How Airports Govern Construction

Lessons Learned in Project Governance

By

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2025

Ethics International Press, UK

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

ISBN (Hardback): 978-1-80441-944-1

ISBN (Ebook): 978-1-80441-945-8

Aknowledgments

We would like to acknowledge and thank our families for their support and encouragement throughout the process of writing this book.

We would also like to acknowledge and thank the following individuals for supporting our research, providing critical feedback, as well as encouraging and motivating us to complete this book: Maureen Riley, Robert Alfert, Cindy Nichol, Dr. Greg Marshall, Dr. Koray Simsek, Dr. A.E. Folk, Dr. Nana Amoah, Marsha Stone Wurster, Bill Wyatt, Stan Thornton, Phil Brown, Jack Christine, John Buckner, Ghizlane Badawi, Christopher Lee, Anthony Brindisi, and Ashley Chang. Dr. Block would also like to thank Consertus Inc. staff who supported the review of data and exhibits: Derek Hennessey, Maegen Ayala, Sarah Stumpo Hyre, Jose Gonzalez, and Travis Sanderfer.

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Introduction

Construction spending in the United States of America (USA) is a significant element of its economy, totaling $2.1 trillion annually,[1] of which $92.7 billion is spent on transportation projects. Airport construction is a subset of the transportation construction sector, with forecasted construction spending for the period 2023-2027 estimated at $151 billion;[2] about a third of current annual transportation sector spending. The total volume of airport construction spending is forecast to accelerate as a consequence of expected growth alongside the need to replace aging facilities reaching the end of their useful lives: depreciation for airport facilities has increased from $6 billion to $8 billion annually between 2012-2020 and is expected to continue increasing[2].

In addition to the existent (and projected) high levels of airport construction spending, airports themselves impact much of the American economy; in 2023 they created 11.5 million jobs, contributed $1.7 trillion of economic activity, and transported 1.3 billion passengers.[3]

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1 US Census Bureau, Construction Spending Data; total construction including private and public sector in September 2024

2 Airports Council North America (ACI-NA) "2023 U.S. Airport Infrastructure Needs Report: Growing Needs Heighten Urgency to Modernize America's Airports"

3 *Ibid*.

Airport construction projects are large, often exceeding $1 billion in value (mega projects), and are complex. They incorporate a wide range of asset types, are often built adjacent or within existent operating facilities, and require extensive security and safety measures. Research conducted by Miller and Hobbs[4] noted that mega projects can take several years to develop into executable forms as a consequence of budgets, scheduling, funding, and regulatory approval (internal to airport organization, as well as with regard to external local, state, and federal agencies). Miller and Hobbs defined the period from inception to the point where (a given) mega project is approved to be implemented as the "shaping" period; they found that, on average, this takes 3 years to reach and costs $120 million, as shown in Figure 1.

[4] Miller, R & Hobbs (2005) "Governance Regimes for Large Complex Projects", *Project Management Journal*, 36(3), pp. 42-50.

