



# NAC Executive Insights

## Scope Development to Support Cost Estimating

### Key Points

1. Establish clear objectives.
2. Confirm complete statement of requirements.
3. Allow changes early.
4. Provide a written scope document.
5. Write scope document so non-engineers will understand.

The owner is typically the primary end user of the facility. The work may be new construction or may be a renovation of an existing facility. Facilities are expected to provide a revenue or a benefit. Many types of projects are built in the construction industry. Owners invest in these to make a reasonable return on their investment, to meet a pre-defined benefit-to-cost ratio, or to service a public need, such as a school.

A project begins with the development of its scope. The owner drives scope development. An architect/engineer (A/E) or an engineering firm often aids the owner in early development of the project scope. If an alternative project delivery method is used, a contractor might guide the owner's development of a project scope statement. These service providers—the A/E, the engineering firm, and the contractor—expand the details of the project scope as the project moves through the development process.

### Introduction

Preparing accurate and timely cost estimates requires a clear statement of project scope. At one extreme, this scope can be described as a single parameter facility cost driver. At the other extreme, the scope is an approved set of construction plans and specifications. The development of a project's scope begins with the project owner (or developer).

The owner first requires an early cost estimate to assess whether a proposed facility or facility improvement provides the rate of return or benefit-to-cost ratio necessary to determine if a project warrants development. If the project moves forward the scope is developed in greater detail, most often

with the assistance of an A/E and/or a contractor or an engineer-procure-construct (EPC) service provider. Developing a clear and complete project scope during the different phases of project development is critical to project success. This Executive Insight discusses the key points in the scope development process and how developing a clear and complete scope provides for greater accuracy of cost estimates and schedule duration.

## **Establish Clear Objectives**

A first step in scope development is establishing clear project objectives. This is critical as demonstrated through research conducted by the Construction Industry Institute (CII). The CII research confirmed the positive relationship between clear project objectives and successful project performance. A clear objective statement has the following attributes:

- Singularly focused statement
- Must be measurable (for example, budget target is \$50 million)
- Must be attainable within the project's duration
- Must be realistic
- Must support organizational objectives

Key project objectives include cost, schedule, technical requirements, environmental aspects, and safety. Other objectives such as carbon footprint or resilience also may be identified based on the specific project. The project objectives must be focused on meeting the rate of return, maximizing benefit to cost, and servicing a public need. The owner begins the process of setting objectives, but each service provider also must have a set of project objectives. Project objectives must be prioritized. The owner and service providers should find alignment around the project objectives. Aligned and prioritized project objectives become the basis for project decision-making.

## **Confirm Complete Statement of Requirements**

Based on the project objectives and type of facility, the owner completes a statement of requirements necessary to accomplishing the objectives. The statement covers key facility characteristics and parameters common to the type of facility. Early in project development, broad statements, usually driven by the owner, define a facility. As the project develops, more detail is provided by an architect and/or an engineer.

Facilities in different construction industry sectors have different characteristics and parameters. For example, in the building sector, the plan view dimensions of a building, its length and width, and the number of floors, provide total building gross square footage. Other key characteristics include the type of structural frame, the heating ventilation and air conditioning (HVAC) system, the electrical system,

and the exterior finish. Correspondingly, in the building sector, external regulatory requirements, site permitting, and building code requirements will impact the scope statement.

An industrial sector project will have a basic plot area and location plus parameters to describe major pieces of mechanical equipment. Equipment requirements will often drive facility layout and the capacity of the facility (e.g., barrels per day or megawatts of electricity). An infrastructure project such as the construction of a new highway would require the boundaries of the project (e.g., from point A to point B) and a plan view showing the location of the highway and the number of lanes. These features determine the number of lane miles of roadway.

These general parameters set the basic framework for further development of the facility. They are also used to prepare the order of magnitude estimated cost of the facility for purposes of economic analysis to determine whether the project is viable to pursue. If viable, then further scope development will occur prior to approving the project for execution (i.e., detailed design and construction).

## **Allow Changes Early**

Changes in scope occur. They often are required as the scope statement is refined. Assessing the implications of a change is better performed early in the project's life cycle during the front end planning phases when the impact of a change is not as substantial as it may be later during construction. Changes made as the scope develops should be justified by the rate of return or benefit-to-cost ratio associated with the change. Changes made to the scope during detailed design and construction often disrupt schedule and cost parameters and may in fact significantly increase project duration and cost.

## **Provide a Written Scope Document**

A clear and comprehensive description of a project's purpose must be captured in a written project scope document. This document should include a narrative describing the general scope of the project. The owner's goals, deliverables, significant milestones, facility performance, expectations/commitments to external stakeholders also are all explicitly stated. Supporting sketches or preliminary drawings should be referenced. Any assumptions made about the scope should be clearly stated. Uncertainties in the project scope should be identified. The level of detail of this document will vary depending on the detail of preliminary engineering completed. All key owner representatives should sign this document. As service providers become engaged in the project, they should agree with the project scope because it will influence their project work.

## **Write Scope Document So Non-Engineers Will Understand**

The technical narrative should be understandable to both the engineer and the non-engineer. Project owner personnel assigned to projects often are not technically knowledgeable, but instead may be business focused. Nonetheless, they must understand the scope of the project including project objectives, project outcomes, budgets, schedules, and the technical nature of the facility. Thus, the

written document must be clear and easy to understand. Business focused personnel must be assured that the project achieves the rate of return and/or meets benefit-to-cost ratios as well as product expectations.

### **About the Author**

Stu Anderson was elected to the National Academy of Construction in 2010. He retired from Texas A&M University in 2019, where he served as assistant vice chancellor for facilities planning and management. He also was a tenured professor and held the Zachry Chair in Construction Integration in the Texas A&M College of Engineering. He earned a bachelor's degree in building construction from the University of Washington, a master's of civil engineering from the University of Illinois, and a PhD from The University of at Texas Austin. He was previously with the Fluor Corporation and with Stone & Webster.