

# The causes of Olympic stadium cost overruns from 2000 to 2020

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## ABSTRACT

The Olympic Games have frequently witnessed cost overruns. Olympic stadiums have drawn significant media attention due to their escalating costs, but lack of systematic documentation. This study aims to identify the causes of cost overruns in Olympic stadium construction over the period 2000–2020 through a qualitative document analysis. These overruns often stem from internal organizational errors. Therefore, we recommend conducting meticulous analyzes and adhering to consistently monitored plans overseen by an independent body.


## KEYWORDS

Causes for cost overruns;  
Olympic stadium; cost  
overrun; Olympic Games;  
COCO-model

## Introduction

The Olympic Games are unique sporting events. They are unlike any other sporting events in their ability to capture the attention of global audiences. More than two billion people watched the Olympic Winter Games in Beijing 2022, underscoring its unparalleled popularity.<sup>1</sup> The Games commence with a spectacular opening ceremony, where the host city is showcased, athletes parade into the stadium, and the Games officially commence amidst the presence of esteemed personalities from across the globe. Over the course of two weeks, media outlets offer extensive coverage, amplifying the Games' reach worldwide. This widespread attention, coupled with the forces of globalization, has cemented the enduring allure of the Olympic Games.<sup>2</sup>

The global prominence of the Olympic Games has shifted the focus of host cities from merely hosting the event to undertaking wider urban transformation for, during, after the Games.<sup>3</sup> These extensive urban developments often result in higher costs than initially projected during the bidding stage.<sup>4</sup> Cost overruns in mega sports events have long been a contentious issue, with particular focus on the costs and overruns associated with Olympic Games, frequently discussed in media and academic literature.<sup>5</sup> Public scepticism regarding the hosting of Olympic Games, coupled with

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<sup>1</sup>IOC, *IOC Marketing Report: Beijing 2022*.

<sup>2</sup>Chappelet, "Managing the Size of the Olympic Games".

<sup>3</sup>Chalkley and Essex, "Learning from the Olympic Games".

<sup>4</sup>Müller, "The Mega-Event Syndrome: Why so Much Goes Wrong in Mega-Event Planning and What to Do About It"; Preuss, Andreff and Weitzmann, *Cost and Revenue Overruns of the Olympic Games 2000-2018*; Preuss and Weitzmann, "Changes of Costs, Expenditures, and Revenues Between Bidding and Staging the Olympic Games from Sydney 2000 to Tokyo 2020".

<sup>5</sup>Flyvbjerg, Budzier and Lunn, "Regression to the Tail: Why the Olympics Blow up"; O'Brien, "Taxpayer Price Tag for Paris 2024 Olympics Could Rise to €3 Billion"; Preuss et al., *Cost and Revenue Overruns*; Reuters, "Cost of Tokyo's New Stadium for 2020 Olympics Rises to More Than £1.3bn"; Wright, "Faster, Higher, Stronger – and Expensive: The True Cost of the Games"; Zimbalist, *Circus Maximus: The Economic Gamble Behind Hosting the Olympics and the World Cup*.

overrunning costs, have prompted numerous failed referendums on the value of hosting such events which lack majority support from the local public.<sup>6</sup>

As the flagship building of any Olympic Games, the Olympic stadium is significantly impacted. It serves as the central venue for the Games, hosting the opening and closing ceremonies and housing the Olympic flame throughout. Thus, the Olympic stadium is frequently regarded as the focal point of the Olympic Games, with the Olympic Park often constructed around it. Consequently, these Olympic stadiums have exerted a considerable impact on urban development, e.g. the implementation of strategies for the further development of a district in terms of public access, the labor market and the housing market.<sup>7</sup> Consequently, every host city constructs or renovates an impressive Olympic stadium, viewing it as a symbol of prestige for the Olympic Games.<sup>8</sup> The decision to invest heavily in infrastructure typically occurs after winning the Games, leading to costs often exceeding initial estimates.<sup>9</sup> The construction of these massive stadiums can breed resentment among the populace, with movements arising to protest against their development. Such projects often burden the local population with unforeseen costs, fostering mistrust in proposals to host the Olympics (e.g. Montreal 1976<sup>10</sup>). Olympic stadiums must meet three fundamental requirements for the population: the initial budget must be adhered to, the stadiums must be sustainable, and a long-term legacy must be established.<sup>11</sup> Stadiums represent a significant social and cultural asset for communities, as they facilitate both active and passive engagement in sporting activities. Hosting major sporting events can also yield positive impacts.<sup>12</sup>

In this paper, we aim to address the systematic examination of cost overruns in Olympic stadiums. Preuss, Andreff and Weitzmann (2019) systematically examined cost overruns in Olympic stadiums from 2000 to 2018<sup>13</sup>, while various other studies have focused on costs and causes of their overrunning in relation to specific editions or stadiums.<sup>14</sup>

Weitzmann and Preuss (2023) have devised a model that organizes the factors behind cost overruns at Olympic Games in a systematic manner.<sup>15</sup> However, the specific causes of cost overruns in constructing or renovating Olympic stadiums have yet to be systematically identified.

## Research aims

This paper aims to meticulously document the causes of cost overruns in Olympic stadium construction or renovation from 2000 to 2020 and integrate them into the Weitzmann and Preuss' (2023) model.<sup>16</sup> The restriction to Olympic stadiums is especially warranted in view of the reduced

<sup>6</sup>Könecke and de Nooij, "The IOC and Olympic Bids from Democracies and Authoritarian Regimes – a Socioeconomic Analysis and Strategic Insights"; Maennig, "Public Referenda and Public Opinion on Olympic Games".

<sup>7</sup>Essex and Chalkley, *Urban Transformation from Hosting the Olympic Games*.

<sup>8</sup>Preuss and Plambeck, "Utilization of Olympic Stadiums: A Conceptual Stadium Legacy Framework".

<sup>9</sup>Preuss et al., *Cost and Revenue Overruns*.

<sup>10</sup>Teixeria and Chatzigianni, "The Olympic Cities of Montreal and Barcelona: A Theoretical Approach to the Impact of Hosting a Mega-Sports Event on Regional Identity in a Multi-National State".

<sup>11</sup>Preuss et al., *Cost and Revenue Overruns*; Preuss and Plambeck, "Utilization of Olympic Stadiums: A Conceptual Stadium Legacy Framework"; IOC, "Electing Olympic and Paralympic Hosts: Targeted Dialogue Explained".

<sup>12</sup>Malfas, Theodoraki and Houlihan, "Impacts of the Olympic Games as Mega-Events"; Tien, Lo and Lin, "The Economic Benefits of Mega-Events: A Myth or a Reality? A Longitudinal Study on the Olympic Games".

<sup>13</sup>Preuss et al., *Cost and Revenue Overruns*.