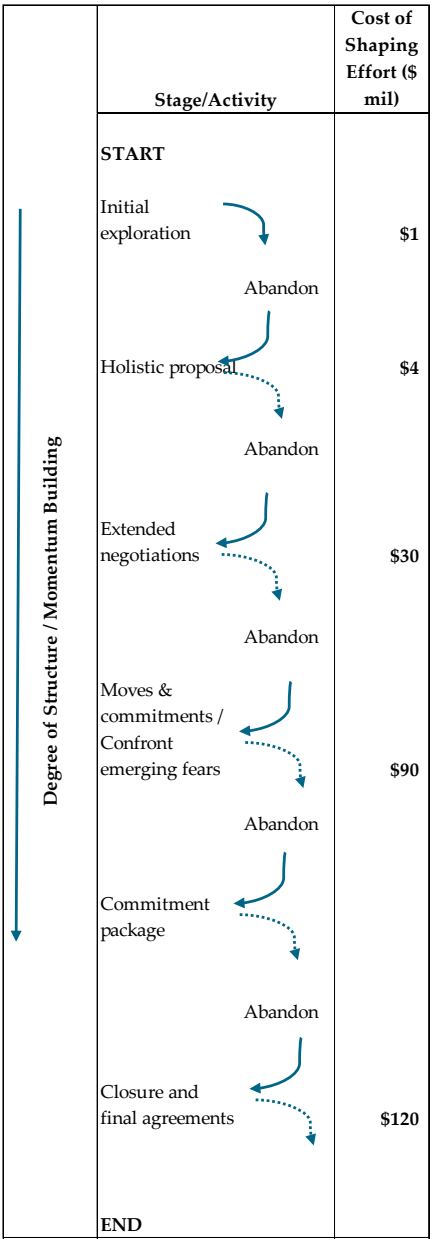

Figure 1 *Project Shaping*

In addition to the high cost of project shaping, Miller and Hobbs found that gaps exist between owner-organization's idealized governance structures and the actual conditions used to control actual project delivery conditions. Although Miller & Hobbs's research did not include mega projects within the USA, similar examples are found within US aviation. For example, the origins of the $3.8 billion Terminal C project that opened in the fall of 2022 can be traced back to 1997, when the Greater Orlando Aviation Authority (GOAA) approved a design which totaled $57 million and an initial (smaller) version of this project with a budget totaling $323 million.[5,6] The lengthy shaping period for Terminal C was driven by extensive air carrier negotiations coupled with the events of 9/11 which sharply curtailed air passenger travel for several years, making this project not viable. Nevertheless, once approved for implementation in 2018, the project was completed within its $3.8 billion budget and there were no resulting claims. This can be seen as a testament to the airport owner organization, given that it completed the project in such a manner despite the COVID-19 pandemic of 2020. Indeed, it ultimately won several awards, including: "Project of the Year" by Airport Business Magazine, 2023, and Engineering News-Record (ENR) "Best of the Best - Best Airport/Transit – Orlando International Airport Terminal C." [7]

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[5] Greater Orlando Aviation Authority Records, Majority-in-Interest Ballot 97-03.

[6] Initially, this project was named the "South Terminal Program"

[7] Greater Orlando Aviation Construction Finance Oversight Committee Records (CFOC), "Memorandum Recommendation to Approve Budget and Commitment Transfer Requests from South Terminal Phase 1 and South Terminal Phase 1 Expansion to Terminal C Enhancement Projects for Fiscal Year 2024 Closeout," Dated May 1, 2024.

Similarly, the Salt Lake City Department of Airports (SLCDA) started to define what ultimately became the $5 billion Airport Redevelopment Plan in March 2010. The SLCDA began initial discussions with its signatory airlines; [8] those which can authorize capital improvement programs; be they to rehabilitate existing airport facilities to be compliant with seismic codes or construct new facilities.

Initially, the dominant carrier, Delta Airlines, requested that SLCDA should evaluate the cost of rehabilitating existing facilities rather than building new ones. After a two-year evaluation period in which SLCDA engaged an architect and specialty consultants to assess different rehabilitation alternatives, it was concluded that the best approach was to construct new seismically adequate facilities. In July 2013, the program definition document was completed, and procurement activities began for the design team and construction manager at risk organization. SLCDA adopted its formal budget, which totaled $1.8 Billion, in 2014. The total shaping period was four years, and there were estimated shaping costs of $5 million. Over the following nine years the SLCDA program was expanded to $5 billion; this included the construction of an entire north concourse facil-

[8] The term *signatory air carrier* is used in aviation to define an airline organization than enters into operating agreements with an airport operator. These operating agreements are generally referred to as Airline *Lease and Use Agreements (Lease and Use Agreements)* within which the term *signatory air carrier* is a defined term. Lease and Use Agreements set forth business terms under which airlines will operate at an airport facility including runways (landing fees) and terminal facilities (gate and terminal rent fees, baggage handling system fees), for example. Airlines become "signatory" when they execute the Lease and Use Agreement. *Signatory air carriers* receive favorable pricing for utilizing f airport facilities and, as is the case for many agreements, the authority to approve capital construction.

ity – an upgrade that was added only after the initial plan had been approved.

