SCEA 2012 Conference Paper:
An Approach to Improving Cost Estimating and Budget Integration in Federal Programs

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Lack of a consistent approach to integrating cost and budget leads to inconsistencies when the two are compared.

▸ There are 2 general approaches to Budget and LCCE integration:
  – Unaltered LCCE is used as the Budget - the two are synonymous
  – Cost and Budget are developed independently

▸ Considerations against using the unaltered LCCE as the Budget
  – LCCE often reflects predicted expenditures, not obligations
  – LCCE does not consider source of funds, including funding year

▸ Considerations against developing LCCE and Budget independently
  – Discrepancies in assumptions and requirements considered in the LCCE and Budget
  – Difficult to accurately assess the affordability of the Program
  – Inconsistency in program documentation

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LCCE data can be very useful in budget formulation and program management decisions.

▶ Benefits of using the LCCE for Budget Formulation:

– **Completeness**. The LCCE should provide estimates of all known and approved requirements

– **Consistency.** The LCCE is used to develop Acquisition Program Baseline (APB)

– **Risk**. The LCCE provides cost at multiple confidence levels

▶ Obstacles in using the LCCE for Budget Formulation:

– **Structure**
  - The *LCCE* is generally structured to support Acquisition decisions/milestones
  - The *Budget* can be structured in many formats with various sources of funding
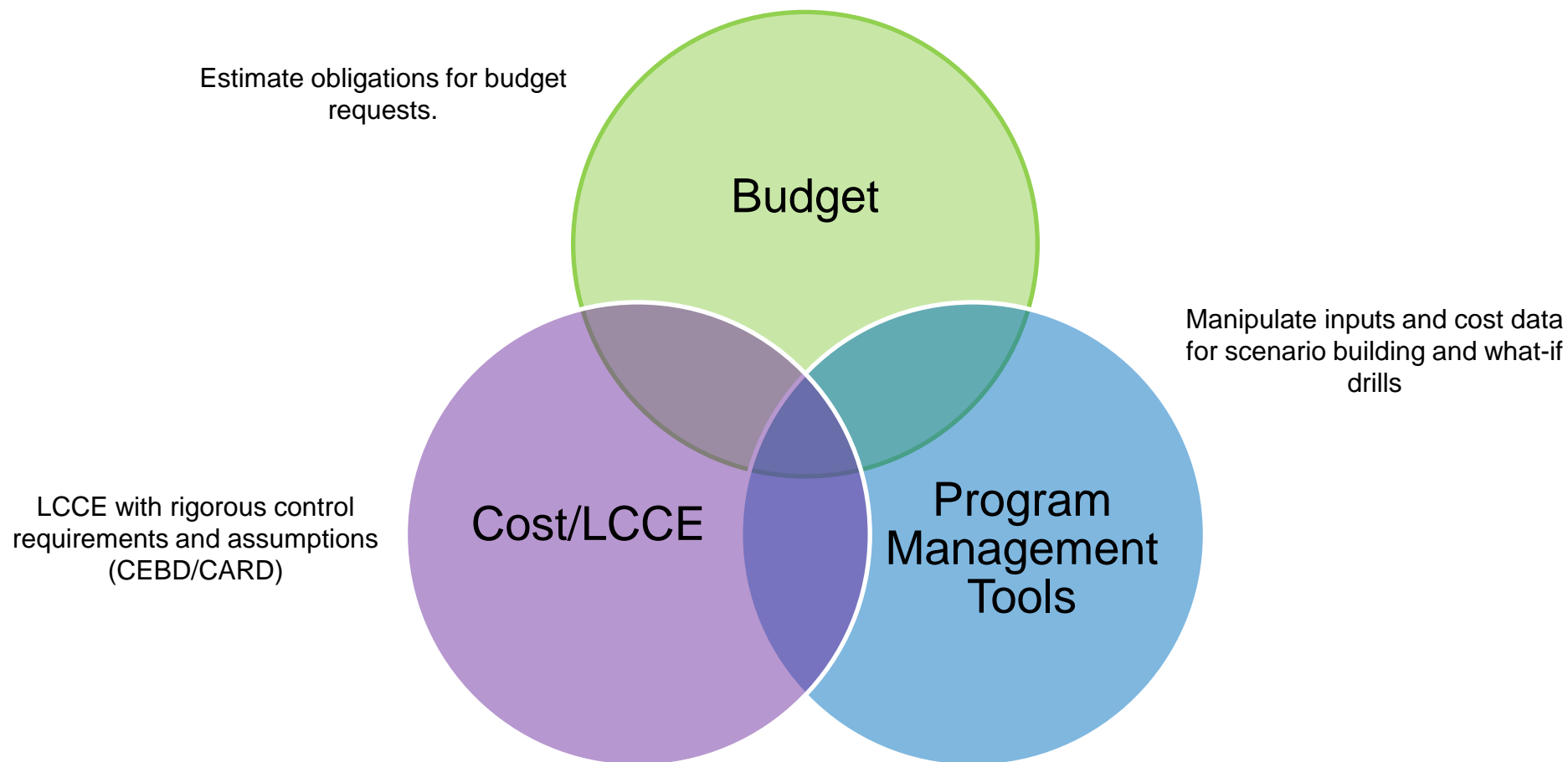
– **Treatment of Assumptions and Schedules**
  - The *LCC*E is an unbiased estimate of all known program requirements
  - The *Budget* aligns limited funding to the highest priority requirements

