cases: 2 out of 161 in total or 1.2%
<i>Project management performance:</i> 3.33 ± 0.42 Average: 3.33 Standard deviation: 0.42	<i>Project management performance:</i> 4.00 ± 0.00 Average: 4.00 Standard deviation: 0.00
<i>Project performance:</i> 5.26 ± 0.59 Average: 5.26 Standard deviation: 0.59	<i>Project performance:</i> 2.62 ± 0.88 Average: 2.62 Standard deviation: 0.88
All-around success or the Holy Grail: project management success and project success	Outright failure or the Planning Fallacy: project management failure and project failure
Descriptive statistics:	Descriptive statistics:
<i>Number of cases:</i> 133 out of 161 in total or 82.6%	<i>Number of cases:</i> 5 out of 161 in total or 3.1%
<i>Project management performance:</i> 5.51 ± 0.90 Average: 5.51 Standard deviation: 0.90	<i>Project management performance:</i> 2.00 ± 0.62 Average: 2.00 Standard deviation: 0.62
<i>Project performance:</i> 6.04 ± 0.84 Average: 6.04 Standard deviation: 0.84	<i>Project performance:</i> 2.05 ± 0.69 Average: 2.05 Standard deviation: 0.69

Adapted from Ika [34, p. 378].

the best theory to explain how projects typically work [16]. To be sure, Flyvbjerg’s [15] critique of Hirschman’s Hiding Hand has generated a reaction not only regarding his methodological approach but also his claims. For example, Anheier [2] notes that by dwelling on the Planning Fallacy, Flyvbjerg’s [15] work demonstrates an excessively narrow focus and does not address the critical issues of complexity and uncertainty in project planning, a point we will revisit later in this article. Room [60] echoes the narrowness criticism, arguing that in his attempt to reject the Hiding Hand, Flyvbjerg [15] does not capture the interconnections that exist between and within projects and their wider social, economic, and political impacts. Lepenies [44] further warns of the danger in terms of understanding when researchers like Flyvbjerg judge the contribution of qualitative scholarship like Hirschman’s using quantitative analysis with large samples.

2) *Planning Fallacy Does Not Trump the Hiding Hand Position*: Theoretically, the Hiding Hand relies on two pillars. The “pseudoimitation” pillar, which is akin to a one-size-fits-all approach to project management, suggests “nothing but a straightforward application of a well-known technique that has been successfully used elsewhere” [30, p.21]. The “pseudocomprehensive program” pillar rather considers the project as part of a strategy, not a piecemeal initiative. However, it falls foul to the illusion that projects are unsuccessful due to “the failure to follow the experts’ instructions rather than on the shortcomings of their advice” [30, p. 23].

Dimly aware of Hirschman’s [30] battle against cost-benefit analysis, Ika [34] argues there are three fundamental flaws in Flyvbjerg’s [15] refutation of the Hiding Hand: 1) a logical and rhetorical flaw or a strawman fallacy in that a weaker version of the Hiding Hand argument without key notions of difficulties, problem-solving abilities, and creativity was discredited; 2) an empirical shortcoming in that Flyvbjerg [15] considers the type of project—infrastructure—where the Hiding Hand is least likely to work due to the prevailing approach of planning one’s work and working one’s plan, as noted earlier; and 3) a methodological error or the failure to consider the full life-cycle costs and benefits and unintended project consequences so fundamental for a valid appraisal of the Hiding Hand. Ika [34] thus takes issue with the narrow cost-benefit lens used by Flyvbjerg [15] to refute the Hiding Hand.

As a consequence, from a methodological standpoint, Ika [34] adopts instead a project management lens and an *ex-post* performance evaluation focus, and proposes a more nuanced framework to assess project performance. Table II provides a summary of Ika’s [34] findings. Ika [34] assumes that the Hiding Hand works when we underrate difficulties, problem-solving abilities, and sometimes still succeed albeit unexpectedly. In testing these assumptions, Ika [34] demonstrates that the Hiding Hand explanation fits with projects that, although *successful* in that they delivered benefits to their client, would be considered project *management* failures by standard metrics of time and/or budget adherence.

TABLE III
UNDERLYING ASSUMPTIONS OF THE PLANNING FALLACY DEBATE

Dimensions	The Planning Fallacy trumps the Hiding Hand [15]	The Planning Fallacy does not trump the Hiding Hand [34]
<i>Ontology</i>		
Notion of a project	A deliberate leap into a planned future: It's all about the plan. Success and failure are black and white notions	A process of pursuit, experimentation, discovery: It's all about complexities. Success and failure are inextricably linked
Fundamentally, the cause of a cost overrun or benefit shortfall is:	(Human) bias	Bias and error
<i>Theory</i>	Kahneman's Planning Fallacy	Hirschman's Hiding Hand
<i>Epistemology</i>	Knowing is all (positivism): Bring the project back to plan and thus back on track in the face of deviations	Learning is all (possibilism): Throw in judgment, be ready to veer from the plan in the face of complexity and learn from experience
<i>Paradigm</i>	Governance (decision-makers' accountability)	Project management
<i>Methodology</i>	Cost-benefit lens	Project management lens
Measurement of cost overruns: definition	Actual cost minus estimated cost, with cost measured in the local currency, constant price, and against a consistent baseline; in absolute or relative terms.	Actual cost minus estimated cost
Measurement of cost overruns: baseline	The budget at the time of the decision to build	Not specified
<i>Research ultimate goal</i>	To understand whether decision-makers make well-informed decisions	To understand whether the project management process works

Note: Based on Kreiner [41] and Love *et al.* [51].

Contrastingly, the Planning Fallacy explanation is more compelling when times, costs, difficulties, creativity, and benefits are close to best-case scenarios. Thus, the Planning Fallacy falls within the category of project management *and* project failures where not only time and/or cost overruns but also benefit shortfalls prevail. Acknowledging the importance of reproducibility of research and drawing, like Hirschman [30], on 161 World-Bank funded projects of varying types, Ika [34] attempted to replicate Flyvbjerg's [12] findings while applying this hypothesis: "If Flyvbjerg is correct, then the Hiding Hand would typically be less empirically common than the Planning Fallacy" (p. 378).

Overall, Ika [34] concluded that the Hiding Hand outweighs the Planning Fallacy by a factor of four to one; the opposite of Flyvbjerg's [15] results. Like Hirschman [30], Ika [34] claims that ignorance can be good and eventually lead to unexpected project success and that Flyvbjerg's statistical analysis does not disprove the Hiding Hand (p. 371). Moreover, Ika [34] noted that the cost-benefit lens used by Flyvbjerg [15] is flawed and does not do justice to the Hiding Hand as the focus is on the upstream and downstream aspects of projects with no consideration being given to the messy and complex processes that go on in between, leading Ika [34] to suggest that Flyvbjerg [15] had treated the function of project management as a black box [34, p. 380].

Nevertheless, whether or not the principles of the Planning Fallacy and the Hiding Hand can be tested against data and evidence remains an open call [49], [67]. As Kreiner [41] suggests, the protagonists of the Planning Fallacy debate espouse two underlying but conflicting positions, the understanding of which settles how we judge the data and where we look for evidence. A case in point, if the Planning Fallacy trumps the Hiding Hand, then bias trumps error [49] and scholars cannot afford to ignore these *a priori* convictions. Consequently, there is a need to further examine the foundations that lay beneath the Planning Fallacy debate.

B. Planning Fallacy Debate: Ontological and Epistemological Background

We submit that, *inter alia*, a further source of disagreement in the Planning Fallacy debate rests with the taken-for-granted yet underlying and crucial ontological and epistemological positions espoused by the protagonists [15], [34], [41], [47], [51] (see Table III). Indeed, the root assumptions of the debate about ontology (what is out there to know) and epistemology (how we can know about it) impact the way the protagonists conceive reality and view knowledge (e.g., what is "true" or "false") [20], [65]. While there are different ways of

unraveling the ontological and epistemological positions behind the Planning Fallacy debate, we now focus on the contributions of Kreiner [41].

