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Making Sense of Hospital Project MisPerformance: Over Budget, Late, Time and Time Again—Why? And What Can Be Done About It?

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ABSTRACT

Hospital projects worldwide often experience misperformance, showing a tendency to exceed their estimated cost, miss their deadline, suffer quality problems, and yield benefit shortfalls. Considering this ubiquitous problem, this paper aims to make sense of this phenomenon by addressing the following research question: *How can we make sense of hospital project misperformance, and what can be done to mitigate its occurrence?* We use an illustrative case study approach and the analytical lens of sense-making to examine the misperformance of three mega-hospital projects. Our research reveals issues such as scope changes, an inability to adapt and respond to risk and uncertainty, ineffectual project management and governance, and optimism bias, which combine to impact project performance adversely. We suggest that the two prominent theoretical perspectives dominating the literature in this field fall short of adequately explaining hospital project misperformance. We provide suggestions for improving the procurement process of hospitals and submit there is a need to develop a robust and balanced theory of project misperformance.

1. Introduction

Hospitals form a critical part of a society's health care system's infrastructure and constitute key instruments for policy-makers to achieve universal health access and coverage and meet the United Nations' Sustainable Development Goals (SDGs), which constitute the core of its 2030 Agenda. They supplement and augment the effectiveness of many of the health care system's constituent elements by making available services for acute and complex conditions [1].

Hospitals concentrate scarce resources within well-planned referral networks to respond efficiently to population health needs. Given medical advances and health care reforms, hospitals must accommodate and respond to changing health care needs and demands. However, hospitals are "immovable structures whose design was set in concrete," with their configuration often reflecting "the practice of health care and the patient populations of a bygone era" [2, p. 803]. It is challenging to modify a hospital's physical structure, amend or construct new operating theaters, and accommodate innovative technologies. The response from health policy-makers has been to increase emergency and intensive care capacity and to provide highly specialized care, impatient services, and the like, by constructing new state-of-the-art hospitals.

However, time and time again, governments worldwide often witness their hospital projects, particularly those classified as *mega*[†] [3], being delivered over budget and late [4–9]. Such features of project misperformance negatively impact taxpayers and thus require attention. For instance, acknowledging the cost escalation and expensive delays associated with the delivery of hospitals, Frank Dobson, the Secretary of State for Health (1997 to 1999) in the United Kingdom (UK), declared that they were a "thing of the past." This clarion call arose from the National Audit Office (NAO)'s [10] inquiry into the cost and time overruns, funding problems and delays experienced at London's Guy's Hospital. While the UK Government's intent and resolve to address mismanagement was unabated at the time, with hospitals such as Dartford, Carlisle, and

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[†] Mega-projects are defined as "temporary endeavours (i.e., projects) characterized by: large investment commitment, vast complexity (especially in organizational terms), and long-lasting impact on the economy, the environment, and society" [3, p. 58].

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Norwich meeting their time and cost targets [11], the problem has not gone away as projects still regularly and significantly veer off track, irrespective of the size of their budget.

Regardless of whether hospitals are newly constructed, refurbished, renovated or extended under the auspices of new public management using private participation in infrastructure (PPI) or procured using conventional means, costs almost always blow out. More often than not, taxpayers face a "double whammy" as they have to foot the bill for the additional costs and delayed access to medical treatment and services. Moreover, delayed projects place a strain on existing facilities. A case in point is the beleaguered New Children's Hospital[†] [12] in Dublin (Ireland). The project, procured using a conventional approach, is set to become one of the world's most expensive buildings with an original budget of 400 million EUR, an approved budget of 1.43 billion EUR, and a total cost that may reach a staggering 2.4 billion EUR [13,14] not to mention contractual claims exceeding 200 million EUR [15]. What is more, while the project promoters have been branded as delusional, the political ramifications of the project's misperformance are abounding, with 77% of voters in a poll attributing it to the Government's mismanagement [16].

Similarly, the procurement of hospitals in the UK under a private finance initiative (PFI)[‡] [17] has been plagued with increasing costs and lock-in contracts (e.g., maintenance and cleaning) and equated to being a "rip-roaring example of out-of-control bandit capitalism" [18,19]. For example, the 646-bed Royal Liverpool University Hospital was slated to open in June 2017, but it is now expected to be complete five years late in 2022. Its cost has increased from 746 million to 1.06 billion GBP [20,21]. Similarly, the 669-bed Midland Metropolitan Hospital in Sandwell, initially scheduled for October 2018, will likely open in July 2022. The hospital turns out to be more than 300 million GBP above its original 686 million GBP budget [21]. As a result of an inquiry by the NAO, the Chancellor of the Exchequer, Phillip Hammond, abolished the future use of PFIs, denouncing their failure to deliver value for money[††] [22–25].

Even though the sheer number of government audits and inquiries undertaken over the last three decades have sought to understand why and how hospitals are delivered over budget and late, health policy-makers have struggled to provide taxpayers with value for money. A review of the media and government audits and inquiries reveals a series of leitmotivs that contribute to the misperformance of hospital projects[‡‡], which include design errors, scope and contract changes, low-balling estimates, lack of governance, labor shortages, inadequacies in contract planning and procurement, and contractor liquidation [20,26,27]. Thus, we see health policy-makers succumbing to the Iron Law where their projects are "over budget, over time, under benefits, over and over again" [28, p.1].

The project misperformance literature has centered on economic projects (e.g., roads, rail, and airports) while overlooking those of a social nature (e.g., administrative buildings, hospitals, schools, libraries, and prisons) despite their socio-political appeal [8,29]. Notwithstanding the importance of hospital projects, limited knowledge is available on why and how they are subjected to misperformance. In this paper, we seek to garner an understanding of hospital project behavior[†††] [30] and of how they take different and complex out-turns [31]. Thus, we aim to address the following research question: *How can we make sense of hospital project misperformance, and what can be done to mitigate its occurrence?*

We commence this paper by presenting a review of the dominant theoretical perspectives of project behavior that may manifest within the context of hospitals (Section 2). Next, we undertake an illustrative case study approach and analytically turn to sensemaking to tackle the proposed research question (Section 3). In doing so, we analyze three hospital mega-projects that have received widespread attention in Australia due to their misperformance (Section 4). We then discuss our study's theoretical and practical implications (Section 5) and finally present the paper's conclusions (Section 6).

2. Explaining hospital project misperformance

In this paper, we take a hospital project's misperformance to be associated with the asset being delivered over budget and late, suffering quality problems, and yielding benefit shortfalls. In spite of this, the determination of benefit shortfalls is fraught with subjectivity, as the realization of benefits depends on varying stakeholders' perspectives that tend to change with time. Moreover, the acquisition of data on quantitative benefits is often difficult yet necessary for determining a project's success [31–33]. Consequently, we only make a perfunctory reference to benefit shortfalls in this paper. Suffice to say, if hospitals are delivered cost effectively and without delay, the public will immediately realize some benefits.

In Table S1 in Appendix A of this paper, we identify a sample of hospital projects from around the world that have experienced misperformance, although our research focuses on the Australian context. Notably, in the case of the Gold Coast University Hospital (1.76 billion AUD), Sunshine Coast University Hospital (1.8 billion AUD), and Queensland Children's Hospital (1.44 billion AUD), which are referred to as the Big Three, the Queensland Health department "did not have sufficient regard to defining the benefits it expected to realise through delivery" of its new hospitals or how it would track these benefits [34, p. 1]. In this instance, none of these projects can objectively demonstrate improved health outcomes to their communities. This does not mean the hospital projects cannot generate benefits. But instead, they are difficult to ascertain. Surprisingly, the decision to build the Big Three was taken before a business case was developed to identify their service needs. Moreover, the decision to build was based on a single solution.

The Queensland Health department focused on delivering new infrastructure without "exploring whether other options could achieve the same outcome and offer better value for money" [34, p. 1]. The decision to construct the hospitals was political—it was based on election commitments—though there was a need to deliver better health services. Due to poor investment planning before and when the three hospitals were announced, they did not meet time, cost, and benefit expectations. In most cases, it is clear from a review of audits, inquiries, and the literature that policy-

[†] Two-stage tender process was adopted which focuses on the early involvement and collaboration with the supply chain to de-risk projects. Thus, the supply chain can provide input into the design to improve constructability. While used widely internationally, it is novel to the Irish public sector [12, p. 22].

[‡] Often confused to be the same as a public private partnership (PPP). However, there are distinctly different due to the way these arrangements are financed [17]. While PFI will utilise debt and equity finance provided by the private sector to pay for the upfront capital costs, the same is not required in a PPP, where the parties have more freedom to structure their contributions.

[††] Questions surrounding the suitability of PPI forms (e.g., PPPs) for the procurement of public infrastructure have also been raised in Canada because several hospitals including the McGill University Health Centre and Le Centre Hospitalier de l'Université de Montréal experienced cost blowout, delays and contractual disputes [23–25].

[‡‡] We provide examples of hospital projects from around the world that have exceeded their time and cost targets in Table S1 in Appendix A. We also provide an outline of the issues that resulted in their misperformance.

[†††] The term project behavior "consists of explaining and anticipating successes and failures, systematic veering from pre-assigned paths, propensities toward specific difficulties, as well as opportunities for special payoffs" [30, p. 4].

makers are not learning from their mistakes. Instead, systematic factors appear to induce governments to either consistently mismanage their projects, "low-ball initial cost estimates, or both" [6].

An examination of various government audits and inquiries, such as those identified in Table S1, reveals two recurring themes that contribute to hospital misperformance: ① inept project management; and ② ineffective governance/accountability of decision-makers, which tends to be politically driven. Therefore, we are drawn to two competing theoretical explanations, identified in Table 1 [29,31], to explain the cost and schedule increases, the poor quality and benefit shortfalls in hospital projects: the project management and governance paradigms [29]. Below, we describe the two dominant theoretical explanations of project misperformance that frequent the literature.

2.1. The project management paradigm

The longstanding project management paradigm is a school of thought featuring several disparate contributions that suggest that projects fail to meet expectations due to scope changes, complexity, and uncertainty, and underscore best practices as a way to counteract the technical and economic causes of misperformance [29,35].

The Hiding Hand principle propagated by Hirschman [36] is an exemplar theory drawn upon by the project management paradigm. The theory of the Hiding Hand ontologically construes projects as processes of pursuit, experimentation and discovery and epistemologically calls for possibilism (i.e., the search of the "unexpected, not the expected") [29].

The Hiding Hand "describes the systematic discrepancy between what proponents propose when seeking permission for projects and what processes actually lead to certain outcomes" [37, p. 979]. The observations of Hirschman [30, p. 13] suggest that managers and decision-makers are "tricked" into undertaking large-scale projects such as hospitals, as they underestimate their creativity in dealing with the difficulties that may arise during the process of construction. According to Hirschman [36, p. 13], "the only way in which we can bring our creative resources fully into play is by misjudging the nature of the task, by presenting it to ourselves as more routine, simple, undemanding of genuine creativity than it will turn out to be." In this instance, the errors associated with underestimating difficulties are "roughly" offset by misjudging our ability to overcome them [36, p. 13]. The "rough" offsetting process can result in managers and decision-makers underestimating the difficulties, costs, and risks, and overestimating the benefits of hospital projects [33; 36, p. 13]. Hence, the Hiding Hand arises from "offsetting underestimations of knowledge and complexity" [31, p. 8]. In the Big Three hospitals referred to above, the incumbent government appeared to be ignorant of their financial costs and seemingly displayed a profound oversight of other health-related options.