– **Treatment of Cost**
  - The *LCCE* estimates when program expenditures will be incurred
  - The *Budget* estimates when funding is required for obligation

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With a few modifications to the model, the data and rigor of the LCCE can be leveraged for multiple purposes.

Estimate obligations for budget requests.

Manipulate inputs and cost data for scenario building and what-if drills

LCCE with rigorous control requirements and assumptions (CEBD/CARD)

Budget

Cost/LCCE

Program Management Tools

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Management pressures in the Program drove the decision to further integrate the LCCE and Budget Formulation.

▸ The Program needed to develop multiple funding scenarios during annual budget builds

- Funding scenarios required different delivery schedules or changes to program inputs and assumptions;

- The Program needed to fully understand and articulate the impact of increases or cuts to the budget on program activities;

- The program needed to adjust to changes quickly while presenting consistent information.

▸ The Program needed to consistently and efficiently analyze and report cost and budget in multiple formats for periodic and ad hoc reporting

▸ The Program needed to provide traceability from the cost estimate through the budget to improve program management and control

▸ The Program Manager wanted flexible tools and information to assess the impact of programmatic decisions

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New functionality was needed in the model to address these Program needs.

▸ Ability to present LCCE data in user-defined structures and to trace data from the LCCE through the budget and other program documents.
  – Refine the Program's WBS as an indexing system
  – Apply data "tags" or "labels" to LCCE's cost elements for user-defined structures
  – Develop the LCCE at the lowest appropriate cost element structure

▸ Ability for users to adjust schedules and inputs to develop program scenarios
  – Maximize inputs to drive cost estimate
  – Develop a method to manipulate schedule in the cost estimate

▸ Estimate obligations using expenditure estimates
  – Define cost element types and expenditure-obligation relationship

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Present LCCE data in user-defined structures and trace data from the LCCE through the budget.

▸ **Approach/Methodology:** Develop a way to label or tag data in useful categories.

- – Estimate using the lowest reasonable cost element structure (e.g. vendor, etc.)
- – Easily apply labels or tags to cost elements
- – Make data and tags available for use through pivot tables

▸ **Benefits**

- – Labeling CES with custom tags allows users to develop pivot tables that display cost estimate data in user-defined structures and formats.
- – Input for periodic and ad hoc reports the require cost data can be generated more accurately and efficiently based on a consistent data set
- – Provides an indexing system that can be used to link cost and budget and trace dollars across various program documents and functions.

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Tagging CES by user defined categories allows for more efficient and useful analysis and presentation of LCCE data.

▶ Required Tags

– CES "contract" period of performance

– Expenditure Type

▶ Useful tags for cost analysis

– Acquisition, O&M

– RDT&E, O&M, Procurement (budget alignment)

– Contractor

– Projects

– WBS Item

– Type of Cost (i.e., HW/SW, People, Training, etc.)