<sup>14</sup>Müller, "After Sochi 2014: Costs and Impacts of Russia's Olympic Games"; Panagiotopoulou, "The Legacies of the Athens 2004 Olympic Games: A Bitter-Sweet Burden"; Pollalis, *The Roof of the Olympic Stadium for the 2004 Athens Olympic Games: From Concept to Implementation*.

<sup>15</sup>Weitzmann and Preuss, "Key Factors for Cost Overruns at Olympic Games – Establishment of a Model".

<sup>16</sup>Ibid.

complexity, given that the organization of the Olympic Games involves a multitude of different organizations. A differentiated analysis of several Olympic stadiums instead of a single one offers a more comprehensive perspective on the topic, thus enabling the formulation of fundamental and overarching recommendations. The period was chosen because the available literature systematically recorded the cost overruns in the construction and renovation of Olympic stadiums between 2000 and 2020. Furthermore, the International Olympic Committee (IOC) had similar requirements for the size of the stadiums and the scale of the Olympic Games was similar, which means that the requirements for the stadiums are comparable. Through document analysis, the study seeks to answer the following research question: ‘What are the causes of cost overruns in Olympic stadiums and how can these reasons be categorized in the model of Weitzmann and Preuss (2023)?’. The findings aim to offer practical insights for future Olympic Games, aiding in the reduction of cost overruns in stadium construction and renovation endeavours.

## Literature review

### *Recurring problems of Olympic Games*

Since the 1960s, the Olympic Games have transitioned from mere sporting events to significant urban phenomena. This transformation has not only altered sports venues but has also spurred substantial urban development processes.<sup>17</sup>

Advocates of these changes argue that hosting major sporting events can yield positive impacts on cities, regions, and countries. Preuss (2004) illustrates how the Olympics can serve as a catalyst for a city, accelerating infrastructure development by a decade.<sup>18</sup> Gratton, Shibli and Coleman (2005) found that such events can bring economic benefits to their host economies.<sup>19</sup> Moreover, hosting major events can enhance a city’s image and increase community engagement,<sup>20</sup> with consideration of event legacies potentially leading to long-term positive impacts.<sup>21</sup>

However, these positive impacts are counterbalanced by the negative effects of hosting the Olympics, notably including cost overruns and disproportionate infrastructure construction.<sup>22</sup>

Müller (2015) and Flyvbjerg, Budzier and Lunn (2021) have conducted a detailed analysis of the challenges inherent to the organization of the Olympic Games and other large-scale events. In their 2021 study, Flyvbjerg and colleagues identified challenges associated with the Olympic Games. The factors of irreversibility, fixed deadlines, the ‘blank check’ syndrome, tight coupling, long planning horizons, and the ‘eternal beginner’ syndrome ultimately lead to rising costs.<sup>23</sup> Müller (2015) identifies seven event symptoms prevalent at mega-events like the Olympics: overpromising benefits, underestimating costs, event takeover, public risk-taking, the rule of exception, elite capture, and

<sup>17</sup>Essex and Chalkley, “Olympic Games: Catalyst of Urban Change”; Gold and Gold, “Olympic Cities: Regeneration, City Rebranding and Changing Urban Agendas”; Hiller, “Post-Event Outcomes and the Post-Modern Turn: The Olympics and Urban Transformations”; Kassens-Noor, *Planning Olympic Legacies: Transport Dreams and Urban Realities*.

<sup>18</sup>Preuss, *The Economics of Staging the Olympics: A Comparison of the Games 1972 - 2008*.

<sup>19</sup>Gratton, Shibli and Coleman, “Sport and Economic Regeneration in Cities”.

<sup>20</sup>Chalip, “Towards Social Leverage of Sport Events”; Grix, “Image’ Leveraging and Sports Mega-Events: Germany and the 2006 FIFA World Cup”.

<sup>21</sup>Preuss, “Event Legacy Framework and Measurement”.

<sup>22</sup>Preuss et al., *Cost and Revenue Overruns; Papanikolaou, “Athens 2004. Ten Years Later the Olympic Infrastructure, the Cultural Olympiad and the ‘White Elephant’ Syndrome”*.

<sup>23</sup>Flyvbjerg et al., “Regression to the Tail”.

event fixation.<sup>24</sup> In the following, the symptom of *underestimation of costs* is considered due to its relevance to this work.

The Olympic Games from 2000 to 2018 saw an *underestimation of costs*, resulting in final costs exceeding those stated in the bid documents, so-called cost overruns.<sup>25</sup> These costs can be categorized into operational costs, managed by the organizing committee, and capital investments. Operational costs encompass expenses directly associated with event organization, including facility operation (e.g. rental and energy costs), personnel, marketing, and ceremonies. Operational cost overruns from 2000 to 2018 ranged from  $-6\%$  in Sochi to  $+114\%$  in Salt Lake City. Capital investments cover infrastructure construction or renovation, such as stadiums. Cost overruns for capital investments during the same period ranged from  $13\%$  in Vancouver to  $178\%$  in Sochi.<sup>26</sup> Flyvbjerg et al. (2021) analyzed Olympic Games and Olympic Winter Games costs from Rome 1960 to Rio 2016, incorporating sports-related expenses such as OCOG organizational costs and sports infrastructure investments in each edition's total. They observed cost overruns of  $213\%$  for Summer Olympics and  $142\%$  for Winter Olympics, with an average cost overrun of  $172\%$  across all Games.<sup>27</sup>

A systematic analysis pinpointing specific causes of cost overruns in Olympic stadiums has not yet been achieved.

### **Studies on Olympic stadiums and their host cities**

Infrastructure projects garner significant attention in the context of the Olympics as they are typically funded by public resources, with the expectation of delivering long-term benefits to the populace. Olympic stadiums tend to be more expensive for summer Games due to their larger size, requiring around 60,000 seats and a track for athletics competitions.<sup>28</sup> These stadiums host various events including opening and closing ceremonies, athletics, and football matches. Since host cities often lack large stadiums, new constructions are common in preparing for Olympic Games. Conversely, Olympic Winter Games often involve stadium renovations, as they are primarily used for ceremonies rather than sporting events. The IOC reports did not specify stadium capacity requirements for Olympic Winter Games during the reviewed period, but most stadiums typically accommodate around 40,000 spectators.<sup>29</sup>

Existing studies concerning Olympic stadiums or their host cities can be categorized into four main areas of research. Some studies evaluate the bidding process,<sup>30</sup> while others concentrate on the planning phase of the Olympic Games.<sup>31</sup> Additionally, there are ex-post studies analyzing and assessing stadiums or host cities of the Olympic Games.<sup>32</sup> Furthermore, numerous recent studies focus on the post-event use of stadiums.<sup>33</sup>

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<sup>24</sup>Müller, "Mega-Event Syndrome".

<sup>25</sup>Preuss et al., *Cost and Revenue Overruns*.

<sup>26</sup>Ibid.

<sup>27</sup>Flyvbjerg et al., "Regression to the Tail".

<sup>28</sup>IOC, *Games of the XXXI Olympiad Working Group Report*.