Interestingly, putting aside the political context and shenanigans that led to the construction of the Big Three and their cost misperformance, these hospitals have been heralded as a success [34]. Hence, ignorance was not necessarily damaging in the cases of the Big Three, as they stumbled into success. The innovative environment the hospitals provide for healthcare provision, medical research, and the teaching of future doctors are the mainstay of their realization. Thus, the Hiding Hand is:

> *. . .a benevolent mechanism by which unrealistically optimistic [managers and decision-makers] embark on unexpectedly challenging plans, only to be rescued by [their] ingenuity, which they could not anticipate, but which ultimately led to success, principally in the form of unexpectedly high net benefits* [38, p. 979].

The inability of the public sector to learn from previous hospital projects' misperformance has provided a breeding ground for ignorance to manifest and for the management of the unknown to come to the fore repeatedly. In addition, changing governments, health department restructuring, and staff turnovers have exacerbated the ignorance management[†] [39] (i.e., dealing with a lack of knowledge) that resides at an organizational level. Consequently, efforts to eliminate ignorance tend to focus on implementing "knowledge management practices" such as the lessons learned from audits and inquiries and prevailing best practices [39, p. 216; 40].

Lessons learned are undertaken to overcome the preventive effect of ignorance, but these tend to be sporadic, unsystematic, and bound to project team members involved in a process [41]. When a project is completed, team members may be required to return to their line functions within their organization (or are moved to others) or to join new projects taking their experiences and knowledge with them. The absence of knowledge transfer often results in organizational amnesia and, therefore, there is no frame of reference for dealing with uncertainties and difficulties [42,43].

Considering that the Hiding Hand does its work "through ignorance of ignorance, of uncertainties and of difficulties" [30, p. 35], it is therefore unsurprising that its approach to dealing with uncertainty is "dilettantish" [37, p. 10]. Management of the unknown is limited by our ability to understand and recognize the presence of ignorance. However, the "recognition of the unknown brings with it an openness to the unexpected and an appreciation that change" provides opportunities and threats [39, p. 217].

When the decision to build a hospital is made, its scope is often ill-defined [8,44–47]. Furthermore, years may pass between the decision to build, the creation of a fully developed design, and the commencement of construction. During this period, information from stakeholders (i.e., needs and requirements) becomes available; thus, a definitive scope can be developed, planning issues can be resolved, and new technology may become available (e.g., medical imaging), which can result in scope changes and increases in project costs. Moreover, the actual construction and commissioning process can also take several years to complete, as can be seen in the examples provided in Table S1.

Throughout the design and construction process, managers and decision-makers must be open to change, which requires a heightened alertness to the unexpected [48]. In response, a contingency sum is put aside during the design (e.g., incomplete scope and inaccuracies of estimates) and construction (e.g., minor change-orders, errors, and omissions in a project's documentation) to cover estimates of risk exposure and uncertainty. However, the contingency put aside for construction is seldom enough to accommodate the cost increases that occur due to scope changes, reworking, labor shortages, and increased materials prices [49,50]. As a case in point, an independent review of the New Children's Hospital in Dublin (Ireland) revealed:

> *There was also no contingency in the capital budget to absorb risks that might emerge during the process of agreeing a GMP [guaranteed maximum price]. As a consequence the budget significantly underestimated the likely outturn cost* [12, p. 19].

Changes in the design and scope of hospital projects are the primary cause of cost misperformance. For example, a study undertaken by Love et al. [29] showed that 99% of the cost increase from a project's contract value to the final account was attributable

[†] Ignorance management is defined as "any purposeful process or practice of identifying, taking into account, seeking to control or employ ignorance whilst maintaining openness to the unknown with a view to enhancing organizational performance" [39, p. 217].

Table 1
A comparison between key concepts of the project management and governance paradigms.

Key concept	Paradigms	
	Project management (best practices)	Governance (decision-makers' accountability)
Ontology	A project is fundamentally a process of pursuit, experimentation, and discovery; it is all about complexities; project success and failure are inextricably linked	A project is fundamentally a deliberate leap into a planned future; it is all about the plan; success and failure are black and white
Theory (exemplar)	Hirschman's Hiding Hand	Kahneman's Planning Fallacy (or Malevolent Hand)
Epistemology (exemplar)	Learning is everything (possibilism): being ready to veer from the plan when confronted with a complex situation and learn from experience; a focus on "what is"	Knowing is everthing (positivism): bring the project back to plan and back on track in the face of deviations; a focus on what "must be"
Definition of cost misperformance	The extent of monetary deviation from the price agreed upon with a contractor/consortium and the settlement of the final account (i.e., final contract sum)	Actual cost minus estimate cost, with cost measured in the local currency at constant prices and against a consistent baseline in absolute or relative terms
Baseline measurement	Contract award (i.e., determination of price)	The budget estimate at the decision-to-build
Causes of cost misperformance	Pathogens (i.e., strategic risks), planning and execution errors, scope changes, human (behavioral) bias, complexity, and uncertainty	Behavioral bias and strategic misrepresentation
Goal	To understand whether a project management system works	To understand whether decision-makers make well-informed decisions

Adapted from Refs. [29] and [31].

to design changes. The hospitals identified in Table S1 were also subject to significant design and scope changes, which played a major role in their cost misperformance.

While learning is grounded in the reality of experience and the agency of decision-makers, it has been policy-oriented within public sector organizations, which has resulted in an underappreciation of the strategic and technical difficulties associated with delivering projects [51]. Even though policy-makers may well aim to mitigate discrepancies between expected and actual outcomes of their projects by "adjusting the relationships between situation, action strategy, assumptions and consequences," they fail to question "the governing variables, the deeper lying norms, values and core beliefs that make consequences important to attain" [52, p. 238].

The strategic decisions of policy-makers can, metaphorically speaking, inadvertently introduce "pathogens" into a project's procurement process, which can produce conditions that result in cost increases, disputes, and rework [8, p. 562]. Traditionally, the public sector is risk-averse and therefore tends to "adopt procurement approaches that place too much risk on contractors and have them subsequently accommodate unforeseen costs not included in their accepted bid" [53, p. 2]. In this case, the traditional procurement method (design–bid–build) separates the design from the construction activities and thereby provides an environment for adversarial relations and opportunistic behavior due to asymmetric information [17,54]. For example, a contractor may submit a low bid to win an auction and then submit claims for additional works due to errors and omissions in contract documentation and change-orders that may arise [55]. In Australia, Canada, and the UK, public and private sectors have entered into medium-to-long-term relationships through the use of public private partnerships (PPPs) and PFIs; however, the special purpose vehicle (SPV) still tends to utilize hard-dollar contracts to construct works. As such contracts are decided on price, and they can result in the emergence of opportunism [17,56].

Understanding the dynamics and consequences of decisions provides a basis for improving the performance of projects. Nevertheless, this is a constant challenge for the public sector, as it grapples with addressing issues of accountability, value of money, and risk avoidance. Dealing with these challenges requires the public sector to adapt, respond, and change its procurement approach. Even though there have been appeals for the public sector to recalibrate its approaches to allocating risk and collaborate with its contractors to ensure that projects are delivered cost effectively and on time, progress toward achieving these goals is limited [11]. To this end, the project management paradigm views the misperformance as a case of the project "not going according to plan (budget), but plans not going according to project" [47, p. 186].

2.2. The governance paradigm

The governance paradigm is the most recent and popular explanation of project behavior permeating the literature. It suggests that the underlying causes of project misperformance are behavioral bias and strategic misrepresentation, which can be curbed by ensuring decision-makers' accountability. The governance paradigm draws on the typical theory of the Planning Fallacy principle proposed by Kahneman [57]. It ontologically views projects as deliberate leaps into a planned future, epistemologically assumes that we collectively know how to win success in projects, and holds an ideal of knowing in advance [31].

While the Hiding Hand, for example, focuses on creative problem solving and goes through a process of incrementalism[†] [58], it has been suggested that the project management paradigm falls short of providing an adequate explanation of project behavior and solutions to combat misperformance, as it possesses an "ego blind spot" [59–61]. That is, the project management paradigm considers the problem of project misperformance from an "inside view" rather than an "outside view." However, an outside view emerges from prospect theory[‡] [62] and underpins the Planning Fallacy (or Malevolent Hand), which is used as an explanation of project behavior and forms the theoretical setting for the governance paradigm [57,59–61,63,64].

The inside view considers a problem by focusing on the specific task, using the information that is close at hand, and making predictions based on that narrow and unique set of inputs. These inputs may include anecdotal evidence and fallacious perceptions derived from building models of future scenarios. The inside view is, therefore, "susceptible to the fallacies of scenario thinking and to anchoring of estimates on present values or extrapolations of current trends" [63, p. 27]. In stark contrast, the outside view

[†] Incrementalism is a method of working by small incremental changes instead of a few large jumps [58]. Most people use incrementalism, as it is the natural and intuitive way to tackle everyday problems that arise.

[‡] Prospect theory is a behavioral model that shows how people decide between alternatives that involve risk and uncertainty (e.g., likelihood of gains or losses). It demonstrates that people think in terms of expected utility relative to a reference point (e.g., current wealth) rather than absolute outcomes.

examines similar situations to obtain a statistical reference for decision-making. Rather than seeing a project with a unique set of problems, the outside view considers whether others have faced similar issues and, if so, what happened. As a result, decision-makers are compelled to set aside the information that they have gathered. Thus, if decision-makers take an inside view, they are prone to the illusion of invulnerability, otherwise known as optimism bias [63].

Simply put, optimism bias is a cognitive bias that causes someone to believe that they are less likely to experience an adverse event than statistical reality warrants [65,66]. In the case of the Planning Fallacy, planners and managers display optimism bias during the framing and evaluation of a project's cost, time, and benefits. The corollary is a tendency to underestimate the costs, times, and risks of future actions while simultaneously overestimating the benefits of a project and its chances of success [64]. As such, the Planning Fallacy conjectures that decision-makers that take an inside view may malevolently underestimate complexity, as they are tricked into believing that they possess the experience and knowledge to realistically assess a project's cost, time, risks, and benefits [31].

So, drawing inspiration from optimism bias juxtaposed with strategic misrepresentation[†] [67], Flyvbjerg et al. [68] suggests that the Planning Fallacy solely explains project misbehavior and misperformance. It is notable that the Planning Fallacy can either be unintentional as a result of delusion (i.e., optimism bias) or intentional due to strategic misrepresentation (i.e., deception) [29]. In fact, Flyvbjerg et al. [68, p. 174] are steadfast in their conviction that the root cause of a project's cost overrun (i.e., cost misperformance) is the behavioral bias that occurs during the planning and design process of a project. Moreover, they downplay the negative impact of scope changes, complexity, uncertainty, and errors on a project's cost misperformance [68].