In addition to long project shaping periods- and adding to the complexity of successfully delivering projects – a wide range of delivery methods, including traditional design-bid-build, design-build, and public-private partnerships (PPP) are used. In addition, such projects also incorporate complex plans of finance that are comprised of local funds, state and federal grants, and debt. Given this, it is no wonder that airport organizations face significant challenges to deliver such projects within planned budgets and on time.

One example of project delivery method complexity and realized risks is the Great Hall Project at Denver International Airport (DIA). This project started in 2017 as a $1.8 billion project which was to be constructed using PPP delivery method. It is now expected to be completed in 2028 at a cost of $2.45 billion and only after the PPP approach was terminated and replaced by a construction manager at risk.[9] One of the key lessons learned from the initial attempt to implementing this project as a PPP was that additional analysis of the (initially) selected project delivery method should be conducted as although DIA had extensive experience implementing projects using design-bid-build and design-build delivery method, this was the first time that it had utilized PPP with the winning PPP organization not having had previous US airport experience.[10] Project delivery selec-

[9] Denver Approves Airport Project With $1 Billion Cost Overrun Edward Russell, Airline Weekly, January11, 2022, Denver International Airport: Great Hall, After Action Report

[10] Denver International Airport "Great Hall After Action Report", August 9, 2022

tion is a key element of the structure of project governance, and this project could have benefitted from additional tools within its governance structure to ensure proper alignment between organizational expertise and the selected delivery method.

These challenges are real because there is a long history in the construction industry of cost, schedule, and other completion challenges, including examples within the aviation sector. The root causes of these challenges include inadequate project definition, inappropriate project estimates, one-sided contractual agreements, and scope creep. As shown in Figure 2 , existing research shows that there is consistent, and ongoing, trend for large projects to overrun their budgets[11].

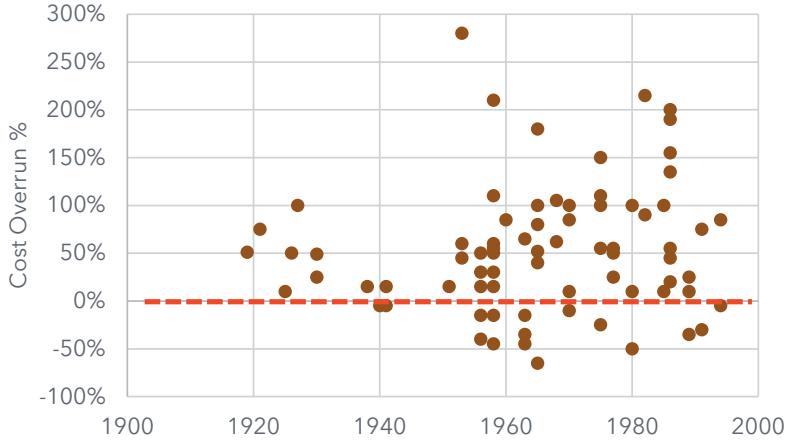

Figure 2 *Mega Project Budget Performance*

A recent example of an aviation budget overrun is the AirTrain Monorail project at Newark International Airport. In November

[11] Flyvberj, C. *et al.*, (2003). This study focuses on mega projects in various end markets in Europe as well as one airport in the US.

2024, the Port Authority of New York and New Jersey, which operates Newark International Airport, increased the funding that had been approved for the project in 2019 by $1.45 billion to $3.5 billion. Reasons for the budget increase included: a five-year project delay due to the COVID-19 pandemic, a pause in the project in 2022, and high inflation pressures within the construction market.[12]

It is important to note that many drivers of increased costs that lead to budget overruns are not the result of governance or performance issues but are nonetheless valid and could also not have been reasonably foreseen. Pertinent recent examples would include the COVID-19 pandemic, and the terrorist attacks of September 11, 2001.