<sup>29</sup>Alm, *World Stadium Index: Stadiums Built for Major Sporting Events – Bright Future or Future Burden?*.

<sup>30</sup>Cashman, "When the Bid Party's over: Sydney's Problem of Delivering the Games"; Chalkley and Essex, "Sydney 2000: The 'Green Games?'".

<sup>31</sup>Digby, "This Changing World: The London 2012 Olympics".

<sup>32</sup>Müller, "After Sochi 2014,"; Panagiotopoulou, "The Legacies of the Athens 2004 Olympic Games"; Zimbalist, "The Economic Legacy of Rio 2016"; Searle, "Uncertain Legacy: Sydney's Olympic Stadiums"; The Anti-Corruption Foundation, Sochi 2014: *Encyclopedia of Spending*.

<sup>33</sup>The Olympic Studies Centre, *Over 125 Years of Olympic Venues: Post-Games Use*; Alm, *World Stadium Index*; Preuss and Plambeck, "Utilization of Olympic Stadiums"; Davis, "Avoiding White Elephants? The Planning and Design of London's 2012 Olympic and Paralympic Venues, 2002–2018".

## Stadium development

The publication of studies focusing on the development of stadiums emerged around the turn of the millennium, with a particular emphasis on European football stadiums.<sup>34</sup> In the 1980s, a transformation of the stadiums commenced. Up until that point, a considerable number of stadiums had a functional character and were constructed in a relatively straightforward manner. The objective was to maximize the number of paying spectators in the stadium.<sup>35</sup> The extensive changes towards modern stadiums can be attributed to three main factors. Stadiums were: used as drivers for urban development; were fundamentally redesigned due to safety incidents; and were intended to generate additional income for the club or the owner. These developments are also evident in Olympic stadiums and will now be examined in more detail.

Those responsible for decision-making in urban areas perceived stadiums' potential to serve as catalysts for urban development, and it was anticipated that this would facilitate further development of the corresponding district and the promotion of tourism. Furthermore, decision-makers consider this when bidding for major sporting events. Consequently, stadiums ceased to be regarded merely as sports venues and came to be seen as iconic buildings in their own right.<sup>36</sup>

The tragedies, most notably those that occurred at Ibrox Park, Heysel, Bradford and Hillsborough, which resulted in a significant number of fatalities, led to an increase in security measures, including a reduction in the number of standing places and a transition towards predominantly seated stadiums. In order to accommodate the same number of individuals within a given stadium, it was necessary to adapt the dimensions of the stadium itself.<sup>37</sup>

The financing of these changes necessitated a transformation in the business models of stadiums, with the establishment of hospitality areas contributing to the evolution of stadiums into multifaceted experiences. These amenities also facilitate the organization of events that extend beyond the domain of sport, thereby transforming stadiums into venues for year-round events.<sup>38</sup>

## Cost estimates and final costs for Olympic stadiums

The initial estimates of Olympic Games and stadium costs are typically outlined in the candidature files of future host cities. While some studies have indicated that the final costs of hosting the Olympics surpass these initial estimates, only a handful of academic papers focus relative changes.<sup>39</sup> Preuss et al. (2019) and Preuss and Weitzmann (2023) conducted a pioneering analysis, examining all available data on Olympic Games costs. Their study meticulously analyzed the progression of Organizing Committee budgets and direct infrastructure-related costs from the Olympic Games in Sydney 2000 to Tokyo 2020.<sup>40</sup>

The table below (see [Table 1](#)) presents an overview of the initial budget, adjusted using the price index of the respective year of the Olympic Games, the final cost, and the resulting cost overruns.

<sup>34</sup>Siebold and Klingmüller, "Sports Facility Financing and Development Trends in Europe and Germany 2003"; Paramio, Buraimo and Campos, "From Modern to Postmodern: The Development of Football Stadia in Europe".

<sup>35</sup>Paramio, Buraimo and Campos, "From Modern to Postmodern".

<sup>36</sup>Ahlfeldt and Maennig, "Stadium Architecture and Urban Development from the Perspective of Urban Economics"; Thornley, "Urban Regeneration and Sports Stadia".

<sup>37</sup>Paramio, Buraimo and Campos, "From Modern to Postmodern"; Bulley, "Stadia Development as a Catalyst for Regeneration"; Siebold and Klingmüller, "Sports Facility Financing".

<sup>38</sup>Bulley, "Stadia Development as a Catalyst for Regeneration"; Thornley, "Urban Regeneration and Sports Stadia".

<sup>39</sup>Preuss et al., *Cost and Revenue Overruns*; Müller, "After Sochi 2014"; Panagiotopoulou, "The Legacies of the Athens 2004 Olympic Games".

<sup>40</sup>Preuss et al., *Cost and Revenue Overruns*; Preuss and Weitzmann, "Changes of Costs, Expenditures, and Revenues".

**Table 1.** Estimated costs, final costs and cost overruns of Olympic stadiums from 2000 to 2018.

Olympic stadium	Estimate in candidature file	Final costs	Cost overrun
Sydney 2000	193,900,000 in 1993 USD <sup>a</sup>	690,000,000 AUD <sup>b</sup>	N/A
Salt Lake City 2002 <sup>c</sup>	9,141,000 USD	32,000,000 USD	250%
Athens 2004 <sup>d</sup>	0	398,900,000 EUR	Not calculable
Turin 2006 <sup>e</sup>	0	N/A	N/A
Beijing 2008	246,710,000 in 2000 USD <sup>f</sup>	~428,000,000 USD <sup>g</sup>	N/A
Vancouver 2010 <sup>h</sup>	0	12,094,000 CAD	323% <sup>i</sup>
London 2012 <sup>j</sup>	305,690,000 GBP	429,000,000 GBP	40%
Sochi 2014 <sup>k</sup>	3,635,788,000 RUB	23,009,190,000 RUB	533%
Rio de Janeiro 2016	41,271,000 in 2008 USD <sup>l</sup>	N/A	N/A
João Havelange Stadium Maracanã Stadium	0 <sup>m</sup>	N/A	N/A
PyeongChang 2018	0 <sup>n</sup>	~109,000,000 USD <sup>o</sup>	N/A
Tokyo 2020	1,477,273,000 in 2012 USD <sup>p</sup>	~1,250,000,000 USD <sup>q</sup>	N/A

<sup>a</sup>Sydney Olympics 2000 Bid Limited, Sydney 2000: *Share the Spirit – Candidature File: Volume 2*.

<sup>b</sup>Sydney Organising Committee for the Olympic Games, *Official Report*.

<sup>c</sup>Preuss et al., *Cost and Revenue Overruns*.

<sup>d</sup>Ibid.

<sup>e</sup>Ibid.

<sup>f</sup>Comité pour la Candidature de Pékin aux Jeux Olympiques de 2008, *Beijing 2008 Candidate City – Candidature File: Volume 1*.

<sup>g</sup>Alm, *World Stadium Index*.