Indeed, behavioral bias will undoubtedly exist in some form, whether cognitive or emotional, optimistic or pessimistic [69]. Yet optimism bias tends to be the behavioral bias that the advocates of the Planning Fallacy refer to when explaining cost misperformance [38]. To say that optimism bias is a root cause of cost misperformance without presenting any empirical evidence of its actual presence and magnitude during the planning and design process is a cause for concern. This dearth of empirical evidence has led several authors to question the legitimacy of the Planning Fallacy as the best explanation of project behavior [31,32,70–72]. Within the context of social infrastructure projects, Love et al. [29] observed that pessimism bias might equally prevail when formulating a cost estimate, resulting in projects being delivered under their contracted value.

As we note in Table 1, the governance paradigm uses the difference between the budget estimate at the decision-to-build and actual construction costs to determine a project's performance. Thus, significant differences in the magnitude of a project's cost performance will occur, in comparison with the project management paradigm. Policy-makers typically use the decision-to-build reference point to determine a project's cost performance; yet rarely, if ever, is scope defined at this point. In the case of the Big Three hospitals, for example, the decision to build was made before a business case was conducted. As a result, the cost estimates prepared during a project's planning and design process will vary as information becomes available. However, according to Flyvbjerg et al. [38,59], a project's cost increase is a product of optimism bias.

However, Flyvbjerg et al. [38,59] did not measure and quantify the presence of an optimism bias; rather, it was merely assumed to exist. Similarly, Love et al.'s suggestion of pessimism bias is based on conjecture [29]. Even though studies fail to empirically ascertain the presence of optimism bias, the UK's *Green Book Supplementary Guidance* uses reference class forecasting (RCF) to determine bias uplifts to budget estimates for hospitals in order to accommodate optimism bias and de-risk estimates [73]. In this instance, projects of a similar type, whose outcomes are already known, are used to make potentially accurate performance predictions. In particular, hospitals are classified as non-standard buildings, and an uplift in the range of 4%–51% is added on top of the base estimate and contingency to cater for their likely cost misperformance [73]. Learning becomes black and white and is based on what is known by drawing on the success and failure of similar real-world cases.

Putting aside the issue of behavioral bias, we now look at the presence of strategic misrepresentation, which has also been suggested to prevail in studies by Flyvbjerg et al. [38,59]. As cogently pointed out by Love et al. [44, p. 365], "a lie is a false statement that is deliberately created by someone to deceive others intentionally; deception requires justification. There needs to be a motivation to enact the lie."

While examples of lying are difficult to unearth during the planning and procurement of projects, they exist, although they are few and far between. A high-profile example of strategic misrepresentation occurred in the High Speed Two (HS2) project in the UK. An inquiry by the Committee of Public Accounts[‡] concluded that the HS2 Ltd. and the Department for Transport deliberately lied, as they knew that HS2 could not be delivered on time, within budget, or within scope, and withheld information that would have informed parliament and the public about the true nature of the project. However, in the case of hospital projects, our examination of various publicly available reports and documents, such as those identified in Table S1, indicates that strategic misrepresentation typically does not arise to justify a business case, but occurs to cover up poor decision-making, incompetence, errors, and the mismanagement of costs. This camouflaging of cost misperformance came to light in the National New Children's Hospital in Dublin (Ireland) and in the Rocky Mountain Regional VA Medical Center (USA) [12,74].

In the arcane arena of project behavior research, there remains an inability to make sense of hospital project misperformance. If we knew and understood the whys and wherefores of hospital misperformance, lessons from history would have been learned and enacted [29]. Unfortunately, this has not been the case. While both the project management and the governance paradigms provide some assistance in understanding misperformance, neither can claim to provide the best explanation of project behavior [31].

We also need to point out that the Hiding (Benevolent) Hand and Malevolent Hand have siblings but the latter have yet to be empirically examined within project settings, these being the [31,37]: ① Passive Hand, which occurs when knowledge is known and risk is avoided. As a consequence, decision-makers overestimate complexity and treat uncertainty as a zemblanity (i.e., an unpleasant yet unsurprising discovery). ② Protecting Hand, which is akin to a "quintessential incarnation of the precautionary principle when facing a combination of unknown risks" [37, p. 10].

Overall, we point out that "there has been a general unwillingness of scholars to seek a point of synthesis between" the Hiding and Malevolent Hands [31, p. 2]. As these authors, Ika et al. [31, p. 2] note:

> *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.*

[†] Strategic misrepresentation is defined as "the planned, systematic distortion or misstatement of fact—lying—in response to incentives in the budget process" [67, p. 437].

[‡] Details of the inquiry can be found at: https://publications.parliament.uk/pa/cm5801/cmselect/cmpubacc/84/84.pdf.

We are not drawn to a specific position here, as we believe that both perspectives are valid and can explain the misperformance of hospital projects. This view aligns with the clarion call made by Love et al. [29,47] for a non-partisan theory to explain project behavior, so that strides forward can be made in addressing the misperformance problem plaguing both economic and social infrastructure projects. However, even though context matters [35], we still do not have a distinctive explanation for the misperformance of hospital projects or know what can be done to address this problem.

3. Research approach

In line with studies of a similar ilk, we draw on the concept of sense-making to develop a rich understanding of the context-based performance assessment of hospital mega-projects to address our research question [35,45]. In doing so, we aim to provide policy-makers with the means "to comprehend, understand, explain, attribute, extrapolate, and predict" [75, p. 51]. Accordingly, sense-making enables us to turn the unending complexity associated with hospital projects into a "situation that is comprehended explicitly in words and that serves as a springboard" to initiate and enact change to ensure that misperformance becomes "a thing of the past" [76, p. 409]. The sense-making lens is often associated with interpretive, social constructionist, and phenomenological research [77]. While there is no single sense-making theory per se, many researchers use this lens as a qualitative methodological frame of reference to study how people understand (i.e., make sense of) what happens in organizational settings [77]. Our sense-making lens uses an illustrative case study approach to unearth a deep and meaningful exploration of hospital project misperformance. Consequently, we aim to contribute to developing a theory of hospital misperformance, as this undertaking has received limited empirical attention [78]. The process we adopted to operationalize our research approach is presented in Fig. 1 [79].

3.1. Case selection

Case selection is a primordial task, requiring an agenda of study [80, p. 294]. Selecting cases is challenging, as it is necessary to address the issue of representativeness and to be able to extrapolate findings to a broader population. We are conscious of the issues associated with selection bias but are equally cognizant of the problems with randomly selecting cases, as those chosen may end up being unrepresentative of a population [80]. Thus, we pragmatically chose the cases used in this research using purposive sampling based on the following criteria: ① a mega project; ② accessibility to data; ③ the same reference class (i.e., homogeneity); and ④ contextual representativeness of a population (i.e., within the same country and procured under similar contractual conditions, laws, and regulations). Considering the criteria above, we selected three hospitals in Australia to examine in this paper: the Fiona Stanley Hospital (FSH), Perth Children's Hospital (PCH), and new Royal Adelaide Hospital (nRAH) (Fig. 2).

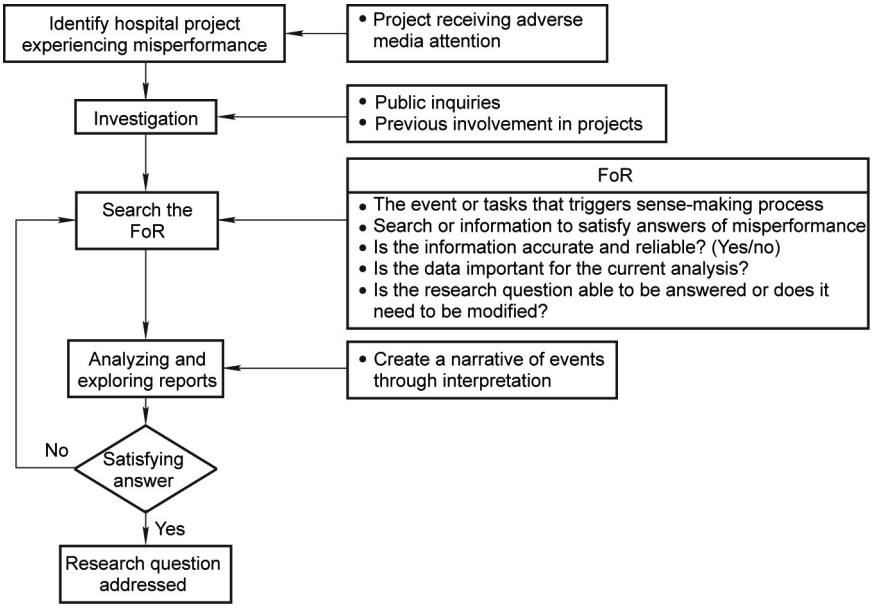

Fig. 1. Operationalization of sense-making. FoR: frame of reference.

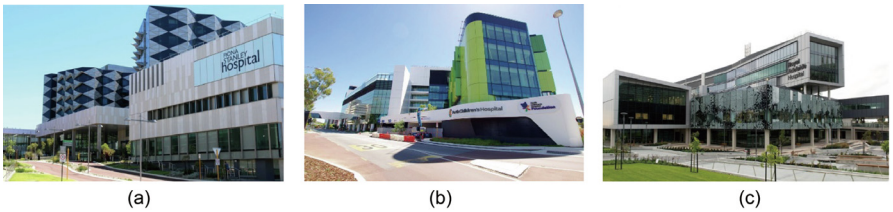

Fig. 2. Three Australian hospital mega-projects. (a) FSH; (b) PCH; (c) nRAH.

3.2. Data sources

We draw on various data sources (e.g., public inquiries) to reflect and make sense of the three hospitals' misperformance. In particular, we emphasize the grey literature, which is defined as sources that are not formally published in books and journals but are found in technical reports, pre-prints, the media, and the like [81]. Such sources are particularly important as a means of distributing scientific, technical, and public policy and practice information [82]. In addition, data from the grey literature is often unavailable in academic publications and reduces publication bias, thereby enabling us to foster a balanced view of project misperformance [83].

The primary data sources of our study are public inquiries into the performance of hospital projects. Public inquiries provide an "explanatory account from the statements of witnesses, publicly allocates responsibility and blame, and makes recommendations that provide evidence for societal and organizational learning" [84, p. 98; 85]. As a result, public inquiries offer "highly convention-governed sense making narratives that employ various forms of verisimilitude in order to bolster their authority" [84, p. 95]. Such inquiries "depoliticize disaster events, legitimate social institutions, and extend the hegemonic influence of dominant groups" and, in doing so, mitigate the concoction of alternative narratives that seek to control the discourse surrounding project misperformance [84, p. 95].

Inquiry reports lay out narratives, albeit "convention governed" by storytelling, which aim to provide a "univocal and coherent view" of the complex events that influenced project misperformance [84, p. 96; 86]. Notably, the public inquiries referred to in this paper (Table S2 in Appendix A) have produced "hegemonically successful" reports, as they have been uncritically accepted as providing a comprehensive and accurate account of the events they purport to describe [84, p. 96]. Thus, we consider them to be authoritative, reliable, and valid.