Index	Cost Element Description	Provider (POP)	Provider	Expenditure Type	Flag Expenditures to Obligations	Cost Element	Provider POP Used	Final: Flag Expenditures to Obligations	Funding Phase	Project
1	Acquisiton		0		1	1.0 Acquisiton	-	1		
2	Cost 1	Vendor 1	Vendor 1	On-going	1	1.1 Cost 1	Vendor 1	1	Acquisiton	A
3	Cost 2	Vendor 2	Vendor 2	Actual	1	1.2 Cost 2	Vendor 2	-	Acquisiton	B
4	Cost 3	Vendor 3	Vendor 3	Moveup	1	1.3 Cost 3	Vendor 3	1	Acquisiton	B
5	Cost 4	Vendor 4	Vendor 4	Same FY	1	1.4 Cost 4	Vendor 4	1	O&M	A
6	Cost 5	Vendor 5	Vendor 5	One-time	1	1.5 Cost 5	Vendor 5	1	O&M	A
7	Cost 6	Vendor 6	Vendor 6	Partial	1	1.5 Cost 5	Vendor 6	1	Acquisiton	A
8	Cost 7	Vendor 7	Vendor 7	Partial	1	1.6 Cost 6	Vendor 7	1	O&M	B

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Adjusting schedules and inputs to develop program scenarios.

▸ **Approach/Methodology**: Develop an input-driven estimate.

- – Identify project cost drivers through analysis (i.e. resource and activity drivers)
- – Set up LCCE to use cost driver and schedule inputs to estimate cost to the extent possible
- – Where appropriate, estimate cost to a lower level of detail rather than allocating/spreading costs

▸ **Benefits**

- – Allows users to quickly develop "what-if" scenarios through user-driven cost and schedule input fields
- – Gives program management more information to assess the impact of requirements and schedule changes
- – Cost estimate is more flexible to adjust to changes in cost elements

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Input-driven cost estimates allow programs to more easily develop "what if" scenarios.

▸ Useful inputs and cost drivers: unit cost, total quantity, start dates, etc.

▸ By estimating using inputs, the user can quickly make assumption, unit, or schedule changes to manipulate the cost.

▸ Data tags allow the results to be quickly viewed and compared in useful analytic structures.

CES	Task Start Date	Task End Date	Unit Cost BY$	2009	2010	2011	2012	2013	2014	Total
1.0 Acquisiton				-	100	500	951	1,000	1,100	$ 3,651
1.1 Cost 1	2010		$ 100	$ -	$ 100	$ -	$ -	$ -	$ -	$ 100
1.2 Cost 2	2011		$ 200	$ -	$ -	$ 200	$ -	$ -	$ -	$ 200
1.3 Cost 3	2012		$ 300	$ -	$ -	$ -	$ 300	$ -	$ -	$ 300
1.4 Cost 4	2013		$ 400	$ -	$ -	$ -	$ -	$ 400	$ -	$ 400
1.5 Cost 5	2014		$ 500	$ -	$ -	$ -	$ -	$ -	$ 500	$ 500
1.5 Cost 5	10/1/10	9/30/12	$ 600	-	-	300	300	-	-	$ 600
1.6 Cost 6	3/1/12	9/30/14	$ 600	-	-	-	351	600	600	$ 1,551

Estimating obligations using expenditure estimates allows the cost estimate to be stated in "budgetary" terms.

▸ **Approach/Methodology**: Develop a method to estimate obligations required in the appropriate period based on expenditure characteristics.

– Identify Periods of Performance (PoP) for existing and future "contracts"

– Define the obligation-expenditure relationship to be used to shift expenditures

– Use tagging to label CES with a "contract" PoP and expenditure type

– Develop and run obligation calculation, which uses expenditure type and contract PoP to shift expenditures into the appropriate period to estimate required obligations

▸ **Benefits**

– Budget formulators can easily develop obligation estimates for the program requirements estimated in the LCCE.