Given historical performances with regard to cost, and both existent high current and future- forecast construction spending, airport operators seek ways by which to ensure that their projects are completed within budget and time objectives. Project governance structures act as such a tool. **One of the cornerstones of successful project delivery is the utilization of a sound governance structure which can be used to oversee and control key aspects of airport delivery including: financial, time, quality, regulatory, and organizational dimensions.**

Unfortunately, as foundational as it is, practitioners and academics have yet to agree on a common definition of project governance. Even within airport organizations, there are often

[12] Port of New York New Jersey Port Authority records and press releases "Here's when the new AirTrain monorail will be up and running at Newark airport" by Steven Rodas, NJ. Com. Published, November 15, 2024.

divergent views and interpretations of the same. Without a commonly understood definition, as well as application, and enforcement of project governance, there is little chance that implementing organizations can devise structures that can measure performance and also provide actionable information to program delivery teams and owner airport management teams. Airport executives often observe that their individual organization's governance structure was "designed for how projects were delivered thirty to forty years ago, not as they are today." They rightly note that many decisions are dictated to them because critical decisions cannot be made in a timely manner, and that actionable information is not available until one to three months *after* it is needed.

To help airport management and project delivery teams address these cited issues, we develop and advance a standard definition of project governance based on the first of its type research about airport project governance structures completed in 2023. This research focuses on large airports, defined as "large-hub[s]" by the Federal Aviation Administration (FAA), with each processing at least 1% of US commercial passenger traffic[13]. Many lessons of learned presented in this book can also be applied to medium- and small-hub airports that are increasingly implementing large-scale projects. Medium and small-hub airports implementing large-scale projects possess the added risks of being organizations that may neither have implemented similar projects nor have systems and governance structures in place to deliver large-scale projects.

[13] FAA: https://www.faa.gov/airports/planning_capacity/categories, for additional information.

In addition to creating a standard project governance definition for US airports, we delve deeper into how airports in the US are legally organized as well as the associated implications of the same to project governance. We also provide insights into features of US airport construction including delivery methods and the project delivery organizations that implement airport capital projects. Based on this foundational knowledge, we present the resulting predominant project governance structure from Dr. Block's research that was conducted in 2023 alongside other associated and prioritized areas of improvement. Based on this information, we provide a framework for evaluating and measuring the performance of airport construction governance structures.

This book is intended to reference industry-wide practices, identify lessons learned, and provide valuable performance frameworks for airport executives whose organizations are implementing capital programs, as well as project delivery practitioners, students, and academics. We also believe that these concepts can be applied to most large-scale projects in the US's public sector.

This book is organized into twelve chapters, building a progressive foundation by which readers can fully understand the implications of the research's results fully. We provide several case studies and examples that have been gathered from over thirty years of capital program advisory and program management consulting experience. This chapter introduces the US airport construction market, some unique features of airport

construction, and why project governance is important within an aviation-specific context.

Chapter 2 delves deeper into the foundational elements of construction governance structures, as well as their theoretical context, application, and practice. We first provide a structured approach to describing the attributes of an airport's project governance structure. Thereafter, we introduce the terms "Boundary" and "Internal" to segregate attributes of a project governance structure as we develop a standard definition. Boundary attributes include the form of governance structure, the span of control, primary objectives, the level of owner control exerted, and the level of adaptation exhibited by the governance structure. Boundary attributes represent limits for different dimensional elements of the construction project governance structure. Internal attributes focus on the inner workings of the governance structure, including participants, delivery methods, reporting, procurement, contracts, and other mechanisms used to enable its operation. Each attribute is defined, and examples of each are provided to give readers a richer understanding of how each individual element functions and, in aggregate, how project governance functions. The added feature of attribute definitions is that they can be used to measure performance, such as developing key performance indicators, reporting, benchmarks, and capabilities needed to function. Examples are provided for several attributes, with key takeaways from this chapter including: an overview of the theoretical basis of construction project governance structures; a standard approach to defining each attribute of construction project governance structures; and examples of each that

provide readers with practitioner-based information pertaining to current practices.