Notably, we did not have access to the business case and information associated with the decision to build. Still, the FSH and PCH had overwhelming support from political parties, the Australian Medical Association (AMA), the Department of Health, and the public. In the case of the nRAH, the decision to build received a mixed reception, as constructing a new hospital was not deemed to offer value for money. Whenever an event hindered the progress or negatively impacted the cost, it was politicized through the media. Unfortunately, a project's success or failure is often determined by the media. In the case of the nRAH, the hospital project was destined to be viewed as a failure from its onset by those who opposed its construction, despite being the most technologically advanced hospital project in Australia and perhaps in the world.

In the FSH case, we also relied on our observations from several site visits during its construction—which were deliberated on our informal discussions—and the grey literature. In addition, we were actively involved in a research project investigating the use of building information modeling (BIM) in the PCH from 2012 to 2016. We regularly visited the site from its commencement to completion, had access to the project's BIM, attended meetings with subcontractors, and discussed issues with site management. As a result, we have intimate knowledge of the PCH project and can retrospectively examine matters that arose during its construction and impacted its performance. Finally, in the case of the nRAH, we solely relied on the grey literature.

3.3. Case analysis

We have made sense of the sense-making that underpinned the public inquiries of the three hospital cases and thus have sought to provide an unbiased account of their performance. Our analysis focuses on each project's context and meaning [35]. Here, context refers to the setting within which a project unfolds, including its delivery, governance, scope, and quality, while meaning relates to the project's cost and time performance (Table S2). To reiterate, we were unable to specifically examine the benefit shortfalls that may have arisen in the projects; instead, we highlight areas where they seemingly occurred as a result of the hospitals' construction.

We can thus craft a narrative to help build an understanding about the meaning of hospital misperformance and, therefore, contextually make sense of its underlying causes. Again, we are not drawn to accepting *a priori* either the project management or governance paradigm, as one is not more plausible than the other. Instead, we address our research question by conducting a within-case and cross-case analysis, allowing patterns, observations, experiences, and knowledge of hospital misperformance to unfold without shoehorning them into a particular theoretical framing of a specific paradigm [29].

4. Research findings

A cursory glance at Table S2 reveals that the PCH and nRAH projects experienced significant cost increases and controversies that were regularly highlighted in the media. Both the PCH and nRAH were delivered late and over budget, and suffered from quality problems. Furthermore, the PCH and nRAH were delivered using BIM, which has been regularly identified in the literature as a way to improve design and construction efficiency, allow real-time visualization for all stakeholders, reduce costs and program schedules, and improve quality [87–89].

While the PCH was subjected to considerable misperformance, the project was the first in Australia and one of only a few worldwide at the time of its construction to develop a BIM strategy for assets and facilities management. During an examination of BIM usage in the PCH, PricewaterhouseCoopers [13, p. 7] observed that the "project is ahead of what many first time users [of BIM] attempt and pushing towards the limit of what is currently achievable." Examples of BIM used during the construction of the PCH are presented in Fig. 3. Due to the adoption of BIM, the PCH's technological and process innovations were overshadowed by its quality issues, contractual disputes, and late delivery.

Despite the misperformance and benefit shortfalls of the PCH and nRAH (i.e., future-proofing was ignored for both hospitals, as they would be unable to accommodate future demand due to predicted population increases in their catchment area), it could be argued, due to their sheer complexity, that if BIM had not been utilized, then their costs could have been significantly higher than those incurred. In contrast, the FSH was delivered on budget, ahead of time, and with no major quality issues being identified, even though it did not utilize BIM. We now look at the three cases in detail.

4.1. Fiona Stanley Hospital

At the time, the FSH (i.e., its approval and construction) was the Western Australia (WA) government's most significant capital works project. The decision to build the FSH was based on the recommendations of the Reid's report [90]. The initial budget for the FSH in 2004/2005 was 420 million AUD; over the next four years, it then increased to 1.76 billion AUD (Table 2 [91]). However, during this period, the size of the hospital increased from 100 000 to 144 000 m^2. The original cost estimate of 420 million AUD "was unrealistic because it was based on a minimal understanding of what services the hospital would deliver" and "significant scope and design changes have increased the size and estimated cost of

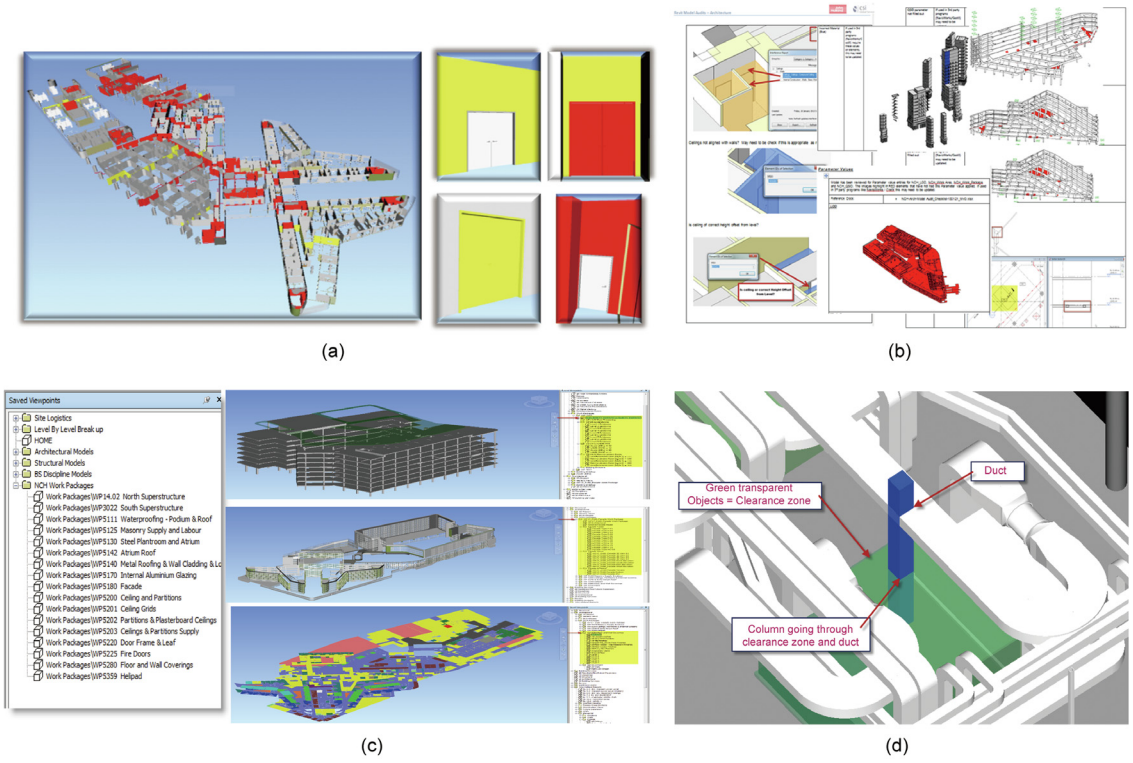

Fig. 3. Examples of BIM usage in the PCH project. (a) Integrity review (fire doors); (b) model audit; (c) coordination; (d) clash detection.

Table 2
FSH budget history, 2004–2007.

Government-approved budget	Original budget 2004–2005[a] (million AUD)	First revised budget September 2005[b] (million AUD)	Second revised budget November 2006[c] (million AUD)	Third revised budget December 2007[d] (million AUD)	Business case budget June 2008 (million AUD)
Construction and building works	420	300	486	755	755
General site works		24	61	69	69
Car decks		9	25	50	50
Contingency		22	87	110	110
Escalation		232	211	431	431
Professional fees		55	114	186	186
Furniture, fixtures, and equipment		96	107	146	146
Art		4	1	1	1
Allowances		–	–	13	13
Total	420	742	1 092	1 761	1 761

Source: Ref. [91, p. 14].
[a] Total area (hospital area is not specified).
[b] Total area 100 000 m^2.
[c] Total area increased to 116 000 m^2.
[d] Total area increased to 144 000 m^2.

the hospital" [91, p. 6]. As construction costs increased, so did the escalation, contingency and professional fees.

The FSH aimed to deliver patient-centered care, provide clinical support to general hospitals and community-based services, and maximize the value for money for healthcare services. The 643-bed tertiary hospital includes a 24-h emergency department (ED), the State burns center, a cancer center, a secure mental health unit, and medical research facilities. In addition to the project's construction, a contract of 4.3 billion AUD for facilities management services over 20 years was outsourced. It was expected that the managing contractor and the facilities managers would work together to ensure that the hospital was constructed by December 2013.

4.1.1. Que sera, sera: Over-optimistic completion date and ill-defined scope

In 2004, the Department of Health announced that the FSH would be completed by 2010. However, it was not ready for operation until May 2014, some three and a half years later. Poor planning by the Department of Health delayed approvals, and an increased scope extended the construction timeframes.

The original announcement by the Department of Health was made without an approved business case. At the time (i.e., in 2004), it was envisaged that the FSH would accommodate 610 beds and be completed within six years. It took over a year of clinical and infrastructure planning to define the scope and services required, however, which required changes to the budget (Table 2),

resulting in the Department of Health extending the expected completion date to December 2011. Further planning was then needed, delaying the business approval to 2008, which "pushed back the start of construction to March 2009" [91, p. 19].

To summarize, the Department of Health could not develop a robust business case and cost estimate. It "lacked essential information," which delayed its approval by the FSH Steering Committee [91, p. 21]. The business case focused predominantly on the construction costs of the hospital and overlooked the facilities management services contract. Needless to say, the original cost and time estimates were unrealistic and not based on a good understanding of the project's scope. As the project's requirements were defined, the scope changes increased, delaying the hospital's opening.

The Department of Treasury and Finance-Strategic Projects (DTF-SP) was responsible for managing the construction process, while the Department of Health was responsible for the hospital's service delivery, as it was the owner. However, between 2006 and 2010, a multi-agency FSH Steering Committee provided oversight over the project, including endorsing recommendations provided by the Economic Expenditure Committee (EEC) [91]. The EEC was replaced by the Major Health Infrastructure Project Steering Committee, which was a project control group dealing with operational matters. The governance structure reflected the differing roles of the Department of Health and the DTF-SP.

4.1.2. Creativity at work: Delivered on time, within budget, and safely

As we note in Table S2, the FSH was delivered using a two-stage managing contractor strategy. Stage 1 (awarded in February 2009) comprised early contractor involvement (ECI), whereby the design and planning of the hospital were undertaken (and completed in June 2010). In Stage 2 (awarded in August 2010), detailed design and construction with a guaranteed maximum price (GMP) were provided. This procurement route was selected to acquire the benefits of ECI (e.g., constructability, planning, and innovation) and cost certainty. Previously procured major capital works projects had experienced significant cost growth and had been reliant on a traditional lump sum, aside from the design and construct contracts [92].