From an ontological point of view, the Planning Fallacy debate assumes conflicting views as to what constitutes a project [41]. Markedly, the Planning Fallacy proffers a narrow view of projects as deliberate leaps into a planned future. Hence, planners and managers may objectively establish their firm success criteria upfront in a plan and consider project performance as being “causally insulated” from the project management process. Instead, the Hiding Hand proffers a broader view of projects as processes of pursuit, experimentation, and discovery. Thus, owing to a consequential agency and unforeseen resourcefulness in the face of uncertainty and complexity, what is seen as a project *management* failure (e.g., cost overrun) may become a project success (e.g., benefit overrun).

As Kreiner [41] argues:

“If, by axiom, we treat the right forecasts as the way to success, there is nothing much we can learn except for more ways that a project can fail. However, following Hirschman, we might think of success criteria as partly endogenously established, thus functioning as a premise for and as an outcome of the project process” (p. 406).

While the Planning Fallacy principle rests on the fundamental conviction that the root cause of a cost overrun or benefit shortfall is bias [15], the Hiding Hand proffers that it is both bias and error [34]. Indeed, as planners and managers tend to be optimistically biased under both principles, a key difference remains that the Hiding Hand relies on a “creative error,” leading them to underestimate their sheer creativity only to stumble into success in the face of unexpected challenges [30, p. 16].

Equally, from an epistemological standpoint, the twin principles of the Planning Fallacy and the Hiding Hand appear to hold contrasting views when it comes to the task of project management and the role of agency in “successfulness.” The former proffers an ideal of knowing and building a body of knowledge as the destination and the latter, learning and being open to new ways of learning as the journey [41]. As such, the Planning Fallacy cherishes the idea of purposive human action and thus assumes that, collectively, we know how to deliver projects successfully. So, if we fail it is because we have not applied, properly or at all, the *best practices* inherent within a body of knowledge. The task of the management process is hence equated to being “inconsequential” for project performance as we need to adhere to the plan. After all, as planners and managers cannot collectively plead they do not know how to plan and manage projects, when projects fail, they are seen as planning or governance failures [15]. This leads Kreiner [41] to suggest that “the poor track record of projects is no reason to renounce the ideal. The challenge is to bring practice close to the ideal, not vice versa” (p. 405).

Contrastingly, the Hiding Hand assumes we should not presume we already know what success is and how to measure it. Moreover, we cannot know in advance what is lying in store for us in projects due to their inherent complexities and uncertainties. Thus, the task of project management is to escape the straitjacket of the established bodies of knowledge and look for

alternative paths down the road, search for opportunities at every corner of its “long voyage of discovery” [30, p. 35], exercise practical judgment and improvise in light of the unforeseen circumstances, and learn from experience so as to eventually stumble into success. Hirschman [32] calls this search for the “unique rather than the general, the unexpected rather than the expected and the possible rather than the probable” *possibilism* [44]. As Kreiner [41] claims, “project management is the never-ending task of exercising the right agency, attending wisely to what is happening, and of drawing on accumulated experience in a casuistic manner” (p. 406).

In sum, the pillars supporting the Planning Fallacy and the Hiding Hand principles appear to be conflicting. However, as we noted earlier, when the two antagonistic positions assume the veracity of their stance without considering synthetic alternatives, we run the risk of framing problems incorrectly and obtaining results that merely seek confirmation rather than clarity or validity. Like Kreiner [41], we contend there is room to reconcile these “incommensurable” though “supplementary” positions (p. 406) so as to advance the Planning Fallacy debate. Below, we complexify the debate and outline a balanced theoretical explanation to account for how projects work.

IV. FINDING SPACE FOR BOTH THE PLANNING FALLACY AND THE HIDING HAND

In the face of a theoretical deadlock existing between the characteristics of the Planning Fallacy and the Hiding Hand, we contend that there is a need to reconcile the twin principles of project behavior, but in order to do so, the first step is to complexify the debate.

A. Do Not Simplify, Complexify: From a Disjunctive to a Conjunctive Style of Thinking

Large-scale projects are often confronted with complexities and uncertainties [7], [52], [62]. Thus, following Tsoukas’s [70] call to complexify complexity in both theory and practice, we complexify the underpinning of the Planning Fallacy debate. In this article, we have chosen to focus on Tsoukas’s [70] work, an organization theory view, as it aligns with Ashby’s law of requisite variety (“only variety can absorb variety”) [4, p. 207], Weick’s position that “it takes richness to grasp richness” [74, p. 16], and Morin’s [43] recommendation to shift from the paradigm of simplification to that of complexification. Put differently, Tsoukas [70] is aligned with the tradition of complexity thinkers, which suggests that complex management challenges require complex ways of thinking, a stance that we concur within our argumentation. More specifically, according to Tsoukas [70], following the cybernetic work of von Foerster [72], projects should not be considered as trivial machines or “systems whose outputs and inputs are connected with a predetermined rule” [70, p. 139] but instead as nontrivial machines, which “keep changing their rule of transformation” [70, p. 140].

This leads us to suggest that Tsoukas’s [70] view is especially instructive as it views project management as a practical, not a mere theoretical, discipline that requires “complex types of inquiry” for a complex object of study (p. 138). Accordingly,

Tsoukas's [70] view calls for scholars to move from a disjunctive and trivial machine to a conjunctive and nontrivial machine style of thinking, which builds on an open world ontology, a performative epistemology, and a poetic praxeology (p. 132). An open world ontology conveys the idea that the real project complexity world is always in a process of becoming and thus under a number of interrelated and changing influences that scholars must not allow themselves to disregard. A performative epistemology draws attention away from complexity as a *thing* to theorizing it as a *process*. In doing so, it highlights the influence of scholars as they create complexity knowledge and construes knowing as action. A poetic praxeology views the practitioner as a purposeful, active, and reflexive "nontrivial agent who, while inevitably shaped by the discursive practices he/she is thrown into, he/she necessarily shapes them back by taking a stand on his/her experience through undertaking purposive action that is relatively opaque in its consequences, variably clear in its motives and desires, and contextually situated" [70, p. 148].

A case in point, the Planning Fallacy debate falls prey to disjunctive thinking as it divides the project domain, sets apart the scholar and the project under consideration, and overlooks the complexity of that world, including context, values, and time [70]. The upshot is that the debate has been framed in either-or choices between the Planning Fallacy and the Hiding Hand or between bias and error, notwithstanding Flyvbjerg *et al.*'s [18] assertion that there is no dichotomy and therefore delusion and deception and bias and error are not black and white arguments (p. 185). Maintaining this dichotomy, we submit, is unlikely to lead to advances in theory and may actually act as a thought-stopper [29], [56]. As a result, we note a tendency for protagonists on both sides of the debate to "acknowledge the complexity of the world but deny it in [their] theorizing" only to fall foul of the risk of oversimplifying their theories and having practitioners question them as they appear detached from reality [70, p. 135].

For example, Flyvbjerg *et al.* [18] acknowledge the complexity of cost overruns as they state that "it is not always clear how cost overrun is defined, why it happens, and how to best avoid it, which has led to misperceptions about the concept with policy-makers, planners, investors, academic, and the public" (p.175). Still, as the cost overrun problem centers around human bias, according to Flyvbjerg *et al.* [18], their solution is to *oversimplify* complexity and apply Reference Class Forecasting (RCF), which they admit is "a simplification, like any forecast, will be" but one that "has been documented to produce better estimates on average than any other simplification" (p. 185). Notably, RCF is supposed to accommodate the risk of optimism bias and strategic misrepresentation being present when an estimate is formulated.