Chapter 3 describes the organizational form of US airports and through so doing informs readers as to how such structures affect and dictate the type of governance structures used by these organizations to govern construction processes. Airports in the US are primarily public organizations that are, with a few exceptions, a department of a city organization or a stand-alone airport authority. Examples of airports that are part of a city organization include some of the largest in the world: Atlanta Hartsfield International Airport, Los Angeles International Airport, Salt Lake City International Airport, and Charlotte-Douglas International Airport. Examples of airports that are part of stand-alone aviation authorities include the Orlando International Airport, San Diego International Airport, and the Port Authority of New York/New Jersey, which operates John F. Kennedy, LaGuardia, and Newark International Airports. Exceptions include a few airports that are operated within a State Department of Transportation (such as Daniel K. Inouye International Airport, Honolulu, Hawaii), or a public-private partnership (such as Luis Muños Marin International Airport in San Juan, Puerto Rico). The fact that most US airports operate within these organizational structures also informs the forms and processes used to govern construction processes; typically dictated by these organizations' internal policies and procedures, alongside associated enabling corporate governance structures. Different airport operating structures result in different requirements and constraints, such as staff compensation structures, project financing resources, regulatory compliance,

and resulting construction project governance structures. Key takeaways from this chapter include understanding how the type of organization affects resulting regulatory requirements, and how resulting construction project governance structures are designed, administered, and operationalized.

Chapter 4 describes various features of US airport construction projects and sets the foundations for the more detailed discussion of project delivery that is subsequently described in **Chapters 5** to **7**. This chapter includes an overview of the regulatory environment associated with airport construction, including the role of various agencies such as the Federal Aviation Administration (FAA), Transportation Security Administration (TSA), US Corps of Engineers, as well as other State, regional, and local organizations. This chapter also describes the wide range of projects that are built on an airport campus such as: runways/taxiways, terminals, parking garages, hotels, roadways, rental car facilities, and intermodal facilities.

Chapter 5 provides an overview of how airports fund construction projects. US airports use a wide range of funding schemes to pay for construction projects. Each of these funding sources has inherent compliance requirements affecting governance, such as procurement requirements, contracting, and the scope of the work to be funded by each source. Funding sources for construction projects also include internally generated cash (used on a cash-flow basis or to support the issuance of debt). Passenger Facility Charges (PFCs)[14] can similarly be used for

[14] Passenger Facility Charges are a fee charged on passengers traveling which are used to fund various types of projects including equipment, airfield, terminal, and other program eligible expenditures. Airports can apply to

cash flow (Pay-As-you-Go) projects and/or to support debt issuance. Additional capital funding sources include state and federal grants; Transportation Infrastructure Finance, and Innovation Act (TIFIA) loans, and externally by PPP organizations, each with extensive procurement, contracting, and eligibility requirements.

Funding deeply affects project governance in several ways. For example, federal funding typically requires specific delivery methods (which may be modified but must be pre-approved by the FAA), while the inclusion of contract clauses such as Buy American Act and the Davis-Bacon Prevailing Wage Act can significantly affect how specific delivery methods are structured. Additional requirements associated with PFC funding and other project financing include determining whether costs are competitive, reasonable, and eligible. Similarly, restrictions have been introduced on design and project/program management services to establish fees and allowable reimbursable expenses. Examples of recent funding schemes for complex projects are provided including: the $426.6 M Automated People Mover Station Project at Orlando International Airport (MCO), the $5.5B Terminal Redevelopment Program at Salt Lake City International Airport, and the $120M Air Traffic Control Tower at San Francisco International Airport.