<sup>h</sup>Preuss et al., *Cost and Revenue Overruns*.

<sup>i</sup>There were no estimates in the candidature file of Vancouver 2010, the first estimates were made in 2004. These estimates were used as a basis to calculate cost overruns.

<sup>j</sup>Preuss et al., *Cost and Revenue Overruns*.

<sup>k</sup>Ibid.

<sup>l</sup>Rio 2016 Bid Committee, *Rio 2016 Candidate City: Candidature File: Volume 1*.

<sup>m</sup>Ibid.

<sup>n</sup>Pyeongchang 2018 Olympic and Paralympic Bid Committee, *PyeongChang 2018 Official Report: Volume 1*.

<sup>o</sup>Aleem, 'Why (Almost) No One Wants to Host the Olympics Anymore'.

<sup>p</sup>Tokyo 2020 Olympic Games Bid Committee, *Tokyo 2020: Discover Tomorrow: Vol. 1*.

<sup>q</sup>Reuters, 'Tokyo 2020 National Stadium Officially Finished'.

Regarding the stadiums for which Preuss et al. (2019) were unable to furnish costs or cost overruns, expenses at the time of bidding and final costs were gathered from diverse sources. It is important to note that these figures represent the original data from the documents, without inflation adjustments, hence cost overruns cannot be reported.

It is notable that in many cases, the candidature file did not include any costs for the construction or renovation of the Olympic stadium. This was the case in Athens in 2004, Turin in 2006, Vancouver in 2010, and PyeongChang in 2018. In Vancouver, a budget for the stadium renovation was allocated just one year after the city was selected as the host.

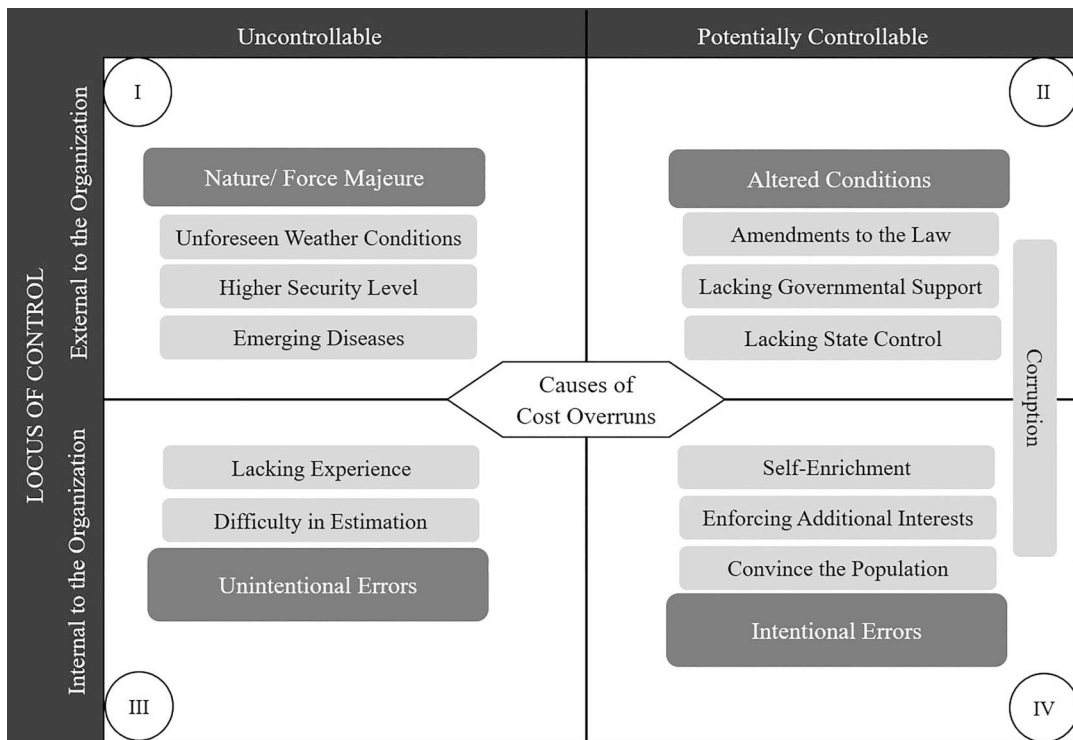
### **Causes of cost overruns-model (COCO-Model)**

One of the few models on Olympic Games cost overruns is by Weitzmann and Preuss (2023) (see Figure 1). A thorough literature review was undertaken, focusing on the causative factors of cost overruns in large-scale projects and Olympic Games.<sup>41</sup>

The model operates within a framework informed by Weiner's attribution theory,<sup>42</sup> which explains the origins of success and failure. In the context of the Olympic Games, exceeding the

<sup>41</sup>Weitzmann and Preuss, "Key Factors for Cost Overruns".

<sup>42</sup>Weiner, "A Theory of Motivation for Some Classroom Experiences".



**Figure 1.** Causes of Cost Overruns (COCO) Model (Source: Weitzmann and Preuss, ‘Key Factors for Cost Overruns at Olympic Games’, 516.).

costs is considered a failure because promises were made to the population during the bidding process that were not kept. In his original theory, Weiner distinguishes between three different dimensions: stability, locus of control, and controllability. Since the renovation or construction of each individual Olympic stadium is designed as a non-repetitive or non-permanent project, the model is limited to the dimensions of locus of control and controllability. The locus of control axis comprises internal factors (e.g. the organization that plans and supervises the construction/operation of the stadium) and external factors (e.g. entities and individuals beyond the purview of the overseeing organization). Likewise, the other axis is controllability and is dichotomized into potentially controllable and uncontrollable factors.

Field I (external – uncontrollable) includes acts of nature and force majeure, like unforeseen weather (e.g. snow, prolonged rain), increased security demands (e.g. post-9/11), and emerging diseases (e.g. coronavirus, Zika virus). Predicting and controlling these cost overruns causes in this field is highly challenging.

Field II comprises causes that lie outside the organization but are deemed potentially controllable. Consequently, accountability for cost overruns is assigned to external entities. Factors such as legislative amendments, insufficient government backing, and lack of governmental oversight are categorized as causes. Given the protracted timelines of major projects, shifts in government can occur, resulting in diminished support, especially financially, for the project.

In fields III and IV, the origins of cost overruns are attributed to the organization overseeing the construction and operation of the Olympic stadium. While the causes may overlap, they differ in their underlying intentions. Errors contributing to cost overruns in both fields encompass

fluctuating inflation or exchange rates, variable material costs, subsequent expenses, project complexity, alterations in scope and design, inaccurate estimations, deficient project management, delays, and unskilled labor.

Uncontrollable causes (Field III) are categorized as unintentional errors, stemming from factors like insufficient experience or the inherent complexity of the estimation process.