However, Flyvbjerg *et al.* [17] and Flyvbjerg [15] have never examined the processes associated with formulating a project's cost estimates. As a result, the accuracy of RCF as a risk management technique, especially in the face of complexity, remains questionable [49], [69]. The disjunctive simplification of complexity does not help the Planning Fallacy debate. While we are not against simplicity *per se*, we are "against mistaking superficial simplicity for simplicity that is profound" [74,

p. 662].³ Certainly, the question—what explains cost overruns and benefit shortfalls—may lie at a previously unexplored nexus between the Planning Fallacy and the Hiding Hand. Indeed, the Planning Fallacy (Malevolent Hand) and the Hiding Hand (Benevolent Hand) have two other siblings, which have not been addressed in the project management literature: the 1) *Protecting Hand* and 2) *Passive Hand*.

As Anheier [2], [3] suggests, the aforementioned Four Hands or theoretical principles of behavior individually and collectively hold a particular relationship to complexity and uncertainty. Indeed, they emerge as a result of the relationship that exists between the state of knowledge at the start of the project (ignorance or awareness) and the estimation of complexity (underestimation or overestimation). The *Hiding Hand* arises as a result of two offsetting underestimations of knowledge and complexity, whereas the *Malevolent Hand* is the outcome of the combination of an awareness of fuller knowledge and willful underestimation of project complexity.

The *Protecting Hand* or what has been known as the precautionary principle in policy-making and planning takes hold when there is both an awareness of a lack of fuller knowledge and an overestimation of complexity. The *Passive Hand* occurs when planners overestimate project complexity even though the state of knowledge is such that few unknowns should come as a surprise [3].

The Four Hands, respectively, perform different functions. The Hiding Hand makes active problem-solving possible in the face of ignorance. The Malevolent Hand exploits the relative ignorance of third parties such as investors for the sake of profiteering. The Protecting Hand tackles ignorance through risk management and worst-case scenario planning. The Passive Hand stifles creativity and avoids risks. Table IV presents a sketch of the Four Hands and outlines how they relate to complexity and uncertainty as well as the functions they perform.

While under the Planning Fallacy projects face cost overruns and benefit underruns and there is not enough creativity to save the day, the Four Hands taken together offer greater explanatory power for project behavior [49]. Notably, the Hiding Hand has a downside in that it pushes adventurism and risky behavior to the maximum under uncertainty, which eventually leads to a project's failure. The Malevolent Hand, however, has an upside as it may help game the system not merely for personal gains but to make things happen, especially where there are planning obstacles and system blockages [3]. Altogether, the Four Hands could help project theorists and practitioners shy away from what Hirschman [31] would call "the propensity to see gloom and failure everywhere" (p. 337). For example, the Hiding Hand delivers unexpected success and the Passive Hand may well lead to project success. The Four Hands alone are not enough, however, to surmount the shortcomings of the disjunctive and unproductive simplification of complexity, which is inherent within the Planning Fallacy debate.

³Let us note that Weick [74] borrows this argument from Schutz [61] who claims that understanding proceeds through three stages: 1) superficial simplicity; 2) confused complexity; and 3) profound simplicity.

TABLE IV
 “THE FOUR HANDS” OR PRINCIPLES OF PROJECT BEHAVIOR AND THEIR RELATIONSHIPS TO COMPLEXITY AND UNCERTAINTY

Project complexity	State of knowledge (Uncertainty)	
	<i>Ignorance</i>	<i>Awareness</i>
Underestimation	Hiding Hand <i>Making active problem-solving possible in the face of ignorance</i>	Malevolent Hand (or Planning Fallacy) <i>Exploiting the ignorance of third parties for profiteering sake</i>
Overestimation	Protecting Hand <i>Tackling ignorance through risk management and worst-case scenario planning</i>	Passive Hand <i>Stifling creativity and avoiding risks</i>

Adapted from Anheir [2], [3].

Thus, we would propose a conjunctive style of theorizing for advancing project behavior research and seek to make connections between different, but interconnected and interdependent, or even paradoxical, ambivalent or contradictory aspects of human experience [70]. We therefore propose a theoretical position for project behavior based on a synthesis between the dialectical poles that have formed and framed the Planning Fallacy debate. Hence, we suggest moving away from *dualisms* like Planning Fallacy versus Hiding Hand [15], [34] or bias versus error [18], [48] to *dualities* [67] of Planning Fallacy and Hiding Hand or bias and error, which altogether better reflect the lived experience of delivering large and/or complex projects.

B. Moving the Planning Fallacy Debate Forward: The Emergence of a Balanced Theoretical Approach and a New Principle of Project Behavior

As we have put forward in this article, to reconcile the twin and dualist principles of the Planning Fallacy and the Hiding Hand, there is a need for a balanced theoretical approach to better understand how projects work, and thus for a new principle of project behavior. With this in mind, we turn our attention to the pioneering work of the German psychologist Gerd Gigerenzer, Daniel Kahneman’s strongest critic over the years, and their debate over whether human decision-making is success-prone [19] or error-prone [39].

1) *Gigerenzer–Kahneman Debate on Bias and Error in Decision-Making*: In essence, Gigerenzer [25] takes issue with Kahneman’s heuristics-and-biases approach and the underlying statistical reasoning where statistical analysis always trumps intuition and bias always outweighs error [37]. The main goal of the heuristics-and-biases approach was “to understand the cognitive processes that produce both valid and invalid judgments” [39, p. 582]. Contrastingly, recognizing that people make decisions under time, knowledge, and computational limitations and borrowing Simon’s [63], [64] cognitive and ecological notions of bounded rationality and “satisficing,” Gigerenzer and Goldstein [24] propose a fast-and-frugal heuristics approach or a sort of rules of thumb way for decision-making in complex real-world environments.

Markedly, fast-and-frugal heuristics can be defined as smart rules of thumb or “simple, task-specific decision strategies that are part of a decision maker’s repertoire of cognitive strategies for solving judgment and decision tasks” and that “yield decisions that are ecologically rational rather than logically consistent” [59, p. 1]. In other words, decision makers should not upfront reject heuristics but instead “find out when they work and when they don’t” [25, p. 281]. As Gigerenzer and Goldstein [24] warn, their unique approach focuses on “the psychological and ecological rather than on logic and probability theory” and “questions classical rationality as a universal norm and thereby questions the very definition of ‘good’ reasoning on which both the Enlightenment and the heuristics-and-biases views were built” (p. 651).

In layman’s terms, when it comes to risk, instead of focusing on how bad people are at making decisions [37], Gigerenzer [25] endeavors to understand how to help people use simple rules of thumb to obtain good outcomes. Gigerenzer [25] seeks to move away from probability theory and embrace smart heuristics by preferring gut feelings as effective tools for dealing with uncertainty. Moreover, Gigerenzer [25] argues that Kahneman’s fast but error-prone unconscious “system one” versus the conscious and more reliable “system two” stories is a dichotomy in the sense that they hold “opposing characteristics” (p. 281). In this instance, all heuristics are considered to be bad or second best. Moreover, simple heuristics and precise models for so-called rational decision-making such as Bayesian models are lumped together and cast as being unreliable [1]. Kahneman’s system one versus system two does not predict anything, but explains almost everything after the fact [19]. Bearing in mind this view, we argue that this is also the case of Flyvbjerg’s work on the Planning Fallacy as the *best* explanation for a project’s cost overruns and benefit shortfalls.