Similarly to project financing, airports in the US utilize a wide range of project delivery methods to design and construct airport projects. **Chapter 6** provides a detailed overview of the project

collect this fee (up to $4.50 per enplaned passenger but with certain limitations) to pay for construction projects on a pay as you go or to pay for debt service associated with a bond paid by PFCs.

delivery methods used by US airports. Each project delivery method is described from a practitioner's perspective, and highlights how each is procured, as well as contracted/contract terms, selection criteria, and inherent performance requirements that are focused on budget and schedule performance. This chapter also utilizes case studies of each delivery method. To highlight examples of design bid build with a general contractor (DBB-GC) will use case studies from Charlotte International Airport and the Port Authority of New York/New Jersey on airfield and non-airfield projects. Similarly, this chapter includes case studies of design bid build with a CMAR (DBB-CMAR) for projects at Phoenix Sky Harbor International Airport and Salt Lake City International Airport. Case studies for DB-CMAR are provided for projects at San Francisco International Airport and San Diego International Airport. Case studies of PPP-delivered projects include Terminal 4 at John F. Kennedy International Airport, and the $5.5 billion Landside Access Modernization Program (LAMP) at Los Angeles International Airport (LAX). Finally, examples of developer agreements are provided for hotel and utility projects at Columbus International Airport and Orlando International Airport. Each case study describes the scope of the individual projects, their unique features, and key considerations of projects' delivery methods with regard to project governance including, for instance, budget, scope, and contract compliance control. Key takeaways from this chapter include fully describing each delivery method from a practitioner's perspective and key considerations of procurement methods and governance focusing on budget and schedule performances. Other takeaways include use of extensive case

studies to highlight how each airport utilized a single governance structure while using multiple delivery methods.

In Chapters 5 and 6, we analyze how aviation construction projects are funded and delivered. **Chapter 7** focuses on how project delivery organization is assembled, its features, and the inherent risks associated with the same. Airports in the US typically use competitive procurements to enter contractual arrangements with architects/engineers to design projects, contractors to build projects, and project management firms (teams or joint ventures) to oversee the management of all entities. Each of these project delivery members enters into contracts with airport owners and are responsible for the design, management and delivery of the asset to be constructed. The architect/engineer and contractor may be the same legal entity under a design-build delivery method. In contrast, the architect/engineer/financier/operator will be the single point of contact for a PPP-delivered project. Unique features of the project delivery organization include its temporary nature, and the contractual arrangements used to construct it; these can create an environment of information asymmetry, self-interest behavior, and non-competitive behaviors.

The airport owner organization has a vital role in assembling the project delivery organization to ensure that its strategic objectives are met, that the needed procurements and contracts are structured to create the desired project organization, and that proper risk transfer exists between each contracting entity. The airport owner must also ensure that its governance struc-

ture is aligned with the delivery method to achieve cost and schedule control.

Three case studies highlight how airports have assembled their project delivery organization. The first case study relates to the Greater Orlando Aviation Authority (GOAA) and how it assembled a project delivery organization to deliver the $3.8B Terminal C complex at Orlando International Airport (MCO). The second case study focuses on the City of Sale Lake Department of Aviation and how it assembled a project delivery organization for its $5.4B Terminal Redevelopment Program at Salt Lake City International Airport (SLC). The third case study describes how Austin Bergstrom International Airport (AUS) assembled the project delivery organization that it used to deliver its $5 billion Journey With AUS capital improvement program.

Chapter 8 describes the results of an industry-wide study that sought to identifying the predominant construction project governance structures used by large-hub US airports to deliver construction projects. This chapter applies elements of the aviation construction projects described in earlier chapters and shows how each played into, affected, or manifested how airports govern their delivery. A deconstructive approach to governance structures is presented in which discrete attributes are identified and analyzed, which, when aggregated, provide a holistic description of the overall predominant -practice. Within this chapter the Boundary and Internal attributes initially presented in Chapter 2, are used to construct the generalized predominant governance structure at the industry level. This chapter presents how the predominant form was identified and

presents actual practices. Data is presented for each attribute; providing readers with a rich narrative about existing practices, e.g., 59% of airports use three or more project delivery methods but also use a rigid structure to govern all delivery methods. Two case studies are presented which build on the previously presented examples discussed in Chapters 5 and 6 and highlight how GOAA and SLC's governance structure operates. Key takeaways from this chapter include developing an understanding of the elements which comprise a construction project governance structure; identification of the predominant structure used, and understanding the gaps and prioritized areas of improvement that can be applied to either evaluate an airport's construction project governance or to benchmark other parameters

