

Cost and Scope Breakdown Structure for Functional Level Estimating of Consultant

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Importance of Preconstruction Service Cost Estimating

Estimating the cost of preconstruction services (PCS) during the early phases of highway project development is an important task. Research has found a link between early investment in preconstruction planning and design services and final project costs. The purpose of this study is to assess current estimating practices and propose a Cost and Scope Breakdown Structure (CSBS) framework to structure functional level estimation of consultant fees. Such a framework is promoted to reduce the chance that under-funded preconstruction services may degrade post-award construction contract cost certainty.

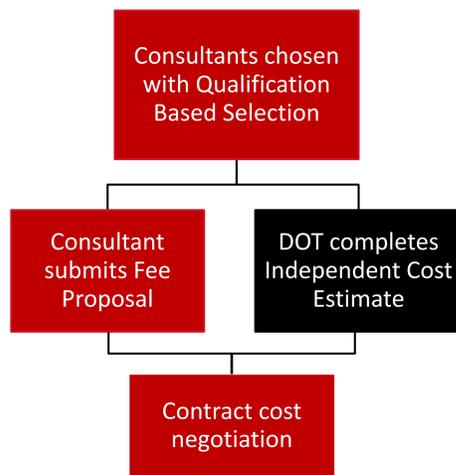


PCS Investment and Cost Growth Relationship

Why Functional Level Estimating?

A functional level estimate can be used to quantify the number of work hours that will be required by a design team to complete a given work package. This can aid management's decision on whether to perform the work with in-house resources or outsource particular tasks.

There are two reasons for developing bottom-up PCS cost estimates:



External Consultant Procurement Process

1) The level of effort required for each PCS task is not directly proportional to one physical project characteristic such as lane-mile. As a result, the best way to quantify these services is to develop a scope of work for the effort required to complete each PCS task.

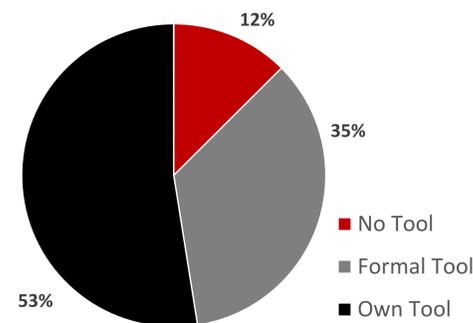
2) Commonly a Department of Transportation (DOT) forms a functional level estimate to fulfil the legal requirements of the Brooks Act for contracting an external consultant to complete PCS work.

Current State of Practice

A survey of AASHTO Subcommittee on Design members found that not all DOTs form a detailed estimate with which to negotiate. There were a number of reasons for this:

- Limited time and resources
- Little importance placed on accurate estimating
- **No formal tools or processes to aid PCS estimates**
- Unique and complex tasks
- Project scope not yet defined

Barriers to Forming Functional Level Estimates



Current State of Practice Tools

The survey found only 35% of staff are provided with a standard estimating tool (such as a spreadsheet) to aid the development of estimates. Despite good intentions, those individuals who created their own tools do not provide a consistent product across an agencies. Agencies without any tools are reliant on engineers with extensive experience.

There is a lack of estimating standardization within agencies.

Method	Description
First Principles	Utilize metrics such as man-days per mile, or other 'rules of thumb'.
Work Breakdown Structure (WBS)	Use a specific list of PCS tasks to assign work hours and calculate costs.
Historical Database	Utilize cost/hour data collected from previous projects.
Software	Sophisticated software that incorporates historical data with a WBS, for example ePM.
Experience	Base estimates on professional judgment acquired from experience.

Current Functional Level Estimating Methods

From these methods only a **WBS** and using **Historical Data** are regarded effective practices as they provide structure to the estimating process and are not reliant of highly experienced staff. Utilizing **Software** encompasses both of these approaches together.

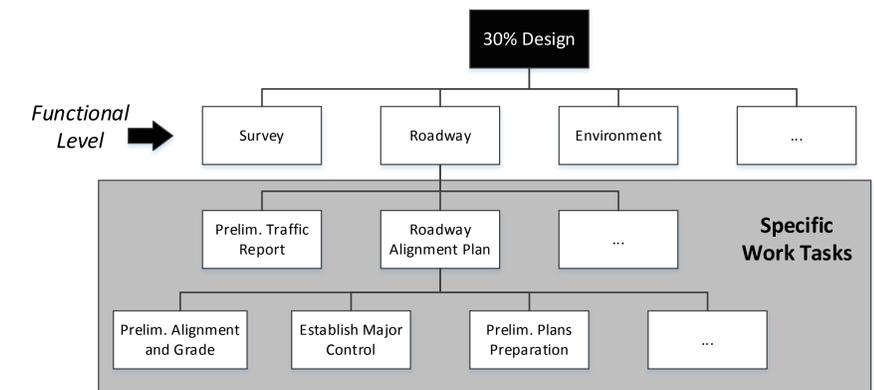
Cost and Scope Breakdown Structure (CSBS)

To avoid confusion with a WBS used for construction tasks, the term CSBS is coined for the organization of tasks during the preconstruction phase. A CSBS is formed by organizing preconstruction tasks into a hierarchy, branching from their functional groups (shown below). There can be varying levels of detail included within the hierarchy depending on the agencies need.

Many agencies value looking at previous project costs to assist with estimating, however few have an organized database to review projects. A CSBS can help organize project information for quick reference.

The benefits of formal classification:

- Provides a template to quickly identify tasks required for future projects
- Allows the collection of work effort hours and costs to aid future projects
- Ensures all appropriate tasks are included within estimate



Example Cost and Scope Breakdown Structure

Conclusions

Implementing a standardized CSBS would:

- Reduce estimating time
- Improve estimate consistency
- Allow direct comparison between estimates
- Improve negotiation process
- Enable historical data to be linked to tasks
- Reduce overhead costs passed onto DOTs from consultants