The hospital's design was conceived collaboratively, drawing from a consortium of experts across the health sector, planners, architects, interior designers, and health practitioners. The project team adopted a philosophy during the design process that enabled them to adapt and respond with innovative solutions within the constraints of a functionally driven brief and a highly structured procurement process. A one-team mindset was developed using ECI to enable the best project design solutions to emerge. For example, logistics, interfaces, and constraints that would arise during construction were accommodated. Buildings were constructed concurrently, which enabled multiple concrete pours to be undertaken simultaneously on different facilities' work faces, allowing plant, trucks/pumps, and cranes to be utilized effectively. In addition, recognizing the need to provide functionality, meet the project's schedule, and ensure quality, the managing contractor working with the design team built a series of mock-ups of critical clinical rooms before construction to resolve any potential issues.

The hospital set new standards in green healthcare design at the time of its construction. The project focused on ecologically sustainable outcomes by designing all building services, systems, passive façades, and other building elements with a minimal energy footprint. Energy efficiency was achieved by designing a complementary tri-generation system (i.e., it combined heating, power, and cooling), which provided 4 MW of gas electrical power, 3.2 MW of cooling, and 1.2 MW of heating. The hospital's central energy plant has two continuously running natural gas tri-generation sets and a single diesel generator, as well as the capacity for another if required in the future.

The project's safety record was exemplary, even though the managing contractor faced production pressure. Over ten million person-hours were worked, and the lost time injury frequency rate (LTIFR) at completion was 4.9, which was well below the industry's standard of 13.7. During construction, the managing contractor implemented several occupational health and safety innovations, including the Mates in Construction suicide awareness program, the Incident Free Thinking initiative to create and maintain behavior-based safety, and a Formwork Jump System designed to provide safe access to concrete core construction.

As shown in Table S2, the managing contractor achieved practical completion ahead of time, even though significant scope changes were required, such as introducing neonatal and obstetric services, a new heart and lung transplant operating theater, and an expansion of the ED. Although these changes placed considerable pressure on the managing contractor, the contractor's ability to work collaboratively with the design team resulted from the trust that had been garnered in Stage 1 of the project. State rehabilitation and mental health buildings, which form part of the main hospital, were also added to the project's scope. Rather than modifying the program, the managing contractor decided to de-risk it by progressively completing noncritical buildings simultaneously with those on the critical path.

Stage 1 required the managing contractor to coordinate and deliver the project design, including cost and program advice. By taking responsibility for Stage 1, the managing contractor was able to realize realistic rather than optimistic estimates of cost and time with buildable and practical solutions. An open-book approach kept the State government fully informed of the cost plan, program, and design development through Stage 1. By the end of this stage, over 80% of the subcontract trade packages had been designed, tendered, and submitted for approval, which provided a high degree of cost certainty. The time and cost savings that were made in the project stemmed from the managing contractor's input, and generally emerged from the development of innovative and efficient design solutions, including those described below:

- The tunnel design for services was modified to accommodate the high groundwater table and acid sulfate soils;
- Foundations were redesigned to replace conventional pad footings with *in situ* bored piles;
- Suspended slabs in the ward towers were changed from a conventional reinforced banded slab system to a two-way post-tensioned flat plate, creating additional ceiling space for services.

The managing contractor also managed industrial relations (IR) through open and continuous dialogue with all the stakeholders. Project and senior site managers were responsible for managing IRs on a daily basis, ensuring direct communication with the site workforce and enabling problems to be addressed before they impacted the project. The managing contractor delivered the FSH with zero contractual letters of dispute and zero time extensions, while setting new standards in safety, providing 30 million AUD of additional work incorporated within the original budget, and delivering the project 17 days ahead of schedule.

The two-stage managing contractor model had not been previously tested on such a large complex project in Australia and thus set a new benchmark for best practice. The ability of the managing contractor to deliver a mega-hospital project on budget and ahead of time attracted the attention of private sector clients from the energy and resources sector. Such clients were engaged with delivering several mega-projects and were experiencing cost and schedule increases. Thus, the first author, working closely with a blue-chip oil and gas company, organized a visit for them to the FSH site to learn how the managing contractor successfully delivered such a

complex project. Dialogue between the oil and gas company and the managing contractor ensued after the visit, as there was a drive for best practices to be transferred to a liquified natural gas project that was being constructed.

4.1.3. Failure to consider the end at the beginning: Post-construction woes

Although practical completion was successfully achieved, the FSH experienced major failings soon after its opening, as inadequate attention was "directed towards non-financial issues, such as the quality of services, and a lack of clarity about the scope of services" contracted [93, p. 122]. Due to these failings, the FSH was considered to have underperformed, which led to several public inquiries [93,94]. While outsourcing the facilities management services contract broke new ground for WA, it was not based on sound business. Procurement alternatives were not evaluated to determine where value for money could be achieved; consequently, the contract combined elements of a PPP with traditional outsourcing (Table S2). If a detailed analysis of the procurement options had been undertaken, a PPP model would have been identified as the most expensive option, and the quality of services provided would have been shown to be inferior [94]. Indeed, this occurred in the case highlighted below. The UK's experience in using PPPs to deliver healthcare services typifies the problems in using this procurement option. As noted by Langoulant [93, p. 99]:

> *The absence of a stand-alone business case to underpin the $4.3 billion [Z] contract was the worst case of financial risk taking for the State to be reviewed by the Special Inquirer.*

Sterilization services—which are a clinical service—were inadvertently included in the facilities services management contract [95,96]. Shortly after opening, the contractor was issued two breach notices for sterilization services. In one case, body tissue (i.e., blood and bone fragments) was discovered on sterilized medical equipment, resulting in the contractor being stripped of its contract and fined 60 000 AUD [97,98]. In fact, sterilization should never have been included in the facilities management services contract; it was ludicrous to include a clinical service that directly affected the hospital's operation [93, p. 115]. This incident was just one of many problems that harmed the hospital's functioning, as issues within the facilities management services had not been given due consideration during the formulation of the business case and the design process—particularly the information and communication technology (ICT) systems requirements [94].

Within the first year of opening, ICT systems (e.g., servers, Wi-Fi, mobility devices, storage, and backup) were found to be ineffective. Their reliability and stability came into question as several areas were impacted, such as the digital medical record systems, the intensive care unit's clinical information systems, outpatient processing, and bookings [94,99]. In fact, the problems that manifested could have been mitigated by paying attention at the beginning of the project to the information technology required to operate and maintain the FCH.

4.2. Perth Children's Hospital

The incumbent and opposition political parties in WA recognized the need to replace the 108-year-old Princess Margaret Hospital for Children as a result of a Health Reform Committee's recommendation in 2004. In 2010, the incumbent government announced the approval of a 1.17 billion AUD business case for the PCH and appointed a managing contractor on 1 July 2011. The original estimated completion date for the PCH was 2014, which was considered to be overly optimistic, with Langoulant [93, p. 127] stating:

> *To say that this was ambitious—with the projected opening now being set for mid-2018—would be an understatement. The project has been plagued by one problem after another.*

Construction commenced on 3 January 2012 and was completed in May 2018. The project was three years late, and its final costs remain unknown due to prevailing contractual disputes (Table S2). This misperformance was in stark contrast to the success of the FSH, which was a much larger and more complex project, resulting in Langoulant [93, p. 127] commenting:

> *The curiosity with this project compared with the construction component of the Stadium and Fiona Stanley buildings is why did the Children's Hospital encounter so many difficulties when these two other projects experienced so few.*

In conjunction with Table S2, we provide a timeline of key events from the project's announcement to completion in Fig. 4 [100]. Key issues adversely impacting the PCH's performance included the effectiveness of its governance structure in identifying and responding to risks, quality assurance of the materials and systems to meet required standards, and the risks and benefits associated with granting practical completion.

4.2.1. A case of the winner's curse

When the contract for the PCH was announced in 2011, it came as a surprise to the first author that the State government was using a two-stage managing contractor with a GMP to deliver the project, considering the success of the FSH. Like the FSH, an open-book approach with a minimum of 80% of the trade packages being designed, tendered, and approved was required in Stage 1.

When Stage 2 of the project was announced, the first author had three issues of concern: ① the use of a GMP in a market that was experiencing rapid cost escalation fueled by a demand for energy (e.g., oil and gas) and mineral resources (e.g., bauxite and iron ore); ② the acceptance of a highly competitive bid (there was no room for error in the managing contractor's bid price at the end of Stage 1); and ③ the fact that the managing contractor had never delivered a hospital project of this scale and complexity, as most of the contractor's previous work had been in the area of civil infrastructure construction.

The first author expressed his concerns directly to the incumbent premier via an E-mail in 2011, and a meeting with the Minister of Infrastructure and representatives from the DTF-SP ensued. A meeting held at Parliament House was subsequently organized between the first author, the incumbent Minister of Infrastructure, and representatives from DTF-SP. The concerns of the first author and the suggestion that an alliance (with open-book cost management and the use of a pain-share and gain-share provision) would have been a more effective project delivery route were heard. However, they were discounted by the Minister of Infrastructure, who stated that due diligence had been undertaken and a fixed price was to be used to mitigate the risk of cost increases borne by the State government.

Hearsay about the contractor's low bid, which circulated throughout the local construction industry, was profound, with questions focusing on the contractor's ability to deliver the project without making a loss. In addition, there was a perception that, as the contractor had missed out on being selected for the FSH, preference was given to the contractor in this case to develop its capability to foster competition in the local market in the long term. The acceptance of the contractor's competitive bid by the State government resulted in the contractor squeezing its supply chain on costs.

Faced with cost constraints, the contractor's response was to manage its subcontractors by creating a culture of fear, as the subcontractors became afraid to make claims or speak up about quality issues and their unsafe working conditions [101]. The