Gigerenzer’s critique of Kahneman’s [37] approach to decision-making also focuses on an outside versus inside view, which forms an innate feature of Flyvbjerg and his colleagues’ Planning Fallacy [18]. When they take the inside view and make forecasts themselves, decision-makers may be fooled by optimism bias (delusion) and/or swayed by strategic misrepresentation (deception). To mitigate delusion and deception in project settings, the trick is to acquire objective past performance data

from similar projects [46]. Hence, as noted earlier, the introduction of the optimism bias uplift and RCF [18], which have been advocated as ways to improve the accuracy of cost estimates and forecasts. In Gigerenzer's [23] view, statistical thinking in general and probability theory in particular as advocated by Kahneman and Flyvbjerg works best in a context of risk when *all* relevant alternatives and consequences and probabilities are known. Yet, in a complex and uncertain world where unknown unknowns prevail, probability theory not only falls short but creates an illusion of certainty and becomes part of the problem [25], pp. 2–42]. This has led Gigerenzer [25] to suggest that “the two-system view has overlooked the distinction between risk and uncertainty” (p. 281). In other words, Kahneman's approach may well work in a risk context but not under uncertainty.

Of course, this distinction is not new in the project management field. It has been long recognized that conventional project management approaches “can be inappropriate and potentially actually disadvantageous” for projects that face high levels of complexity and uncertainty [75, p. 505]. It is customary to distinguish between foreseen and unforeseen uncertainty [10], known and unknown unknowns [7], [58] or between risk and uncertainty [25], [45], and therefore between conventional risk management methods and uncertainty-driven ones [10], [45]. However, the temptation to “understand, reduce, respond” [52, p. 1076] is strong in project management theory and practice. Therefore, when it comes to dealing with uncertainty, there is a tendency in the literature to adopt a reductionist perspective; that is to seek to reduce, *not* embrace uncertainty [70]. For example, while some authors consider that many unknowns are not really unknown at all and thus differentiate between knowable and unknowable unknowns, they still fall back to reducing unwelcome surprises or uncertainty [7], [58].

Hirschman [30] warned against this reductionist tendency as he submitted that “optimal rather than minimal uncertainty or difficulty is the appropriate as well as the only feasible goal” (p. 85). Echoing this point, Gigerenzer [25] suggests that when making decisions, we may turn to two sets of tools: “RISK: If risks are known, good decisions require logic and statistical thinking. Uncertainty: If some risks are unknown, good decisions also require intuition and smart rules of thumb” (pp. 23–24). An example of a statistical analysis tool is RCF [18]. An example of rule of thumb, notably in a risky situation, is the max–min criterion or selecting “the project with the least threatening worst case, eliminating the left tail of the outcome distribution (in project management this is referred to as ‘ensuring the floor’)” [45, p. 598].

Additionally, Gigerenzer [25] states that “by suggesting a false sense of certainty, models of a known risk can promote rather than prevent disaster” (p. 36). He further disputes the assumption that rational decision-making models always lead to the best outcomes. It is time for the project management field to get past what Gigerenzer [26] calls “a bias bias” or the tendency to spot bias where there is none. Thus, the idea that cost overruns and benefit shortfalls are all about human bias [18] is exaggerated [49], [50], [51]. Like the gloomy view of projects the proponents of the Planning Fallacy proffer, they present an unfairly negative view of the human mind where it is believed

that people are bad at making decisions [25]. Thus, in focusing only on bias, they push the idea that people are “idiots” [1] or that forecasters are “fools” and “liars” when they incorrectly determine passenger demand forecasts [68]. In essence, fools are aligned with people who are subject to optimism bias and liars with those who practice strategic misrepresentation [18].

Gigerenzer [25], however, views people as being neither inherently stupid nor chronically misled by their gut feelings, but merely ill-educated in risk literacy, arguing that if we could teach them when to trust their guts more and turn to simple and learned rules of thumb, they would be in a better position to handle risk and uncertainty. While Kahneman [37] seeks to warn people against their own biases and chooses to familiarize them with rigorous statistical analysis, Gigerenzer [25] wants to empower decision-makers with simple and learned rules of thumb (heuristics) to help them navigate the complex and uncertain settings in which they operate. For Gigerenzer [25], education and teaching of critical thinking about statistical analysis and probability theory is the best way to understand and manage risk.

2) *Toward a New and Balanced Principle of Project Behavior: The Fifth Hand:* In light of the above discussion, we suggest that Gigerenzer's [25] stance on decision-making is akin to a conjunctive theorizing and a profound simplicity inasmuch as his ideas entertain dualities *not* dualisms, and, thus, display, as we have seen, ambivalences, tensions, contradictions, and paradoxes [61], [70], [74]. In so doing, they provide a balanced theoretical approach that is needed to advance and complexify the Planning Fallacy debate. As a result, we would be better positioned to reconcile the issues of bias and error, optimism bias and pessimism bias, risk and uncertainty, statistical analysis and intuition, biases and heuristics, governance and project management paradigms for cost overruns and benefit shortfalls explanations. Considering this contextual backdrop, we suggest an overarching principle—the *Fifth Hand*—that can provide a balanced theoretical explanation of project behavior and pragmatically reflect the lived experience of managing projects.

The Fifth Hand shares with the Hiding Hand and the Planning Fallacy an underestimation of costs and challenges and an overestimation of project benefits and odds to success. Like the twin principles, it only helps understand project performance in hindsight as it allows complexity and uncertainty to take hold. Like the Hiding Hand and the Planning Fallacy, the Fifth Hand has an upside and a downside. While its advantage is to help make the best of the evolving context surrounding the project and learn from experience, its disadvantage consists in an indeterminacy of project performance as it becomes a feeling project stakeholders *collectively* feel about what had been achieved and not a calculation decision-makers make in advance of the project [41].

Unlike the Hiding Hand, the Fifth Hand should not just focus on “felicitous and surprising escapes from disaster” [67, p. xiii], that is, help projects succeed in unforeseen ways [34]. Nor should it, like the Planning Fallacy, merely emphasize cost overruns and benefit shortfalls. Instead, it should provide project planners, managers, and teams with an understanding of when

TABLE V
KEY INSIGHTS FOR MOVING THE PLANNING FALLACY DEBATE FORWARD

Frame of Reference	The Planning Fallacy Debate	The Gigerenzer-Kahneman Debate	The Fifth Hand
<i>Key questions</i>	Does the Planning Fallacy (PF) trump the Hiding Hand (HH) and/or does bias trump error?	Is human decision-making error or success-prone?	How to reconcile bias and error?
<i>Either/or stances</i>	PF trumps HH [15] <i>versus</i> HH trumps PF [34]; bias trumps error [17] <i>versus</i> error trumps bias [49].	Human decision is error-prone [37] <i>versus</i> success-prone [25].	Stop the tyranny of OR and embrace the power of AND: it is both bias and error and both the PF and HH that prevail.
<i>Assumptions about human nature</i>	People are either ‘fools’ (optimism bias) or ‘liars’ (strategic misrepresentation) [18].	People are neither inherently stupid nor chronically led by their gut feelings, but merely ill-educated in risk literacy [25].	People are plural and paradoxical. They are prone to both bias and error. They may be guided by statistics and gut feelings [13].
<i>Research focus</i>	Governance paradigm: PF and decision-making biases [18] <i>versus</i> PM paradigm: looking into scope changes, complexity, and uncertainty [34], [49].	Fallacies and biases in decision-making [37] <i>versus</i> fast-and-frugal heuristics or smart rules of thumb [25], [63], [64].	Both governance and PM paradigms
<i>Practical prescriptions</i>	Ensure accountability of decision-makers: Implement RCF and optimism bias uplift [18] <i>versus</i> apply best PM practices [49].	Warn decision-makers about their own biases and familiarize them with rigorous statistical analysis [37] <i>versus</i> empower them with simple and learned rules of thumb and help them navigate complexity and uncertainty [25].	Warn project planners and managers about their own biases [37], empower them with simple rules of thumb and above all help them learn and draw from experience so as to navigate complexity and uncertainty [25].
<i>Fault line</i>	Disjunctive simplification of the debate [70]: there is not much distinction between risk and uncertainty, especially in Flyvbjerg’s work [34].	Disjunctive simplification of the debate [70]: there is not much distinction between risk and uncertainty, especially in Kahneman’s work [25].	
<i>The way forward or the contribution of this paper</i>	Complexification of the debate with Gigerenzer’s [25] conjunctive style of theorizing [70]. Moving from dualisms to <i>dualities</i> , that is both competing explanations (PF and HH; bias and error) should be reconciled: In risk settings, good investment decisions require statistical analysis. But in uncertainty settings, rather smart rules of thumb are required.	Both statistical analysis and heuristics work but in different settings: under risk, rigorous statistical analysis works; but under uncertainty, rather smart rules of thumb work [25].	Complexification of project behavior [25] with a conjunctive style of theorizing [70] and a pragmatist perspective [13] so as to accommodate both error and bias, PF and HH, optimism bias and pessimism bias, risks and uncertainties, statistics and rules of thumb, knowing and learning.