Field IV, conversely, houses intentional errors, such as third-party self-enrichment, pursuit of additional interests, and attempts to sway public opinion. This often entails misappropriating Olympic stadiums for extraneous purposes, like incorporating unnecessary infrastructure or misleading the public about lower costs during the bidding process to secure their approval.

Corruption is recognized as a contributor to cost overruns, yet its categorization regarding the locus of control remains ambiguous. While corruption is considered potentially controllable, whether it originates internally or externally within the organization is not definitively established.<sup>43</sup>

## Methodology

Following the presentation of the causal attribution framework for cost overruns in the preceding section, this portion delves into the methodology of this paper. We have limited ourselves to a specific period and one venue for a number of reasons. A comprehensive investigation of the urbanization of the Olympic Games over a longer period of time is not feasible due to the considerable number of entities involved in the project, including the organizing committee, the state, the city, and various other stakeholders. This would result in an unmanageable level of complexity. Due to the already explained prestige effect of the Olympic stadium, we have limited ourselves to this sports venue. The present study has made use of a comprehensive set of data relating to the cost overruns of Olympic stadiums, for which systematic results were available for the period between 2000 and 2020. Furthermore, the number of athletes and sports participating in the Olympics has remained constant since 2000, as has the required stadium size. In addition, the present study includes those stadiums that were built or renovated before the introduction of the IOC reform process.

A qualitative document analysis was conducted utilizing secondary data spanning from the bid phase to the present. Literature searches were conducted across various databases, including the Olympic Studies Centre in Lausanne, Science Direct, BISP-Surf, JSTOR, Google Scholar supplemented by newspaper search via Google News. Search terms comprised 'Olympic stadium' alongside corresponding city or stadium names, as well as 'cost' and 'cost overrun'. To ensure robust findings, official documents and credible reports were utilized as selection criteria. To be included in the analysis, the documents had to contain information on changing costs of the Olympic stadiums and/or emerging events and problems in the construction or renovation of the Olympic stadium. Various documents such as candidature files, official reports, scientific articles as well as websites and news articles were taken into account.

The number of documents considered is listed in [Table 2](#).

In general, there are few official references in the official reports. Similarly, there are few academic articles published on the Olympic stadium during its construction phase. On the other hand, there are significantly more publications on the subsequent use of the stadiums. It can also be seen that there are many newspaper articles during the construction process of Olympic stadiums.

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<sup>43</sup>Weitzmann and Preuss, "Key Factors for Cost Overruns".

**Table 2.** Overview of the sources of the analysis.

Type of source	Number of sources
Newspaper articles	24
Information websites of stadiums, architects, or cities	15
Scientific articles	13
Candidature files	11
Grey literature	9
Official reports	10

In order to determine the causes for cost overruns at Olympic stadiums, the original plans in the bid documents were compared with results found in other sources. These causes were then categorized using the framework proposed by Weitzmann and Preuss (2023).<sup>44</sup> Consequently, insights into the origins of cost overruns emerge, facilitating the identification of potential solutions to mitigate cost overruns in Olympic stadiums.

## Results

The qualitative document analysis reveals a range of factors that contribute to cost overruns in the construction or renovation of Olympic stadiums between 2000 and 2020. Drawing from the model proposed by Weitzmann and Preuss (2023), it is evident that the reasons behind these cost overruns are multifaceted. Upon analyzing eleven Olympic stadiums, cost overrun causes were identifiable across all four fields, albeit with varying frequencies. The qualitative analysis highlights a concentration of cost overrun causes, particularly within the two organization-related fields (uncontrollable and potentially controllable).

Figure 2 illustrates all potential causes of cost overruns identified for Olympic stadiums, mapped onto the COCO-model. Each reason from the model is represented by a letter (A-L). The size of the circle is indicative of the frequency with which each cause has been identified in relation to cost overruns at the various Olympic stadiums. The localization of the letter within a field has no significance.

### **Field I – external to the organization and uncontrollable**

In field I, some factors may be localized. With respect to unanticipated weather-related occurrences, additional labor was required and construction was subject to delays in Vancouver 2010 and in London 2012. In Vancouver, the stadium roof was severely compromised by a storm and heavy snow fall in the period preceding the Olympic Games, necessitating extensive repair work.<sup>45</sup> In London, protracted periods of precipitation resulted in delays to construction activities, as the prevailing conditions were so adverse that work could not proceed as scheduled.<sup>46</sup>

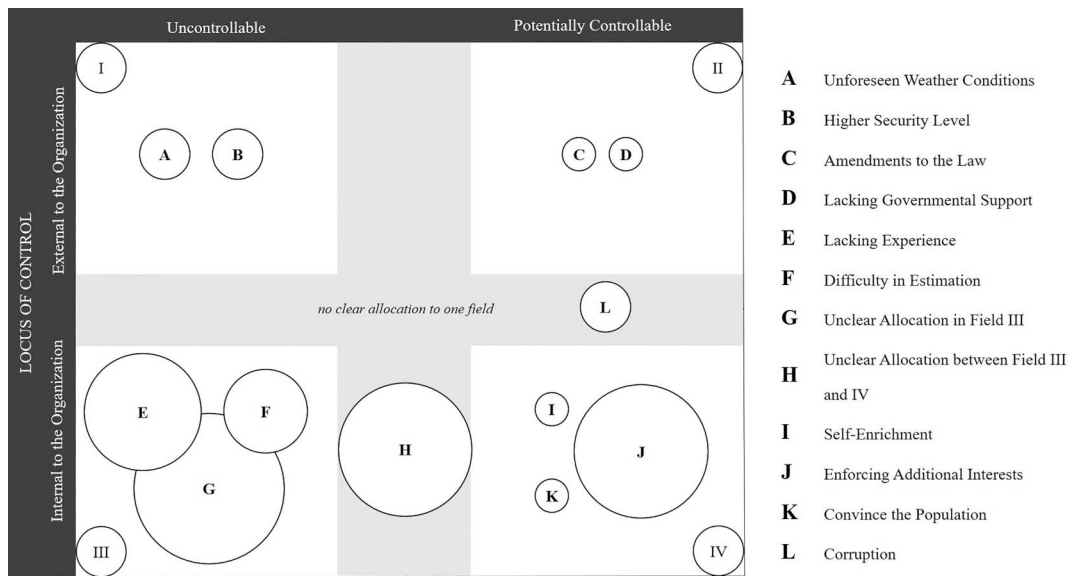
Furthermore, the necessity for enhanced security measures was identified as a contributing factor to elevated expenditure at two stadiums. Following the New York terrorist attacks in Salt Lake City 2002, additional costs were incurred, resulting in further expenditure.<sup>47</sup> Moreover, this was

<sup>44</sup>ibid.

<sup>45</sup>Eifling, "The Original Quote for Vancouver's \$514 Million Stadium Renovation Was a Mere \$100 Million"; BC PavCo, "Information Bulletin: BC Place Revitalization Final Cost".

<sup>46</sup>IOC, *Final Report Of the IOC Coordination Commission: Games of the XXX Olympiad*, London 2012.