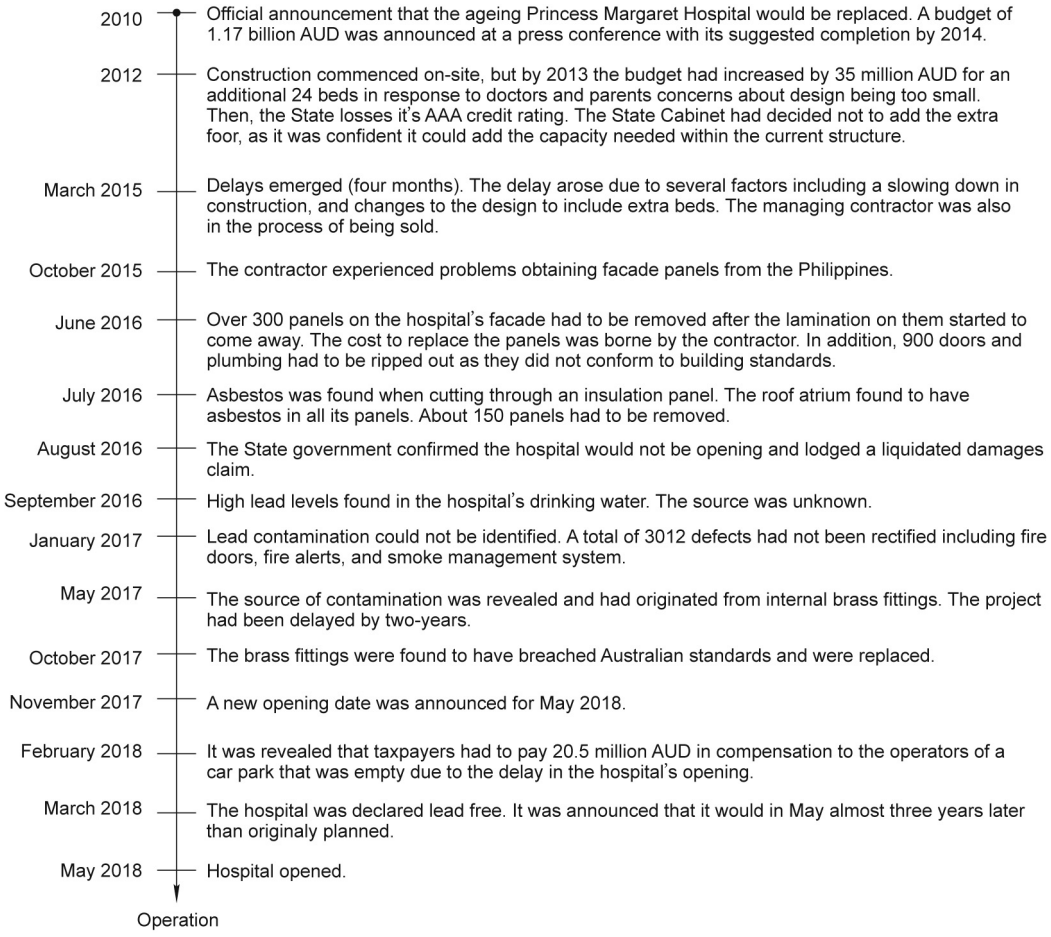

Fig. 4. Timeline of key events for the PCH.

Construction, Forestry, Mining, and Energy Union (CFMEU) was particularly scathing of the contractor, as noted by Roberts [101], who stated:

> *Mr [X] accused head contractor [XYZ], appointed by the previous [XX] government, of cutting costs by using subcontractors that paid below award wages, did not have experience on major projects and used labor hire firms to employ cheap labor such as inexperienced backpackers and foreign workers.*

The concerns of the first author were confirmed several years later by the Public Accounts Committee [100, p. i] in its critique of the State government's management and oversight of the hospital, stating:

> *The State was also aware that [XYZ] submitted an extremely competitive bid with negligible margins when tendering for the PCH project.*
>
> *Under such circumstances, we would have expected the State's governance structures to be attuned to the risks that might be encountered if the project ran into difficulty. Unfortunately, this appears not to be the case. Throughout this inquiry, we have observed a situation where the State's governance processes were consistently falling short of best practice principles. This has undoubtedly undermined the State's capacity to manage the project and the multitude of challenges it presented.*

Hence, the managing contractor fell prey to the so-called "winner's curse" and inadvertently set itself up for failure before the project's commencement by submitting such a low bid, given its limited experience in delivering large and complex hospitals.

4.2.2. Difficulties and confusion: Disorganization

The Public Accounts Committee [100] heavily criticized the PCH's dual governance structure. The PCH Commissioning and Transition Taskforce (referred to herein as "the Taskforce") operated as the lead entity, but the authority for delivering the project was divided between the DTF-SP and the Department of Health, with both sitting on the Taskforce. In this instance, the DTF-SP was responsible for the construction and the Department of Health was responsible for the hospital's commissioning. Indeed, effective governance requires clarity to be established in regard to roles, responsibilities, and accountabilities. In this case, however, confusion over roles and responsibilities materialized, exacerbated by an "unhealthy tension" between the DTF-SP and the Department of Health over four years [100, p. ii].

For a governance structure to function effectively and efficiently, the work-orientation communication network requires continual and exhaustive exchanges between members. In the case of the PCH, this did not occur. The network was impeded, distorted, and misinterpreted; misunderstandings materialized and resulted in social disorganization, where the right hand didn't know what the left hand was doing. In this instance, a "reduction and absorption of risk" occurred, impeding the information flow and preventing the DTF-SP and the Department of Health from unifying their actions toward the common goal of delivering the PCH in accordance with its predetermined deliverables [102, p. 322].

4.2.3. Taking things for granted: Over-optimistic reporting

Issues associated with optimism bias came to the fore during the reporting of the project's progress, although they had no direct

impact on the construction schedule. As the Public Accounts Committee [100, p. 38] stated:

> *It would not be reasonable to suggest that over-optimism and unrealistic expectations were endemic within the PCH project. Indeed, examples of sober assessments from Strategic Projects regarding the status of the construction program are evident in some Taskforce minutes and briefing notes. However, such assessments are interspersed with numerous examples demonstrating unjustifiable optimism at certain critical stages.*

Ministers and public officials repeatedly provided a series of revised forecasts for the PCH's opening date, which were never met. For example, Dr. Treasurer Mike Hahan advised, "it is important to note we are still working towards a phased opening of the PCH this year" [103], and the Health Minister stated, "preparations are well advanced for the opening date later this year" [104]. These statements were indeed misleading. The DTF-SP and the Department of Health "put forward over-optimistic assessments around the timing of key milestones. It appears the relevant ministers at the time often accepted these assessments without challenging the assumptions upon which they were based" [100, p. 37]. The Public Accounts Committee proffered that the optimistic assessments may have resulted from overconfidence, as the DTF-SP and the Department of Health relied solely on a single information source to make a decision, even though they did not possess the knowledge and experience to raise questions [100].

4.2.4. Head in the sand: Quality issues

Even when asbestos-contaminated materials were discovered in the ceiling panels, and there was "an unidentified source of elevated lead in the water supply for two months" (an issue that was not formally reported to the project's Taskforce), the DTF-SP provided overly optimistic practical completion dates [100, p. 39]. At the same time, quality issues associated with installing 900 fire doors, replacing 1600 vitreous enamel cladding panels, and installing 450 m of corroding water piping had not been resolved. The DTF-SP was overly reliant upon the information provided by the contractor about its programs and assurances when formulating an assessment of the project's progress to the Taskforce and the Minister. In sum, the DTF-SP was unable to question the data provided to them with the Public Accounts Committee [100, p. 41] stating:

> *If Strategic Projects were unable to adequately interrogate program data provided by the builder, the procurement model used for this project may well be fundamentally flawed.*

It is widely known that optimism bias results in underestimated risk, which was the case during the progress reporting (i.e., milestones and practical completion) from the DTF-SP to the project's Taskforce and the government. While the DTF-SP had succumbed to over-optimistic reporting, several government departments arrived at the consensus that the managing contractor had "failed to properly manage and supervise the project" [100; 105, p. 3]. Naturally, the managing contractor had a different view and attributed the delays to changes in scope. At the time of writing, the final costs of the PCH remain unknown due to ongoing contractual disputes, with the managing contractor claiming 300 million AUD in compensation and unpaid work.

4.3. New Royal Adelaide Hospital

Like the PCH, the nRAH has been plagued with cost increases, delays, and poor quality. Poignantly, two people were killed during the project's construction. As had occurred with the FSH, health services were found to be compromised after the opening of the nRAH, with poorly performing ICT systems (e.g., electronic patient system) and facilities such as the ED and resuscitation rooms that were too small to use. The Head of the South AMA lamented that "no hospital is an easy project, but we need to acknowledge that the nRAH has had a troubled birth" [106]. Such a comment is also germane to the FSH and PCH.

The 800-bed nRAH was the largest social infrastructure project ever undertaken in Australia. A PPP was used to construct, maintain, finance, and provide non-medical services and equipment. A project agreement covering 35 years was entered into between the State of South Australia (SA) and SA Health Partnership Pty. Ltd. (also known as Project Co) (Table S2). The initial estimate of design and construction costs by Project Co was 1.85 billion AUD in 2011. The original practical completion date was January 2016, but the project was finally handed over in June 2017, approximately 18 months late.

The State issued several default notices using its rights under the project agreement, including failing to achieve practical completion by the contractual due date and failing to adopt best construction practices [107, 108]. Commercial acceptance of the hospital was achieved on 13 June 2017, approximately 14 months later than specified in the project agreement. The hospital opened in September 2017, but defects and disputes remained unresolved, and work (e.g., modifications) was incomplete. The delays with the nRAH arose due to changes and contamination remediation, which resulted in the project's cost increasing by "$346.8 million from $2.094 billion at the financial close in June to $2.441 billion at 30th September 2017" [107, p. 3]. A timetable of significant events influencing the nRAH costs and delays is provided in Fig. 5.

4.3.1. Problems began from the start: Political machinations

In June 2007, the incumbent premier announced a new 1.7 billion AUD medical facility to replace the existing Royal Adelaide Hospital (RAH). The site selected for the nRAH was a defunct railyard. The AMA considered the plan for the new hospital to be visionary in that it would provide a world-class health service to the State. However, a senior group of South Australian medical authorities started a public campaign to save the RAH, considering it preferable to spend the money refurbishing the RAH instead of building a new facility.

Despite persistent lobbying against the construction of the hospital, work commenced at the city's railyards in 2009; however, by the end of 2011, the costs had increased from 1.7 billion to 2.1 billion AUD to cover the risks of labor shortages and design issues. As a result of the increase in estimated costs, lobbyists argued that the actual costs would be closer to 5 billion AUD. The main opposition political party had previously stated that it could rebuild the existing RAH on its current site for half the cost the incumbent government had planned to spend.

Several months after the initial estimate, a revision of 2.1 billion AUD was announced, the AMA determined that the nRAH design did not provide enough room for critical health services such as pathology and clinical research. Although the Department of Health had entered into dialogue with doctors, their concerns were overlooked. Evidence of these concerns was revealed after the completion of the nRAH; as we have already described, the ED and resuscitations rooms were too small. The new State government made the point that the "bungles" were "staggering while parts of the building were not fit for [the] purpose and would have to be re-built" [107].