In Chapter 8, the structures and features of the predominant construction project governance structure for large-hub US airports are identified. In **Chapter 9,** discussion of the same is extended to address prioritized areas of industry-wide improvement. The primary aims of this chapter are to understand explicit or implied gaps in existing practice, and to provide practitioners with a powerful tool to either benchmark their (own) organizations against the industry or to use the same a starting point to internally benchmark practices. Areas of improvement follow the governance structure attributes identified in Chapters 2 and 8 and therefore provide readers with context about the success of existing practices. Additionally, each area of improvement is categorized as to its root domain; and in particular whether each pertains to a process deficiency, contractual issue, or is sourced to management prac-

tices. Key takeaways from this chapter include the prioritized areas of improvement identified by executive airport managers who oversee the capital delivery process. These research results inform readers about the challenges that practitioners face when implementing capital programs and seeking to ensure that the associated governance structure achieves budget, schedule, and/or other desired objectives.

One of the most powerful features of devising a standardized methodology for evaluating construction project governance structures is the ability to conduct detailed analyses of any airport's governance structure whether that be as a whole or with regard to a discrete element. **Chapter 10** describes a standard methodology by which to map, perform gap analysis, and measure the maturity of any aspect of an airport's construction project governance structure. Also included in Chapter 10 is a maturity model to evaluate project governance attributes or project governance functions as a whole.

The first element of the proposed method is to conduct exploratory research to gather information about the (given) organization's processes, procedures, systems, staff, reports, and the contract agreements that make-up existing conditions. The second element is to utilize a standard questionnaire to gather information about each element of the applicable governance structure from a cross-functional or peer group so as to gather information about their views related to the evaluated element, i.e. each attribute of the governance structure described in Chapters 2 and 8.

Thereafter, results may be triangulated with interviews. Prioritized ranking data from the questionnaires can also be used to identify the magnitude and severity of identified gaps, providing very actionable data. This is especially useful for practitioners because there are usually limited resources available to invest in improvements, and this approach serves to optimize improvement initiatives. Additionally, data gathered from questionnaires can measure the organization's maturity level and also serve as a strategic tool by which to measure its capabilities as part of a continuous improvement initiative. Practitioners at all levels of the organization can use these tools to improve a single process, report, or aggregate the same to the entire function of the governance structure.

Key takeaways from this chapter include learning about an actionable methodology for conducting a discrete or holistic maturity analysis of any airport construction project governance structure. Additionally, this chapter sets forth actionable and practitioner-centered approaches that can be used to undertake continuous improvement and measurable initiatives to improve the project governance function.

Chapter 11 builds on the foundation provided in the previous chapters and presents a case study measuring the project governance function used to deliver Terminal C at Orlando International Airport. As part of measuring the project governance function, standard definitions of key terms are developed in order so as to create a standardized approach to measuring the performance of the construction project governance structure of any airport organization. This chapter offers methods

to define and measure intra, inter, and industry-wide measurements of project governance performance.

Extensive research has been conducted which highlights the need to establish common measurements to measure the performance of construction project governance structures. Key takeaways from Chapter 11 include establishing that financial performance is the highest-ranked objective of the aviation industry's construction project governance structure. As such, Chapter 11 also establishes that the predominant airport governance structure starts its governance function in the planning phase and ends at the closeout of a project (program). This means that financial performance, measured as adherence to budget, begins when a project enters the planning phase and ends at the time of completion. Budget history and final expended costs, including final depreciated amounts, are the measurement to use to evaluate financial performance. Similar performance measures are fully developed and described in this chapter to include time, reporting, contingency utilization, unforeseen conditions, quality of design (measured as RFIs/changes and design comments), claims, quality control issues, and staffing costs to administer the governance function versus financial performance.

Key takeaways from this chapter include understanding how to conduct performance evaluations of a construction project governance structure, and practitioner-based examples of the actual performances recorded by various airports implementing projects using different delivery systems, funding streams, and project delivery organizations.