explanations involving the Planning Fallacy or the Hiding Hand may well work in the true spirit of ecological rationality [25]. Thus, under the Fifth Hand, any sort of project performance is possible including the shades of grey between success and failure. The Fifth Hand hence accommodates failure-success paradoxes (e.g., the Hiding Hand), success-failure paradoxes (e.g., projects that come within budget but fall short of business expectations), and outright failures (e.g., the Planning Fallacy). Creativity may be underestimated, overestimated, exactly estimated or even triggered or stifled or not before and after project completion. Ignorance can thus be good or bad according to the circumstances [34]. The Fifth Hand thus fits with many different types of projects in contrast to the Hiding Hand, which favors emerging or changing fields such as semiautonomous cars or health care, and the Planning Fallacy, which thrives in well-regulated fields such as air or road infrastructure and in an organizational culture where drawing and learning from experience is rewarded [3]. The Fifth Hand may well accommodate pessimism bias in that it also allows for an overestimation of costs and challenges and an underestimation of project benefits and odds to success [50], [51].

Moreover, as we theorize, following Gigerenzer [25], the Fifth Hand would be risk savvy as it can assist people to understand when to trust their guts, use statistical analysis or learned rules of thumb and better handle the project scope, complexity, risk, uncertainty and management along with surprises down the road. This new principle should promote the optimal outcomes possible in light of the sheer circumstances surrounding the proposed project. Unlike the Planning Fallacy that seeks to simplify complexity, the Fifth Hand even further complexify complexity and notably holds an even greater ability to handle

tensions than the Hiding Hand. This is attested by the shades of grey between success and failure it allows. Thus, there is a need in the Fifth Hand realm for even broader rationality as in the Hiding Hand compared to the narrower rationality underpinning the Planning Fallacy [41].

After all, projects harbor tensions between projections and plans, decisions and actions, outputs and outcomes, success criteria and success, and project *management* success and *project* success, the ignorance of which may be the reason why projects fail more than they succeed [34], [40], [41]. As such, the Fifth Hand would open up the Planning Fallacy debate and thus entertains “more things,” “a greater variety of interpretations” and enables people to “differentiate their ideas, argue, listen to one another, work to reconcile differences, and commit to revisiting and updating whatever profound simplicities they settle on as guidelines for action” [74, p. 663]. Table V summarizes our key insights on how to move forward the Planning Fallacy debate. Table VI contrasts the Fifth Hand with both the Hiding Hand and the Planning Fallacy.

In light of the above, we would suggest an antidualist ontology and a pragmatist epistemology for the Fifth Hand. Indeed, such an antidualist stance fosters a broader notion of projects not only as processes of pursuit, experimentation, and discovery but a view that would overcome and reconcile opposing categories like bias and error or the Planning Fallacy and the Hiding Hand. People are thus plural and paradoxical, and may be subject to both bias and error. Moreover, the pragmatist epistemology proffers the belief that a true theory is what people find useful in the face of complexity and uncertainty and that much like action-taking and meaning-making are part of the same process, action and thought cannot be separated [13].

TABLE VI
FIFTH HAND, HIDING HAND, AND PLANNING FALLACY COMPARISON

Project Behavior Principles	The Hiding Hand	The Planning Fallacy	The Fifth Hand
Times, costs, difficulties and risks estimation	Underestimation	Underestimation	Underestimation (optimism bias), overestimation (pessimism bias), or exact estimation (no bias)
Project benefits and project success odds estimation	Overestimation	Overestimation	Overestimation (optimism bias), underestimation (pessimism bias), or exact estimation (no bias)
Creativity and problem-solving ability estimation	Underestimation at the onset but creativity to the rescue in the end	Overestimation at the onset but not enough emerging creativity to save the day	Everything possible from underestimation to exact estimation to overestimation at the onset but creativity may be triggered, stifled or neutral before and after project completion.
Bias or error explanations	Bias and error	Bias	Bias and error
Statistical analysis or rules of thumb	Statistical analysis and rules of thumb	Statistical analysis	Statistical analysis and rules of thumb
Risk or uncertainty settings	Uncertainty	Risk	Risk and uncertainty
<i>Ex-post</i> project performance	'Near-miss', happy ending or stumbling into success	Dismal failures or disasters and/or a 'double whammy' of substantial cost overruns and benefit shortfalls	Any possible performance from failure to success to shades of grey between failure and success
Hopeful or hopeless view of projects, uncertainties and risks	Optimistic or 'bias for hope': People can unexpectedly save the project from failure and thus 'stumble into success'	Pessimistic or doom and gloom: People may be 'fools' or 'liars'; they are 'their own biggest risk' and should not trust their gut feelings	Pragmatic view between optimism and pessimism: People can make the best of the evolving context and make it happen if we empower them and teach them how and when to trust their guts
Upside	Active problem-solving in the face of uncertainty (entrepreneurialism)	Get things somehow done by gaming the system and avoiding planning obstacles and system blockages	Make the best from the evolving context and draw and learn from experience
Downside	Too much risk-taking under conditions of uncertainty which may lead to failure	Profiteering and corruption	Indeterminacy of project performance as success becomes not a calculation but a collective feeling of what had been achieved (No causality)

TABLE VI
CONTINUED

Project Behavior Principles	The Hiding Hand	The Planning Fallacy	The Fifth Hand
Fitting project settings	Emerging fields (Climate change response, coronavirus response, ICT infrastructure, semi-autonomous cars) or changing fields (health care, education)	Well-regulated fields (Air or road transport infrastructure; water and sewage systems)	Many different types
Fitting organizational culture	A risk-taking culture where failure is accepted and rewarded as long as you learn from it	A risk-averse and cheating culture where rule avoidance and attempts to game the system are recurrent	A learning culture where opportunities and threats are two sides of the same coin and where learning from experience is rewarded so as to exercise the right agency in changing circumstances
Fitting rationality	A broad notion of rationality	A narrow notion of rationality	A broader notion of rationality
Complexity metaphor	Complexify complexity	Simplify complexity	Further complexify complexity
Foresight or hindsight value	The Hiding Hand explains success after the fact (Hindsight)	The Planning Fallacy explains failure after the fact (Hindsight)	The Fifth Hand helps understand project performance after the fact (Hindsight)
Ability to handle tensions	Great: Failure-success paradoxes; 'creative error';	Least: it is all about bias and dichotomies such as error or bias; optimism bias or pessimism bias; statistical analysis or rules of thumb; governance rules or 'best practices'; inside or outside view.	Greatest: Failure-success paradoxes; success-failure paradoxes; error <i>and</i> bias; optimism bias <i>and</i> pessimism bias; statistical analysis <i>and</i> rules of thumb; analysis <i>and</i> gut feelings; governance rules <i>and</i> 'best practices'; inside <i>and</i> outside view.
Ignorance: Good or bad?	Good	Bad	Good or bad, it depends
Theoretical pillars	(1)'The pseudo-imitation technique' or the project as a solution looking for a problem to solve and (2) the 'pseudo-comprehensive program' or the project as a part of a larger program, not a piecemeal initiative	(1) Delusion (Honest Planning Fallacy) and (2) Deception (Intentional Planning Fallacy)	(1) Ecological rationality or the understanding of the circumstances in which 'projects work or not' and (2) Empowerment of planners, managers and teams through teaching them when to trust their guts and when to use statistical analysis or learned rules of thumb for more success

3) *Agenda for Research and Methodological Challenges*: In line with the Fifth Hand as we denote in Table VI, the research agenda we propose is twofold.