<sup>47</sup>CNN, "Winter Games Open with Celebration of American Heroes".



**Figure 2.** COCO model applied to Olympic stadiums between 2000 and 2020.

also a prerequisite for Turin 2006. The standard security requirements were not fulfilled at the stadium.<sup>48</sup>

The final factor considered in this field pertains to diseases that may potentially influence costs. The present study has identified that this cause was not identified as a cost driver for any of the stadiums.

### **Field II – external to the organization and potentially controllable**

Only in Sydney 2000 were external causes recognized and deemed potentially controllable. Significant emphasis was placed on addressing environmental concerns to ensure the site was cleaned and maintained green.<sup>49</sup> Due to the environmental emphasis, the implementation involved the participation of the non-profit organization Greenpeace.<sup>50</sup> Greenpeace's involvement resulted in the introduction of new requirements for the construction of the Olympic stadium, which can be categorized as an adjustment to existing legislation.

Similarly, two state elections occurred between the decision to host the 2000 Olympic Games in Sydney and the actual event, potentially impacting the government's support for the Games.<sup>51</sup>

### **Field III – internal to the organization and uncontrollable**

In field III, numerous causes of cost overruns were identified. In eight of the ten stadiums analyzed, the organization itself was responsible for cost overruns that could be classified as uncontrollable, many of which stem from inadequate analysis or bad management.

<sup>48</sup>Manens-Tifs, "Olympic Stadium".

<sup>49</sup>Chalkley and Essex, "Sydney 2000"; Myer and Chaffee, "Life-Cycle Analysis for Design of the Sydney Olympic Stadium"; Searle, "The Long-Term Urban Impacts of the Sydney Olympic Games"; Sydney Organising Committee for the Olympic Games, *Official Report of the XXVII Olympiad: Volume One – Preparing for the Games*.

<sup>50</sup>Cashman, "When the Bid Party's over".

<sup>51</sup>Ibid.

As seen at the Olympics in Beijing in 2008, Vancouver in 2010, Rio de Janeiro in 2016, PyeongChang in 2018 and Tokyo in 2020, a lack of experience has led to higher costs. In Beijing, significant challenges of a technical and architectural nature were identified, with the objective of contributing to sustainability. The actual stadium design underwent significant changes compared to the original sketch, appearing more futuristic and abstract to meet seismic requirements and offer optimal viewing for visitors.<sup>52</sup> In Vancouver, the decision was taken to hold the medal ceremonies in the Olympic stadium, as this provided superior images for television broadcasting.<sup>53</sup> In Rio criticisms were directed at the poor pre-bid analysis of the only ten year old stadium roof, revealing structural weaknesses necessitating renovation for the 2016 Olympic Games.<sup>54</sup> A comparable situation materialized in PyeongChang. Initially, the ski jumping hill was designated as the venue for the opening and closing ceremonies. However, it was subsequently determined that this location was not conducive to the successful execution of the opening and closing ceremonies, necessitating the construction of a temporary stadium that would be exclusively dedicated to this purpose.<sup>55</sup> In Tokyo, it was also determined that the summer heat was unbearable for spectators and athletes. This finding led to the decision to install air conditioning in the stadium.<sup>56</sup>

In addition to a paucity of experience, a number of Olympic stadiums have encountered difficulties in estimates. This was evident in the case studies of the Beijing in 2008, Sochi in 2014, Rio in 2016 and Tokyo in 2020 Olympic stadiums. The scarcity of material in Beijing necessitated the utilization of alternative materials.<sup>57</sup> The rising costs of materials and labor experienced in Tokyo contributed to the overall increase in costs.<sup>58</sup> The economic downturn that occurred beforehand in Brazil and Russia, known as a ‘recession’, resulted in escalating costs for the Olympic Games in Sochi in 2014 and Rio in 2016.<sup>59</sup>

In the third field, there are some causes that cannot be clearly assigned to a lack of experience or to the difficulty of making estimates. The failure of financing plans for the stadium in Sydney in 2000 and Rio in 2016 to materialize resulted in increased costs.<sup>60</sup> A frequent cause of cost overruns is the delay or insufficient time frame for construction processes. This phenomenon has been documented in a number of cities, including Sydney 2000, Athens 2004, Beijing 2008, London 2012, and Tokyo 2020. The necessity to complete the stadiums on time, due to

<sup>52</sup>Beijing Organizing Committee for the Games of the XXIX Olympiad, *Official Report of the Beijing 2008 Olympic Games: Volume 1*; Rayner, “Beijing Olympics”; Beijing Organizing Committee for the Games of the XXIX Olympiad, *Official Report of the Beijing 2008 Olympic Games: Volume 3: Preparation for the Games: New Beijing Great Olympics*; World Construction Network, “Beijing National Stadium”.

<sup>53</sup>Vancouver 2010 Organising Committee, *VANOC Official Games Report*.

<sup>54</sup>ESPN, “Rio’s Olympic Stadium Closed Til ’15”; World Architecture News, “Rio Olympic Stadium Closed for Repair”.

<sup>55</sup>Badalge, “The 2018 Winter Olympics Stadium That Cost \$100 Million to Build, Will Only Be Used 4 Times, and Is Roofless”; The Pyeongchang Organising Committee for the XXII Olympic Winter Games, *PyeongChang 2018 Official Report: Volume 1*; Zaldivar, “2018 Winter Olympics Preview: Cost, Safety and Politics”; Shane, “As the Olympics End, South Korea Asks: Was the Cost Worth It?”; Aleem, “Why (Almost) No One Wants to Host the Olympics Anymore”; Weber, “Here’s What Pyeongchang Looks Like Now”; Eaton, “It’s Time for Pop-up Olympics”; ESPN, “Costly Pyeongchang Olympics Venues Could Eventually Be Razed”.

<sup>56</sup>The Tokyo Organising Committee of the Olympic and Paralympic Games, *Tokyo 2020 Official Report – Volume 1*; Reuters, “Tokyo 2020 National Stadium Officially Finished”.

<sup>57</sup>World Construction Network, “Beijing National Stadium”; Beijing Organizing Committee for the Games of the XXIX Olympiad, *Official Report*; TravelChinaGuide, “National Stadium (Bird’s Nest)”.

<sup>58</sup>The Tokyo Organising Committee of the Olympic and Paralympic Games, *Tokyo 2020 Official Report – Volume 1*; Mackay, “Construction Work on Olympic Stadium for Tokyo 2020 Completed”.

<sup>59</sup>Mankoff, *Russian Economic Crisis*; International Monetary Fund, *International Financial Statistics Yearbook 2015*; The Anti-Corruption Foundation, Sochi 2014; Watts and Douglas, “Rio Olympics: Who Are the Real Winners and Losers”.