4.3.2. Site contamination: Unknown knowns

In 2011, the Australian Environmental Protection Authority (EPA) performed an independent audit of the nRAH's site. The railyards were found to be contaminated with diesel and other pollutants. But why had an audit not been completed before the project

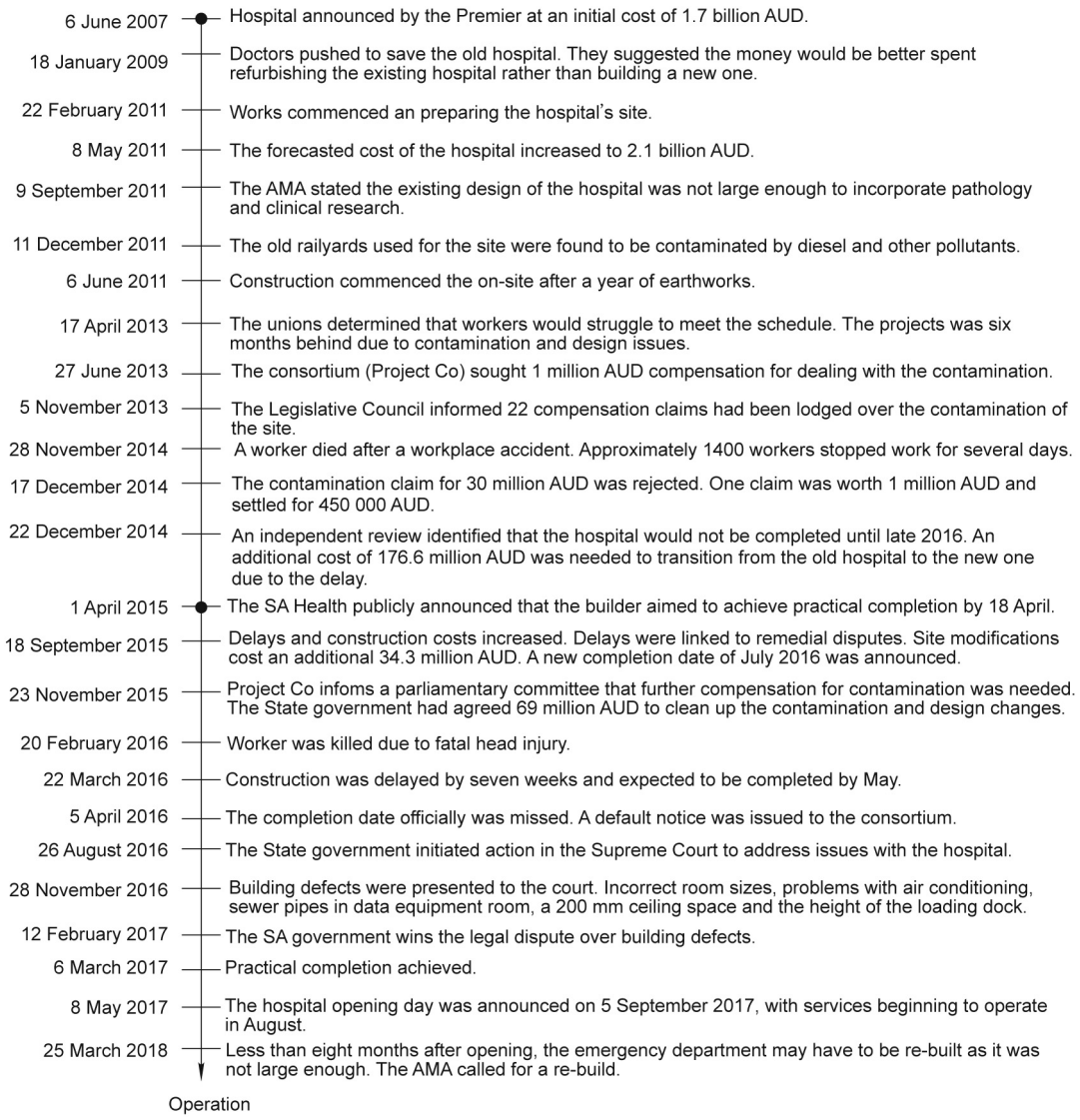

Fig. 5. Timeline of events for the nRAH.

agreement was signed? Knowing that the site was contaminated, the State government should have known the extent of decontamination required *a priori* as part of its business case proposal. Furthermore, issues regarding the costs of decontamination, who was responsible, and whether the site would be safe for a hospital became pressuring matters at the time.

A nominal allowance for decontaminating the site had been made in the budget, and it was expected that the consortium (Project Co) would assume this risk. In June 2013, the consortium made a claim seeking 1 million AUD compensation for dealing with the contamination but was refuted by the State government. By November 2013, a further 22 claims had been lodged over the contamination clean-up for unforeseen remediation costs. In total, a 30 million AUD claim for contamination was submitted, but the State government rejected it and made a counteroffer of 15 million AUD. It was notable that one claim submitted for 1 million AUD was settled for 450 000 AUD.

In November 2015, a settlement of 69 million AUD was made to clean up the contamination and allow for design changes, and the State's share of financing costs payable over the period of the commercial acceptance date was extended. In sum, the scope of the remediation work was significantly more than initially anticipated. Perhaps optimism bias was at play here? Moreover, as the additional costs and delays were incurred, they adversely impacted the transition from the existing building to the nRAH, resulting in an additional 176.6 million AUD being required.

4.3.3. Completion date missed: Default issued and legal proceedings

The original completion date was 18 January 2016, but this was revised under the project agreement and the deed of settlement to 4 April 2016. Unfortunately, this deadline was not met. Therefore, the State government issued a default notice to Project Co. Project Co then provided a new date of the 25 May 2016, but again this deadline was not met. Legal proceedings commenced, which required a realistic date for completion to be provided. Relations between the State government and Project Co began to sour further, with the government feeling that it had been "constantly given the run-around" [109]. Due to the repeated misrepresentations provided by Project Co, the Department of Health failed to finalize its plan to move patients, staff, and equipment from the existing RAH. Moreover, requests for leave from the health staff could not be accommodated due to the uncertainty of the move.

The State government did not trigger the liquidation and ascertain damages clause within the contract to avoid worsening

relations with Project Co, but it did withhold service payments (~1 million AUD per day). As a result, Project Co did not receive any income from the government to service its debts, which required an explanation to its financiers. In addition to the default notice, legal proceedings commenced with the Supreme Court (i.e., a civil trial) regarding the quality of the hospital's construction.

4.3.4. Defects delay practical completion

The Supreme Court visited the nRAH, as the State government had alleged that the size of several rooms was incorrect, the air conditioning (A/C) was not functioning (i.e., six A/C units at the cost of 4.1 million AUD had not been installed), sewer pipes were in the data equipment room (i.e., there was a risk of water ingress), there was a 200 mm ceiling space, and the height of the loading dock was too low (i.e., 700 mm lower than planned). These quality problems held up the practical completion of the hospital.

Despite the quality concerns of the State government, the consortium's contractor had a different view, suggesting that the building was safe and reliable. However, the Supreme Court's decision favored the State, although the judge ruled that some defects, such as the loading dock, could not be remedied and stated that damages could be sought. Thus, it was not possible at that time to enact the court's decision regarding a request for a practical completion date. An agreement between the State government and the contractor was reached to end the legal action, and an arbitrator was appointed to help rectify outstanding contractual issues. Practical completion occurred on 6 March 2017 after lengthy construction delays and protracted legal bickering. A 90-day testing period then commenced, and the hospital finally opened on 8 May 2017.

4.3.5. A pervasive cost saga: Broken promises, but no lies

The nRAH now has a legacy of being the world's third most expensive building, at the cost of 2.44 billion AUD[†] [106], and is the most technologically advanced building in Australia [97]. Despite this accolade, less than eight months after opening, reports began to emerge that the ED would have to be rebuilt and the resuscitations rooms enlarged. As had been determined during construction, the hospital was not fit for its intended purpose [110]. Since the ED was too small, bottlenecks were being created that contributed to ambulance ramping[‡]. The incumbent State government—which was the main opposition party at the time of the hospital's construction—pledged to remedy the problems with the ED in order to provide the best working environment possible for its clinicians. Despite the State government's promises, the ED issues remain unresolved, with overcrowding "causing immediate and significant distress and anxiety to both clinicians and patients" [111].

5. Discussion

By looking into the under-explored settings of mega-hospital projects, this paper offers plausible explanations for their misperformance. We reveal issues such as scope changes, an inability to adapt and respond to risk and uncertainty, ineffectual project management, poor governance, and optimism bias, which combined to adversely impact the performance of the hospitals we have examined. In what follows, we discuss the significance of our findings and then lay out the theoretical and practical contributions of our research.

5.1. Misperformance: Points of difference

All too often, the performance of infrastructure assets at practical completion is determined at that time and the costs and (dis) benefits that materialize during their operation and maintenance ignored [112]. Furthermore, the point of reference for determining cost (under)performance will influence the extent to which deviations may occur [29]. The FSH is a case in point. The media and main opposition party to the government at that time would like taxpayers to believe that the project experienced a cost blowout [113]. For example, the shadow Health Minister Kim Hames stated that "they [the incumbent government] put money into a fund, but remember they started at $400 million, then it was $800 million, then it was $1.2 billion, then it was $1.8 billion" [113].

If we adopt a governance lens to look at project misperformance, then the FSH would have experienced almost a 500%[††] cost increase; its proponents would simply attribute this deviation to behavioral bias and perhaps strategic misrepresentation [68]. In contrast, if we use a project management lens, then the cost deviation would be 13.6%[‡‡] and, as shown above, this was due to scope changes initiated by the State government [29]. Considering the additional changes requested by the State and the delivery of the FSH being completed ahead of time, this phase of the project was an overwhelming success from a cost, time, quality, and safety perspective.

Both the governance and the project management paradigms tend to empirically eschew performance measurement after the completion of construction; thus, they only consider a snapshot of a project's life-cycle (Table 2). Despite the UK's negative experiences with PPPs, PPI continues to be utilized to deliver healthcare assets. Therefore, due consideration must be placed on developing a life-cycle performance management system to ensure that value for money and benefits are realized [29,114].

5.2. Contributors of misperformance in hospitals

The presence of optimism bias (in the cost estimates) and strategic misrepresentation were not identified in the inquiries and were never mentioned during the first author's discussions with the project team members involved in delivering the FSH and PCH. To our knowledge, except for the New Children's Hospital in Dublin (Ireland) [12], no other public inquiry or a commissioned review has identified optimism bias as being as a problem in the cost estimation process of hospital projects. Thus, based on the evidence provided, we can conclude with a high degree of confidence that optimism bias did not positively contribute to the cost increases of the FSH and PCH projects. However, in the case of the PCH, optimism bias was present—not at the business case approval, but instead during the reporting of project progress (e.g., cost and schedule) by the public sector authorities responsible for the hospital's delivery to the State government. Such optimism, we suggest, manifested as a result of overconfidence on the part of the respective authorities, who were unable to correctly assess the knowledge presented yet believed they had the expertise to do so.

The FSH and PCH were procured by the same State government (WA), with the construction and commissioning under the responsibility of the DTF-SP and the Department of Health, respectively. Furthermore, the same procurement method was used to deliver both hospitals. Cost estimates were prepared in a collaborative and open-book environment by the managing contractor with the design team's assistance and approved by the State. There

[†] In the article by Stanowich [97], a cost of 2.1 billion AUD was reported. The final cost was 2.44 billion AUD [106, p. 3].

[‡] Ambulance ramping, also known as ambulance offload delay, which occurs when ambulances are unable to transfer patients to the ED due to a lack of appropriate space.

[††] See Table 2. Original budget (decision-to-build) to cost at practical completion (Table S2).

[‡‡] Difference between contract award and cost at practical completion (Table S2).

was an absence of optimism bias identified in the cost estimates, so why then were the outcomes of these projects so different? Pinpointing specific causal influences is beyond our reach, due to the dynamic and complex interdependencies that prevailed. Putting aside the issues associated with the ICT systems in the FSH, we identify key interrelated issues contributing to the differences in projects outcomes.