- 1) In what circumstances does the Fifth Hand really work, when, why, and how? For example, does the type of project, industry-sector, institutional, organizational, or cultural setting matter?
- 2) How can we ensure that planners, managers, and teams are empowered and risk savvy so that they know when to use statistical analysis or learned rules of thumb to deliver projects successfully in the face of uncertainty and complexity?

However, this complexification of the Planning Fallacy debate does not come without its methodological challenges. We note that the above agenda for research presents several challenges to project scholars, whether they focus on *ex-ante* decision-making and a cost-benefit lens [15] or on *ex-post* performance evaluation and a project management lens [34]. While difficulties may be measured by risks and uncertainties (or unwelcome surprises), other issues such as creativity or problem-solving abilities that are so critical for the Hiding Hand assessment are still difficult to measure.

Even with a cost-benefit lens, access and availability of whole life-cycle costs and benefits of projects is a challenge to demonstrate the presence of the Hiding Hand, the Planning Fallacy, or the Fifth Hand, as information (e.g., feasibility studies, cost and benefit data and final accounts) is generally incomplete, often contains noise and is invariably confidential. Seldom, if at all, is the performance of projects measured during their operation phase. Thus, the determination of actual benefits remains burdensome, as performance measurement is rarely an innate feature of a project's operations.

Another methodological challenge centers around the determination of optimism bias within a cost or benefit estimate that is typically prepared by a team. Notably, the Planning Fallacy was originally based upon experiments whereby *individuals* were required to complete tasks (*not teams*) within a specific time-period. Moreover, the emphasis of the (original) Planning Fallacy has been on time, and not the determination of cost and benefits. Until now, there is no reliable empirical evidence to support the presence of optimism bias in forecasting costs or benefits within a team environment [51]. In the case of strategic misrepresentation, we face a similar encounter as promoters and planners would unlikely admit that they have lied or fudged the figures to ensure their projects go ahead.

Finally, the Hiding Hand and the Planning Fallacy may explain project performance only in hindsight, *not* in foresight. Indeed, it is only in retrospect that we can know whether complexity or creativity has been underestimated or overestimated as project behavior and project performance may be coproduced by the project management process. As such, in line with attribution theory, the Hiding Hand and the Planning Fallacy may at best represent attribution errors about project performance. We tend to blame deviations from plans and targets excessively more on planners and managers than on the complexity of both the circumstances and the project [40]. This makes the twin principles difficult to assess empirically [41]. The issues we have identified

for the Planning Fallacy and the Hiding Hand equally apply to the Fifth Hand.

V. CONCLUSION

It has been acknowledged that there has been a paucity of thought-provoking academic debates within the project management literature. Without such debates, we stymie critical thinking and creativity and the ability to innovate and respond to change. Furthermore, there is a danger that scholars may become complacent and unresponsive to the demands and needs of organizations and governments, which projects in particular the large and/or complex ones should meet. Over the last couple of years, however, there has been a debate brewing in the background that has focused on explaining how projects work: the Planning Fallacy *versus* Hiding Hand or the Planning Fallacy debate.

In sum, this article presented the case for a new project behavior principle, a *Fifth Hand* that would reconcile bias and error, the Planning Fallacy and the Hiding Hand, optimism bias and pessimism bias, risk and uncertainty, statistical analysis and intuition, biases and heuristics, governance and project management paradigms for cost overruns and benefit shortfalls explanations and, above all, empower planners, managers, and teams. As a result, the article proffers an antidualist ontology and a pragmatist epistemology for the Fifth Hand that allow greater accommodation of complexity and uncertainty. More importantly, however, it overcomes the unproductive Hiding Hand *versus* Planning Fallacy stalemate in which the debate was caught from an ontological, epistemological, theoretical, and methodological point of view.

From a practical standpoint, in contrast to the gloomy view of the Planning Fallacy and the serendipitous view of the Hiding Hand, the Fifth Hand pragmatically considers projects as even more complex and messy processes of pursuit, experimentation, and discovery with many shades of grey not only between optimism and pessimism but also success and failure. It construes planners and managers as plural and paradoxical, optimistic and pessimistic, and prone to both bias and error, but with the agency to make the best of the evolving context and draw and learn from experience in the face of complexity and uncertainty. In so doing, while the Fifth Hand, like the Hiding Hand and the Planning Fallacy, may not help understand project performance in foresight, this article contributes to project management theory and practice, especially in large-scale project settings. The key questions remain whether or not the Fifth Hand can be assessed empirically; in what circumstances the Fifth Hand works; and how to empower planners and managers so that they know when to use statistical analysis or learned rules of thumb, especially in conditions of complexity and uncertainty. This, however, goes beyond the remit of this article and is what we will turn our attention to in our future works.

ACKNOWLEDGMENT

The authors would like to thank T. Browning, Professor at the Neely School of Business and Co-Editor-in-Chief of the *Journal of Operations Management* and K. Kreiner, Professor Emeritus at the Copenhagen Business School for their eye-opening

comments on two preliminary versions of the paper. They are also grateful for the encouraging feedback they generously received on the first draft of the paper at the 7th International Megaprojects Workshop at Montreal in 2019. Notably, they are indebted to C. Bredillet, Professor and Dean at the *Université du Québec à Trois-Rivières* and S. Tywoniak, Professor at the Telfer School of Management who have helped shape their antidualist and pragmatist stance in the face of uncertainty and complexity. Last but not least, this article could not have crossed the finish line without the support and critique of the Department Editor, Prof. Y. H. Kwak and the four anonymous reviewers. Reviewer four was particularly helpful. By the same token, they extend their thanks to the Editor-in-Chief, Prof. T. Daim, who shared the great news of the acceptance of the article with them.