– Budget and cost elements contain the same program index (WBS)

– Budget and cost can be easily compared because the same data is used to formulate both.

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There are generally 5 types of obligation-expenditure relationships used for estimating obligations.

▸ **On-Going.** The costs are evenly spread across all months of the FYs or there is no information to specify the exact month for the start and end date except by FY. For example, the on-going type would be used for expenditures that are incurred equally in each month and the obligations are based only on the PoP start dates in each FY. On-going is not used if the contract does not start on October 1 or before and doesn't end on September 30 or continue past September 30.

▸ **Actual.** The cost is historical and the obligations calculation will not change the actual costs in prior years (e.g., PoP and extension is set to zero). As the model progresses through the lifecycle, actual costs will replace estimates and normally will be on separate CES element as only one expenditure type can be used for each CES element.

▸ **Same FY.** The obligations and expenditure occur in the same FY so no adjustment is made to the expenditures when obligations are calculated. Handled the same as the "Actual" cost type except the costs would not be removed from the calculations.

▸ **Moveup.** The expenditure is moved forward one FY for obligations. For example, the obligations for a period cost is one year before the expenditure.

▸ **One-time.** The schedule can be based on timing of the obligations or when the actual procurement or deployment will occur, which is the timing the expenditure. For obligations, the number of units obligated in each FY is an input. This approach can be used for budget drills when determining the number of units for obligating funds in each FY. The other approach is inputting the schedule for the expenditures. The model then calculates the timing of the obligations.

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Obligation calculation uses the 5 expenditure types to define when obligations are required for an estimated expenditure.

▸ **On-going.** *Obligations = (FYEnd – PoPStart)/days in year * Current FY expenditures + ((PoPStart+1year-1 day)-FYStart))/days in year * Current+1 FY expenditures*

▸ **Actual**. *Obligations = Current FY obligations*

▸ **Same FY.** *Obligations = Current FY expenditures*

▸ **Moveup.** *Obligations = Next FY expenditures – 1 Year*

▸ **One-time.**

  – If schedule is based on expenditures, then use "on-going" equation

  – If schedule is based on obligations, then use "same FY"

> **Equation Key**
>
> Contract PoP Start Date (PoPStart)
> Contract PoP End Date (PoPEnd)
> Fiscal Year Start Date (FYStart)
> Fiscal Year End Date (FYEnd)

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The Program is benefiting from integration in multiple areas.

▸ Program Budget is more precise, accurate, and defensible

- – All LCCE-defined requirements are considered in budgeting (CARD/CEBD)
- – Cost and schedule relationships are better integrated into budget values
- – Program can easily modify inputs and schedules to develop new budget scenarios
- – Provides detailed information on the composition of budget, including which cost elements are being increased or cut.
- – Risk/confidence levels is used to identify management reserve levels in budget requests
- – Consistency between cost estimate and budget

▸ The program can more easily articulate the difference between the LCCE and Budget to address questions of program affordability during the Acquisition Review Process

▸ Program can use a consistent index (tagging) in LCCE, Budget, Schedule and Contracts using the Program's WBS to improve annual program planning, budget execution, and categorization of expenditures.

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Keep in mind several elements when evaluating this approach for budgeting.

▸ The model presents the requirements of the program in budgetary terms as *the starting point* in the budget formulation process

▸ Program Management must continue to prioritize requirements for and decide on the confidence level to be used in budget requests.

▸ Program managers may bypass the LCCE when developing elements of the budget (e.g. time constraints, external factors, future or special projects not in the LCCE)

▸ LCCE is as good as the data provided to the cost estimators

▸ Initial design of the model will requires upfront investment to meet the needs of the program

▸ Stakeholders must be educated about the differences of cost and budget and on how to use the model.

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External issues with integrating cost and budget

▸ Adaptability
  – The LCCE is generally a baseline fixed in time
  – The Budget may fluctuate through Planning, Programming, Budgeting, and Execution (PPBE) cycle.

▸ Knowledge and communications gaps between cost estimating and budgeting communities/stakeholders
  – Close collaboration between Program cost and budget teams
  – Education of Program's Acquisition and Budget stakeholders

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Questions?

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