The managing contractor selected for the FSH had experience with: ① constructing hospitals, ② working with the government and health department, and ③ the procurement approach. There were some teething problems with the governance structure in the formative stages, which hindered the development of the business case. Of course, problems were bound to arise, due to the project's magnitude and complexity. Yet the project team had experience delivering hospitals and accordingly adapted and responded in unison to problems as they occurred, particularly when scope changes were required. The State's experience and learning from the FSH should have stood it in good stead to deliver the PCH. However, an inexperienced managing contractor was selected. Accordingly, the WA State Government may have knowingly institutionalized and legitimized the so-called winner's curse, which opened the way for the managing contractor to engage in opportunistic behavior.

The governance structures of the FSH and PCH projects were similar, and a project control group was used to manage operational matters. Distinct roles for construction and commissioning were also present in each project. However, the PCH's governance turned out to be a recurring problem, due to the inability of government departments to communicate and work collaboratively. The irony here is that these departments had previously worked well together on the FSH. We can only assume that a perceived power imbalance existed in the governance structure. This imbalance began to widen when construction-related issues (e.g., scope changes, poor quality, and poor management of subcontractors) started appearing in the media, placing the DTF-SP on the defensive as its ability to manage the construction process was questioned. Problems with governance are endemic features of mega-projects [115] and of hospital procurement in general (Table S1). However, establishing balanced reciprocal relationships that encourage collaborative behaviors and engender trust provides a "blueprint" for effective governance [116, p. 351]. Trust was clearly missing in the PCH project.

Around the world, it can be seen that the use of PPPs to procure hospital projects almost always results in the hospitals being delivered over budget, late, and with benefit shortfalls (Table S1). Yet despite the widespread failure of PPPs, the SA State Government still opted to deliver the nRAH using this procurement strategy. The rationale for utilizing a PPP was based on acquiring value for money and the transference of risk to the private sector [117]. In fact, we have seen several state governments expecting contractors to accommodate unforeseen costs not included in their accepted bid [53]. In such instances, margins are not only eroded but may result in a contractor's insolvency [118].

The costs and delays associated with the contaminated site resulted in considerable production pressure on the contractor and in disputes, which fractured relations between the contractor and the government. It was notable that the consortium struggled to raise the finances for its bid but was able to "stitch together sufficient funds" from 25 separate banks [117, p. 5]. Having to account to 25 financers would have placed considerable pressure on the consortium when delays began. When the consortium was faced with production pressure, safety was compromised and quality issues impacted the project's schedule; the contractor's margins were doubtless adversely impacted as well. Nevertheless, the SA State Government's risk-averse mindset provided the milieu for the nRAH's misperformance. The choice of using a PPP to procure the nRAH remains questionable and the ensued benefits "highly contested" [117, p. 7].

Risks in hospital mega-projects should be collectively shared rather than being allocated to either the private or public sector. This leads us to advocate the use of alliancing—or its equivalent in the United States, integrated project delivery (IPD)—for procuring hospital mega-projects. The concept of collective risk-sharing provides a foundation for the characteristics that underpin alliance contracting, including collaboration, a commitment to no disputes, a gain-share and pain-share regime, making best-for-project decisions, and innovation [53,119]. It is outside the scope of this paper to fully describe the nature of alliancing/IPD. However, a detailed explanation of its theoretical underpinning and practical applications can be found in Walker and Rowlinson [120].

5.3. Theoretical implications

We can see from the evidence provided that the conditions influencing the misperformance of the projects are interdependent, complex, and diverse in nature. Accordingly, it would be foolhardy to forcefully attribute our observations from the examined hospital cases to one of the theoretical lenses discussed in Section 2. Nonetheless, considering the literature, the examples of hospital misperformance presented in Table S1, and the cases examined in this paper, we see elements of both the governance and the project management paradigms.

There are no black-and-white explanations for hospital misperformance; rather, misperformance occurs within a grey area, making it difficult to develop robust strategies to mitigate it. Furthermore, the theoretical deadlock that exists between the characteristics of the governance and project management paradigms stymies our ability to make headway in addressing the persistent and recurring problem of project misperformance [31]. Therefore, if strides are to be made to address the project misperformance phenomenon, we must concede that we are dealing with a wicked problem and thus develop a theoretical explanation that can provide a balanced and nuanced perspective.

Acknowledging the need to reconcile the governance and project management paradigms, Ika et al. [31] suggest that this can be resolved not through a process of theoretical simplification, but through one of complexification. In this instance, the management of a project's performance is not trivialized as a system "whose outputs and inputs are connected with a predetermined rule;" instead, it should be viewed as a system changing its "rules of transformation" [121, p. 139]. Therefore, researching project management and performance "requires complex types of inquiry" [121, p. 138]. Attributing the cause of project misperformance solely to behavioral bias and applying RCF to address its likely presence in preparing a cost estimate is akin to having a superficial understanding of a wicked problem. That is to say, we lack theoretical sophistication due to our profound preference for either/or explanations of project misperformance [31]. Indeed, it has been shown that complexity theorizing in project management is not often complex enough to deal with the requisite complexity needed to tackle the challenges encountered in the management of projects [122].

5.4. Practical implications

We cannot discount the presence of optimism bias, as it will exist in some capacity during the decision-making process to procure new or refurbish, renovate, or extend health infrastructure assets. Politics may also come into play during the decision process

as a consequence of so-called pork barreling[†]. Thus, the justification and need for major health infrastructure projects deemed to deliver significant benefits should be rigorously and independently assessed (e.g., by Infrastructure Australia[‡]) to provide decision-makers and communities with confidence that such projects are worthwhile investments. Having a fully transparent system for health infrastructure investments would ensure that money is not wasted on apparently valuable yet rather useless projects that cannot provide significant benefits to the community.

Preventing politicians from putting their political and self-interests first will be an ever-present challenge. Still, an effort by an incumbent government needs to be made to ensure bipartisan support for major new health infrastructure. As part of ensuring transparency, the business case should therefore be openly made available for discussion. Thus, we suggest that a project's business case should be based on a benefit-cost analysis that utilizes a preliminary rather than conceptual design. In addition, such a preliminary design would require input from health professionals and facilities and asset managers in order to better assess the project's scope. Considering a hospital's facilities and assets' management needs at the outset of a project provides a basis to effectively utilize BIM by ensuring information is available to the right person, in the right format, at the right time during the hospital's operation and maintenance.

As mentioned above, we suggest using alliancing for new health infrastructure projects or programs of work. Hospital projects are complex and thus require sophisticated designers and contractors to deliver them. Accordingly, governments, through their health departments, need to be actively involved with their procurement. Alliances have been used extensively by the public sector in Australia, such as to procure economic infrastructure assets (e.g., rail, water, and roads), but are seldom (if ever) used for health projects [94]. Adopting an unknown procurement method such as alliancing/IPD carries more risk than the methods that are already familiar to governments and private healthcare providers (e.g., design and construct, PPP, and two-stage management contracts). However, countless best-practice examples exist on its use in the United States [123]. Hospitals in the United States procured using IPD have been deemed a success—delivered on time and on budget, to the specified quality, and in a safe manner [123].

Learning from best practices is a core tenet of the project management paradigm. In the context of the governance paradigm, however, which relies on RCF to mitigate the risk of optimism bias and strategic misbehavior by probabilistically predicting the likelihood of a cost overrun based on previous outcomes, best practices are ignored, and mediocrity is deployed in the quest for project success.

In essence, alliancing/IPD is an adaptive and flexible (e.g., making it possible to respond to unpredictable challenges) procurement strategy that provides the ability to engender innovation in project teams. Using a joint governance framework (which is best for project decision-making) and establishing a no-blame culture and payments on a cost-plus basis provide a platform for ensuring project success [120]. The collaborative nature of alliances enables design and construction processes to be integrated, and creating an integrated work environment provides the building blocks to enact a digital strategy (e.g., BIM, the Internet of Things, and Industry 4.0) to future-proof a hospital.

Mega-hospital projects have been a source of primary healthcare and services, but their construction, operation, and maintenance place considerable financial strain on governments and taxpayers. With changing demographics and advances in technology, fewer hospital mega-projects may be required in the future, as we see a greater need for "primary and ambulatory care in localised clinics and in the comfort of people's homes" [108]. Thus, hospitals will likely focus on emergency and critical cases, and offer highly specialized care. We are already seeing treatments such as dialysis and chemotherapy[††] being offered at home.

Building a better health system and responding to increased demand for services by promising to build new hospitals are perhaps economically and socially unsustainable in the long term, considering the public's changing health needs, the demand for quality clinical outcomes, and their ongoing costs [124–126]. In the future, rather than building hospital mega-projects, policymakers might consider constructing separate specialty healthcare facilities by using an alliancing (program) delivery model to deliver value, drive innovation, and ensure that predefined deliverables are achieved.

6. Conclusions

Hospital projects are regularly delivered over budget and time, with their benefits being questionable in some instances. However, in the case of cost misperformance, the baseline is often used to determine the extent of the incurred increase. The media, for example, is often drawn to the budget that is announced by a government or given at the time of the decision-to-build, ignoring the fact that the costs of hospitals generally increase due to sanctioned design and scope changes, which may arise due to changing demographics, technological advancements, and an increased need for healthcare services. Unfortunately, we often see the determination of the success or failure of a hospital project to be based on its cost and subjected to trial by the media, predicated on information bias.

In this paper, we have sought to understand hospital project misperformance and address the following research question: *How can we make sense of hospital project misperformance, and what can be done to mitigate its occurrence*? Our paper's theoretical setting centers on two exemplar explanations for project misperformance: namely, the governance and project management paradigms, drawn from the Planning Fallacy and the Hiding Hand, respectively.

Based on our observations and the grey literature (e.g., public inquiries), we examined project misperformance in three hospital mega-projects, one of which has resulted in the third most expensive building in the world. The reasons for project misperformance were found to be complex and interdependent, including issues associated with governance, the selection of inexperienced contractors, the legitimization of the winner's curse, and the inequitable allocation of risk associated with the choice of procurement method. Such contributors are indeed products of the project management paradigm. Markedly, no salient explanations from a governance paradigm were present, although optimism bias did manifest during project progress reporting. However, we cannot discount the governance paradigm in its entirety, as behavioral bias undoubtedly does occur, while being difficult to detect explicitly.

To mitigate cost and time misperformance in hospital mega-projects, we suggest that decision-makers consider using alliances/IPD, as such procurement methods have repeatedly been able to produce deliverables, meet cost and schedule targets, and stimulate innovation. However, there is a caveat. The public sector needs to be actively involved in delivering its hospitals and selecting design and construction teams with proven track records. The assurance of project success is a challenge, as understanding

[†] The utilization of government funds for projects designed to please voters or legislators and win votes.

[‡] More information can be found at: https://www.infrastructureaustralia.gov.au/.

[††] See Medibank's Chemotherapy at Home Trial: https://www.medibank.com.au/health-support/health-services/medibank-at-home/chemotherapy/.

misperformance remains a wicked problem. However, we believe that this problem can be managed through a new theoretical polyphony, which provides a balanced explanation of misperformance.

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Compliance with ethics guidelines

Peter E.D. Love and Lavagnon A. Ika declare that they have no conflict of interest or financial conflicts to disclose.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.eng.2021.10.012.

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