REFERENCES

- [1] T. Adams, "Nudge economics: Has push come to shove for a fashionable theory?," *The Guardian*, Jun. 1, 2014. [Online]. Available: <https://www.theguardian.com/science/2014/jun/01/nudge-economics-freakonomics-daniel-kahneman-debunked>. Accessed on: May 8, 2019.
- [2] H. K. Anheier, "Of Hiding Hands and other ways of coping with uncertainty: A commentary," *Social Res., Int. Quart.*, vol. 83, no. 4, pp. 1005–1010, 2016.
- [3] H. K. Anheier, "Infrastructure and the principle of the hiding hand," in *The Governance of Infrastructure*, K. Wegrich, G. Kostka, and G. Hammerschmid, Eds. London, U.K.: Oxford Univ. Press, 2017.
- [4] W. R. Asby, *An Introduction to Cybernetics*. London, U.K.: Chapman & Hall, 1956.
- [5] M. Boisot and J. Child, "Organizations as adaptive systems in complex environments: The case of China," *Org. Sci.*, vol. 10, no. 3, pp. 237–252, 1999.
- [6] T. Brady and A. Davies, "Managing structural and dynamic complexity: A tale of two projects," *Project Manage. J.*, vol. 45, no. 4, pp. 21–38, 2014.
- [7] T. R. Browning and R. V. Ramasesh, "Reducing unwelcome surprises in project management," *MIT Sloan Manage. Rev.*, vol. 56, no. 3, pp. 53–62, 2015.
- [8] R. Buehler and D. Griffin, "The Planning Fallacy. When plans lead to optimistic forecasts," in *The Psychology of Planning in Organizations: Research and Applications*, M. D. Mumford and M. Frese, Eds. New York, NY, USA: Taylor & Francis, 2015.
- [9] A. Davies, S. Manning, and J. Söderlund, "When neighboring disciplines fail to learn from each other: The case of innovation in project management research," *Res. Policy*, vol. 47, pp. 965–979, 2018.
- [10] A. De Meyer, C. H. Loch, and M. T. Pich, "Managing project uncertainty: From variation to chaos," *MIT Sloan Manage. Rev.*, vol. 43, no. 2, pp. 60–67, 2002.
- [11] J. Denicol, A. Davies, and I. Krystallis, "What are the causes and cures of poor megaproject performance? A systematic literature review and research agenda," *Project Manage. J.*, vol. 51, no. 3, pp. 328–345, 2020.
- [12] P. C. Dey, "Complete collection of project management statistics 2016," 2016. Accessed on: Aug. 28, 2019. [Online]. Available: <http://blog.planningproapp.com/complete-collection-project-management-statistics-2016/>.
- [13] M. Farjoun, C. Ansell, and A. Boin, "Pragmatism in organization studies: Meeting the challenges of a dynamic and complex world," *Org. Sci.*, vol. 26, no. 6, pp. 1787–1804, 2015.
- [14] B. Flyvbjerg, "What you should know about megaprojects and why: An overview," *Project Manage. J.*, vol. 45, no. 2, pp. 6–19, 2014.
- [15] B. Flyvbjerg, "The fallacy of beneficial ignorance: A test of Hirschman's Hiding Hand," *World Develop.*, vol. 84, pp. 176–189, 2016.
- [16] B. Flyvbjerg, "Planning fallacy or hiding hand: Which is the better explanation?," *World Develop.*, vol. 103, pp. 383–386, 2018.
- [17] B. Flyvbjerg, M. K. S. Holm, and S. L. Buhl, "Underestimating costs in public works projects: Error or lie?," *J. Amer. Plan. Assoc.*, vol. 68, no. 3, pp. 279–295, 2002.
- [18] B. Flyvbjerg et al., "Five things you should know about cost overruns," *Transp. Res. A: Policy Pract.*, vol. 118, pp. 174–190, 2018.
- [19] J. Fox, "Instinct can beat analytical thinking," *Harv. Bus. Rev.*, 2014. Accessed on: May 8, 2019. [Online]. Available: <https://hbr.org/2014/06/instinct-can-beat-analytical-thinking>.
- [20] J.-B. Gauthier and L. A. Ika, "Foundations of project Management research: An explicit and six-facet ontological framework," *Project Manage. J.*, vol. 43, no. 5, pp. 5–23, 2012.
- [21] J. Galdi and J. Söderlund, "Project studies: What it is, where it is going," *Int. J. Project Manage.*, vol. 36, no. 1, pp. 55–70, 2018.
- [22] J. Galdi, J. Söderlund, and A. H. van Marrewijk, "Advancing theory and debate in project studies," *Project Manage. J.*, vol. 51, no. 4, pp. 351–356, 2020.
- [23] G. Gigerenzer, "On narrow norms and vague heuristics: A reply to Kahneman and Tversky," *Psychol. Rev.*, vol. 103, no. 3, pp. 592–596, 1996.
- [24] G. Gigerenzer and D. G. Goldstein, "Reasoning the fast and frugal way: Models of bounded," *Psychol. Rev.*, vol. 103, no. 4, pp. 650–659, 1996.
- [25] G. Gigerenzer, *Risk Savvy: How to Make Good Decisions*. Baltimore, MD, USA: Penguin, 2013.
- [26] G. Gigerenzer, "The bias bias in behavioral economics," *Rev. Behav. Econ.*, vol. 5, pp. 303–336, 2018.
- [27] N. Gil and J. K. Pinto, "Polycentric organizing and performance: A contingency model and evidence from megaproject planning in the UK," *Res. Policy*, vol. 47, pp. 717–734, 2018.
- [28] V. Govindarajan and C. Trimble, "Stop the innovation wars," *Harv. Bus. Rev.*, vol. 6, no. 1, pp. 77–83, 2010.
- [29] R. Gulati, "Tent-poles, tribalism, and boundary spanning: The rigor-relevance debate in management research," *Acad. Manage. J.*, vol. 50, no. 4, pp. 775–782, 2007.
- [30] A. O. Hirschman, *Development Projects Observed*. Washington, DC, USA: Brookings Institution, 1967.
- [31] A. O. Hirschman, "The search for paradigms as a hindrance to understanding," *World Politics*, vol. 22, no. 3, pp. 329–343, 1970.
- [32] A. O. Hirschman, *A Bias for Hope: Essays on Development and Latin America*. New Haven, CT, USA: Yale Univ. Press, 1971.
- [33] A. S. Huff, "Writing for scholarly publication as a contribution to scholarly conversation," *M@n@gement*, vol. 19, no. 3, pp. 240–247, 1998.
- [34] L. Ika, "Beneficial or detrimental ignorance: The straw man fallacy of Flyvbjerg's test of Hirschman's hiding hand," *World Develop.*, vol. 103, pp. 369–382, 2018.
- [35] L. A. Ika and J. Söderlund, "Rethinking revisited: Insights from an early rethinker," *Int. J. Manag. Projects Bus.*, vol. 9, no. 4, pp. 931–954, 2016.
- [36] A. Jetter, F. Albar, and R. C. Sperry, "The practice of project management in product development: Insights from the literature and cases in high-tech," Project Manage. Inst., Newtown Square, PA, USA, Whitepaper, 2016.
- [37] D. Kahneman, *Thinking, Fast and Slow*. Toronto, ON, Canada: Doubleday Canada, 2011.
- [38] D. Kahneman and A. Tversky, "Intuitive prediction: Biases and corrective procedures," in *Studies in the Management Sciences: Forecasting*, vol. 12, S. Makridakis and S. C. Wheelwright, Eds. Amsterdam, The Netherlands: North Holland, 1979, pp. 313–327.
- [39] D. Kahneman and A. Tversky, "On the reality of cognitive illusions: A reply to Gigerenzer's critique," *Psychol. Rev.*, vol. 103, pp. 582–591, 1996.
- [40] K. Kreiner, "Restoring project success as phenomenon," in *Advancing Research on Projects and Temporary Organizations*, in R. A. Lundin and M. Hällgreen, Eds. Copenhagen, Denmark: Copenhagen Business School Press & Liber, 2014, pp. 21–40.
- [41] K. Kreiner, "Conflicting notions of a project: The battle between Albert O. Hirschman and Bent Flyvbjerg," *Project Manage. J.*, vol. 51, pp. 400–410, 2020.
- [42] Y. H. Kwak and F. Anbari, "Analyzing project management research: Perspectives from top management journals," *Int. J. Project Manage.*, vol. 27, pp. 435–446, 2009.
- [43] S. Lenfle and C. Loch, "Lost roots: How project management came to emphasize control over flexibility and novelty," *California Manage. Rev.*, vol. 53, no. 1, pp. 32–55, 2010.
- [44] P. Lepenies, "Statistical tests as a hindrance to understanding: What the controversy around the 'hiding hand' reveals about research in the social sciences and conceals about project management," *World Develop.*, vol. 103, pp. 360–365, 2018.
- [45] C. H. Loch, "Creativity and risk taking aren't rational: Behavioral operations in MOT," *Prod. Oper. Manage.*, vol. 26, no. 4, pp. 591–604, 2017.
- [46] D. Lovo and D. Kahneman, "Delusions of success: How optimism undermines executives' decisions," *Harv. Bus. Rev.*, vol. 81, pp. 56–63, Jul. 2003.
- [47] P. E. D. Love, D. D. Ahiaga-Dagbui, and Z. Irani, "Cost overruns in transportation infrastructure projects: Sowing the seeds for a probabilistic theory of causation," *Transp. Res. Part A, Policy Pract.*, vol. 92, pp. 184–194, 2016.