<sup>60</sup>Searle, “Uncertain Legacy”; The Audit Office of New South Wales, *Performance Audit Report: The Sydney 2000 Olympic and Paralympic Games: Review of Estimates*; Nationalpost, “Track and Field Stadium for Rio 2016 Olympics Goes Dark over Reported \$250,000 in Unpaid Bill”.

the fixed date of the Olympic Games, resulted in the utilization of additional financial resources.<sup>61</sup>

#### **Field IV – internal to the organization and potentially controllable**

In the realm of potentially controllable causes within the organization, various factors were identified, spanning all three causes in this field: self-enrichment, enforcement of additional interests, and influencing the population.

In Sochi 2014 President Vladimir Putin aimed to leverage the Olympic Games to develop the southern region of Russia, presenting the country as ‘great, new, and open’. He wanted to show the world that Russia was a world power, and he wanted this legacy to be his, what is attributable to self-enrichment.<sup>62</sup>

The construction of Olympic stadiums has often been used to enforce other interests. For example, the construction of the Olympic stadiums in Sydney in 2000, Salt Lake City in 2002, Athens in 2004, Vancouver in 2010, London in 2012, Sochi in 2014 and Rio in 2016 served as a means of urban and regional development. The stadium in Sydney was built bigger than originally planned, but in the end, there was no demand for such a large stadium.<sup>63</sup> The construction of the new stadiums in London and Sochi was supposed to lead to urban or even regional development.<sup>64</sup> In Salt Lake City and Vancouver, the existing stadiums underwent major renovations in preparation for the Olympic Games. These renovations would not have been undertaken to the same extent without the Olympics and had the aim of leaving a lasting impact on the city. As a result, the stadiums were returned to good condition.<sup>65</sup> In Athens, a large investment was made in the construction of a roof. The short-term nature of the planning and construction caused costs to spiral. Additionally, the area around the stadium was upgraded to enhance the central meeting point of the Olympic Games.<sup>66</sup> In Rio, the station at the Engenhão stadium was renovated as it was considered the central station for the Olympic Games. The renovation focused on increasing capacity and making the station accessible.<sup>67</sup>

Lastly, in London, a bid was made to convince the public that hosting the Olympics was a good decision and that it could be financed. As soon as the Games were awarded, the original plans were discarded, because adjustments were made to the Olympic Games and Olympic stadium plans.<sup>68</sup>

#### **Indeterminate factors**

In addition to the reasons outlined in field III (internal to the organization – uncontrollable) and field IV (internal to the organization – potentially controllable), there are factors that could not be

<sup>61</sup>Sydney Organising Committee for the Olympic Games, *Official Report*; Panagiotopoulou, “The Legacies of the Athens 2004 Olympic Games”; Pollalis, *The Roof of the Olympic Stadium*; World Construction Network, “Beijing National Stadium”; TravelChinaGuide, “National Stadium (Bird’s Nest)”; Beijing Organizing Committee for the Games of the XXIX Olympiad, *Official*; IOC, *Final Report Of the IOC Coordination Commission: Games of the XXX Olympiad*; Mackay, “Construction Work on Olympic Stadium”.

<sup>62</sup>Müller, “After Sochi 2014”; The Anti-Corruption Foundation, Sochi 2014.

<sup>63</sup>Searle, “Uncertain Legacy”.

<sup>64</sup>Digby, “The Legacy of the 2012 Games”; Müller, “After Sochi 2014”; The Anti-Corruption Foundation, Sochi 2014.

<sup>65</sup>Lee, “Economic Impact of 2002 Olympics Still Felt”; Vancouver 2010 Organising Committee, *VANOC Official Games Report*.

<sup>66</sup>Pollalis, *The Roof of the Olympic Stadium*; Athens 2004 Organising Committee for the Olympic Games, *Official Report of the XXVIII Olympiad: Athens 2004: Volume 2: The Games*; Beriatos and Gospodini, ““Glocalising” Urban Landscapes: Athens and the 2004 Olympics”; Paphitis and Tongas, “Athens Olympic Site in Ruins 10 Years on from 2004 Games”.

<sup>67</sup>Brazil Olympic Committee, *Rio2016 Official Report: Vol. 1: Organisation*; Gibson, “Olympic Stadium Costs Soar to More Than £600m After Roof Complications”.

<sup>68</sup>Gibson, “Olympic Stadium Costs Soar to More Than £600m After Roof Complications”.

definitively categorized into fields III or IV, as it remained unclear whether these discrepancies stemmed from unintentional errors or intentional actions to fulfil various objectives.

These include design alterations at the stadium in London 2012 and also the fact that the original plan to erect a temporary athletics stadium was rejected. Instead, the proposal to construct a world-class, multifunctional arena was endorsed.<sup>69</sup> During the preparatory phase for the construction of the stadium in Tokyo, it became evident that the costs would increase substantially. In response to the prevailing sentiment of the populace, it was resolved to erect a more economical stadium in 2015 that would remain within the initially allocated financial parameters.<sup>70</sup> The construction of the stadium in Sochi involved modifications to the roof,<sup>71</sup> while the construction of the stadium in Beijing placed significant emphasis on environmental considerations.<sup>72</sup>

In the case of the existing stadiums in Salt Lake City in 2002, Turin in 2006 and Vancouver in 2010, upgrades to the stadiums that were added during the preparation phase led to higher costs. However, the precise localization of these increased costs remains uncertain. In Salt Lake City, it became evident during the preparation phase that the stadium's materials were outdated. Consequently, a comprehensive renovation of the university campus stadium took place.<sup>73</sup> The stadium in Turin, which was selected in the bid documents as the venue for the opening and closing ceremonies, was replaced due to its inadequate size for the purpose. Consequently, the Stadio Olimpico (formerly Stadio Comunale) underwent reconstruction to serve as the Olympic venue.<sup>74</sup> The reconstruction included adding a new roof and enhancing stadium security.<sup>75</sup> The stadium in Vancouver has undergone significant renovations, with the seating capacity being increased as an example of such modifications.<sup>76</sup>

Corruption, both internal and external to the organization, is classified as potentially controllable. In Sochi in 2014 and Rio in 2016, corruption emerged as a significant driver of increased costs in Olympic stadium construction and renovation.<sup>77</sup>

## Discussion

Based on the available findings it can be seen that each stadium has different causes for cost overruns and that internal causes are increasingly cited for escalating costs. However, the question of whether the quantity of causes also correlates with the severity of cost overruns remains unanswered, as the available results are insufficient to provide a definite response. This uptick in internal causes may stem from several factors. Firstly, not all causes of cost overruns are publicly disclosed, particularly when they originate outside of the organizing committee. Additionally, the organization itself may bear greater responsibility for overrunning cost due to

<sup>69</sup>London Organising Committee of the Olympic Games and Paralympic Games Limited, London 2012: *Olympic Games Official Report*; Gibson, "Olympic Stadium Cost Rises to £701m from Initial £280m Estimate".

<sup>70</sup>Mackay, "Construction Work on Olympic Stadium".

<sup>71</sup>BBC, "Sochi 2014".

<sup>72</sup>Beijing Organizing Committee for the Games of the XXIX Olympiad, *Official Report*; World Construction Network, "Beijing National Stadium".

<sup>73</sup>Utahutes, "Rice-Eccles Stadium".

<sup>74</sup>Juventus Football Club, "Previous Juventus Stadia"; Turin Organising Committee, *XX Olympic Winter Games Torino 2006*.

<sup>75</sup>The Stadium Guide, "Stadio Olimpico Di Torino".

<sup>76</sup>Vancouver 2010 Organising Committee, *VANOC Official Games Report*; Alm, *World Stadium Index*; CTV News Vancouver, "Calculating the True Costs of the 2010 Olympics"; Tomalty, "The Legacy of the 2010 Winter Olympics in Vancouver".

<sup>77</sup>The Anti-Corruption Foundation, Sochi 2014; Bowring, "5 Reasons Why Sochi's Olympics May Be the Most Controversial Games yet"; Müller, "After Sochi 2014"; Watts and Douglas, "Rio Olympics".

inadequate pre-analysis and deliberate actions aimed at garnering public support for hosting the Olympic Games.

Weitzmann and Preuss (2023) have advanced the following three proposals with a view to minimizing Olympic Games' cost overruns: (1) 'Reviewing the future host city in terms of extreme weather conditions, security issues, political stability, experience in hosting mega (sport) events, government attitude towards sporting events, and support of population in hosting Olympic Games, (2) stronger support of IOC towards host city, and establishment of a special team from the IOC at each organizing committee of Olympic Games, and (3) monitoring by an independent organization of the entire planning and implementation process'.<sup>78</sup> Furthermore, Müller (2015) and Flyvbjerg et al. (2021) have identified additional issues pertaining to the organization of the Olympic Games.<sup>79</sup> The IOC's New Norm process is a comprehensive framework that incorporates numerous proposals addressed by Weitzmann and Preuss (2023), Flyvbjerg et al. (2021) and Müller (2015). A key aspect of the process is the delineation between a strategic and a technical evaluation. The strategic evaluation encompasses a thorough analysis of the country's background, political context, environmental factors, and socio-economic situation. In contrast, the technical evaluation involves a detailed examination of existing infrastructure, security provisions, links to existing long-term development plans, and the availability of political, private, and public support. The designated motto for prospective host cities is '*Games should adapt to the host, not the host to the Games*'.<sup>80</sup>

A number of the findings from Weitzmann and Preuss (2023), Flyvbjerg et al. (2021) and Müller (2015) can be applied to the construction or renovation of Olympic stadiums. Prior to the submission of any applications, it is imperative to undertake a comprehensive analysis of the stadium in question, with the objective of ascertaining its present condition. This process necessitates a thorough examination to determine the stadium's suitability for a major sporting event, such as the Olympic Games. Subsequent to this, it is essential to ascertain the future utilization of the stadium, extending beyond the Olympic Games. To this end, it is imperative to determine the local demand. The question of whether a sports-focused stadium is sufficient, or whether the city requires a multipurpose arena, or if the stadium is part of a broader urbanization process, is pivotal in informing these considerations. In such processes, the provision of support and guidance by the IOC is an essential element, which is now to be implemented through the process of the New Norm. It is imperative that this process also addresses the necessary infrastructure. Key questions that must be addressed include the stadium's suitability in its current state and any further development requirements. The consideration of past results is of paramount importance in this regard. This approach assists in mitigating the so-called 'eternal beginner syndrome', as articulated by Flyvbjerg et al. (2021), by ensuring that the accumulated knowledge from prior Olympics is integrated into the entire process. Concurrently, this approach would serve to mitigate the risk of underestimating costs, which Müller (2015) identifies as significant of mega event syndrome. These recommendations have so far been taken into account in the New Norm by the IOC.

In conjunction with the dialogue process, it is recommended that an autonomous institution be commissioned to supervise the process from commencement to conclusion, underscoring the importance of minimizing unintentional and intentional errors. This approach is not yet included

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<sup>78</sup>Weitzmann and Preuss, "Key Factors for Cost Overruns".

<sup>79</sup>Müller, "Mega-Event Syndrome,"; Flyvbjerg et al., "Regression to the Tail".

<sup>80</sup>IOC, "Electing Olympic and Paralympic Hosts: Targeted Dialogue Explained".

in the New Norm process. However, a similar approach was taken in Sydney in 2000 and London in 2012. Flyvbjerg et al. (2021) posit that extended planning horizons are a contributing factor to cost overruns. Prior to the implementation of the New Norm, the selection of a host city was undertaken seven years in advance of the Olympic Games. However, the selection of Brisbane as the host city for the 2032 Olympic Games was made in 2021. This represents an extension of the previous time-frame. The question of whether this extended period will result in greater cost overruns remains to be answered.

In addition to this planning, it is imperative to specify the consequences of any alterations to the previously defined objectives throughout the course of the project. Such alterations to the objectives may result in adjustments to the scope of the stadium project, potentially leading to increased costs. It is therefore essential to establish the individuals or organizations who have the authority to make such decisions and to whom the responsibility for any ensuing consequences will be assigned. The government should not provide a blank cheque. It has been demonstrated that the avoidance of cost escalation was indeed feasible in Tokyo. This mitigates the issue of public risk-taking that Müller (2015) highlighted.

In summary, precise planning for Olympic stadiums is crucial for both new constructions and renovations, and this will be facilitated through the IOC's new dialogue process. This approach will enable the integration of existing knowledge from past planning processes into future plans. Establishing a dedicated team within the IOC for this purpose is imperative. It is also imperative to ascertain the parties liable for any cost overruns and to establish a protocol for their management. Overall, it is important that the guiding principle should be that the Olympic Games adapt to the host city, not vice versa. These collaboratively developed plans must be consistently upheld by an external monitoring organization.

Given the complexity of the Olympic Games, this paper has focused solely on cost overruns in stadium construction and renovation. The next phase could involve analyzing other infrastructure projects or one single edition of Olympic Games. While qualitative document analysis provided valuable insights, further information could be gleaned through methodological expansions like qualitative expert interviews. In doing so, factors could be identified that show a stronger correlation with the severity of the cost overrun. Additionally, applying the model of Weitzmann and Preuss (2023) to projects beyond the Olympics or sports context is conceivable.

The results presented here offer a pathway to mitigate cost overruns in Olympic stadium construction and renovation within a comprehensive framework. However, a holistic approach is indispensable to minimize risks. While the IOC has made strides in addressing certain aspects. Although, the new dialogue process has been the subject of criticism with regard to its transparency. Consequently, further modifications are imperative to enhance the predictability and management of the costs associated with the Olympic stadiums. The subsequent years will demonstrate the extent to which the implementation of the New Norm will result in the Olympics exceeding, or not, its budgetary limits.

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## Disclosure statement

No potential conflict of interest was reported by the author(s).

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