- [48] P. E. D. Love and D. D. Ahiaga-Dagbui, "De-bunking 'fake news' in a post-truth era: The plausible untruths of cost underestimation in transport infrastructure projects," *Transp. Res. A, Policy Pract.*, vol. 113, pp. 357–368, 2018.
- [49] P. E. D. Love, L. A. Ika, and D. Ahiaga-Dagbui, "On de-bunking 'fake news' in a post-truth era: Why does the Planning Fallacy explanation for cost overruns fall short?," *Transp. Res. A, Policy Pract.*, vol. 126, pp. 397–408, 2019.
- [50] P. E. D. Love, M. C.P. Sing, L. A. Ika, and S. Newton, "The cost performance of transportation infrastructure projects: The fallacy of the Planning Fallacy account," *Transp. Res. A, Policy Pract.*, vol. 122, pp. 1–20, 2019.
- [51] P. E. D. Love, L. A. Ika, and M. C.P. Sing, "Does the planning fallacy prevail in social infrastructure projects? Empirical evidence and competing explanations," *IEEE Trans. Eng. Manage.*, to be published, doi: [10.1109/TEM.2019.2944161](https://doi.org/10.1109/TEM.2019.2944161).
- [52] H. Maylor and N. Turner, "Understand, reduce, respond: Project complexity management theory and practice," *Int. J. Oper. Prod. Manage.*, vol. 37, no. 8, pp. 1076–1093, 2017.
- [53] H. Maylor, J. R. Meredith, J. Söderlund, and T. Browning, "Old theories, new contexts: Extending operations management theories to projects," *Int. J. Oper. Prod. Manage.*, vol. 38, no. 6, pp. 1274–1288, 2018.
- [54] E. Morin. *On Complexity*. (Transl: R. Postel). Cresskill, NJ, USA: Hampton Press, 2008.
- [55] R. Müller and G. Klein, "What constitutes a contemporary contribution to Project Management Journal?," *Project Manage. J.*, vol. 49, no. 5, pp. 1–2, 2018.
- [56] J. Nubiola, "Dichotomies artifacts: A reply to Professor Hookway," in *Following Putnam's Trail: on Realism and Other Issues*, M. U. R. Monroy, C. C. Silva, and C. M. Vidal, Eds. New York, NY, USA: Rodopi, 2008, pp. 71–80.
- [57] C. Oswick, P. Fleming, and G. Hanlon, "From borrowing to blending: Re-thinking the processes of organizational theory building," *Acad. Manage. Rev.*, vol. 36, no. 2, pp. 318–337, 2011.
- [58] R. V. Ramasesh and T. R. Browning, "A conceptual framework for tackling knowable unknown unknowns in project management," *J. Oper. Manage.*, vol. 32, pp. 190–204, 2014.
- [59] T. Reimer and J. Rieskamp, "Fast and frugal heuristics," in *Encyclopedia of Social Psychology*, R. Baumeister and K. D. Vohs, Eds. Thousand Oaks, CA, USA: Sage, 2007.
- [60] G. Room, "The hiding hand: A rejoinder to Flyvbjerg on Hirschman," *World Develop.*, vol. 103, pp. 366–388, 2018.
- [61] W. Schutz, *Profound Simplicity*. New York, NY, USA: Bantam, 1979.
- [62] A. J. Shenhar and D. Dvir, *Reinventing Project Management: The Diamond Approach to Successful Growth and Innovation*. Boston, MA, USA: Harvard Bus. School Press, 2013.
- [63] H. A. Simon, "Rational choice and the structure of the environment," *Psychol. Rev.*, vol. 63, pp. 129–138, 1956.
- [64] H. A. Simon, *Models of Bounded Rationality*. Cambridge, MA, USA: MIT Press, 1982.
- [65] H. J. Smyth and P. W. G. Morris, "An epistemological evaluation of project and project management research," *Int. J. Project Manage.*, vol. 25, no. 4, pp. 423–436, 2007.
- [66] S. Sonenshein, "Routines and creativity: From dualism to duality," *Org. Sci.*, vol. 27, pp. 739–758, 2016.
- [67] C. R. Sunstein, "Albert Hirschman's Hiding Hand," in *Development Projects Observed*, 3rd ed., A. O. Hirschman, Eds. Washington, DC, USA: Brookings Institution, 2015.
- [68] N. N. Taleb, *The Black Swan: The Impact of the Highly Improbable*. London, U.K.: Penguin, 2007.
- [69] T. N. Thomsen, "The processes of public megaproject cost estimation: The inaccuracy of reference class forecasting," *Financial Accountability Manage.*, vol. 35, pp. 337–352, 2019.
- [70] H. Tsoukas, "Don't simplify, complexify: From disjunctive to conjunctive theorizing in organization and management studies," *J. Manage. Stud.*, vol. 54, no. 2, pp. 132–153, 2017.
- [71] A. Tversky and D. Kahneman, "Advances in prospect theory: Cumulative representation of uncertainty," *J. Risk Uncertainty*, vol. 5, pp. 297–323, 1992.
- [72] H. von Foerster, "Principles of self-organization—In a socio-managerial context," in *Self-Organization and Management of Social Systems*, H. Ulrich and G. J. B. Probst, Eds. Berlin, Germany: Springer-Verlag, 1984, pp. 2–24.
- [73] K. E. Weick, "Vita contemplativa: Mundane poetics: Searching for wisdom in organization studies," *Org. Stud.*, vol. 25, no. 4, pp. 653–668, 2004.
- [74] K. E. Weick, "The generative properties of richness," *Acad. Manage. J.*, vol. 50, pp. 14–19, 2007.
- [75] T. Williams, "Assessing and moving from the dominant project management discourse in the light of project overruns," *IEEE Trans. Eng. Manage.*, vol. 52, no. 4, pp. 497–508, Nov. 2005.
- [76] G. Wood, P. H. Phan, and M. Wright, "The problems with theory and new challenges in theorizing," *Acad. Manage. Perspect.*, vol. 32, no. 4, pp. 405–411, 2018.



Lavagnon A. Ika received the Ph.D. degree in administration from the Université du Québec, Montréal, QC, Canada, in 2011.

He is currently a Professor of project management with the Telfer School of Management, University of Ottawa, Ottawa, ON, Canada. His research has been published in prestigious journals such as the *World Development*, *IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT*, *Production Planning and Control*, *Transportation Research Part A: Policy and Practice*, *International Journal of Project Management*, and *Project Management Journal*.

Dr. Ika is an Associate Editor for the *International Journal of Project Management* and a member of the distinguished Academic Boards of the international project management associations PMI and IPMA. His work on project behavior has earned him an Emerald Outstanding Paper in 2017 and an IPMA Research Award in 2017.



Peter E. D. Love received the Ph.D. degree in operations management from Monash University, Melbourne, VIC, Australia, in 2002, and the Higher Doctorate of Science for his contributions in the field of civil and construction engineering from the Curtin University, Perth, WA, Australia, in 2012.

He is currently a John Curtin Distinguished Professor with the School of Civil and Mechanical Engineering, Curtin University. His research interests include operations and production management, resilience engineering, infrastructure development and digitization in construction. His research has appeared in leading journals such as the *European Journal of Operations Research*, *Journal of Management Information Systems*, *Journal of Management Studies*, *IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT*, *International Journal of Operations and Production Management*, *Production Planning and Control*, and *Transportation Research A: Policy and Practice*.



Jeffrey K. Pinto received the Ph.D. degree in organization theory from the University of Pittsburgh, Pittsburgh, PA, USA, in 1986.

He is the Andrew Morrow and Elizabeth Lee Black Chair in Management Technology with the Black School of Business, Penn State–Erie, The Behrend College, Erie, PA, USA. He is the author or editor of more than 25 books. His research has been published in the *Management Science*, *Research Policy*, *Journal of Management*, *Expert Systems With Applications*, *Sloan Management Review*, *Journal of Management Studies*, *Journal of Product Innovation Management*, and the *IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT*.