Estimating the Construction Cost Associated with Accelerated Bridge Construction

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ABC UTC

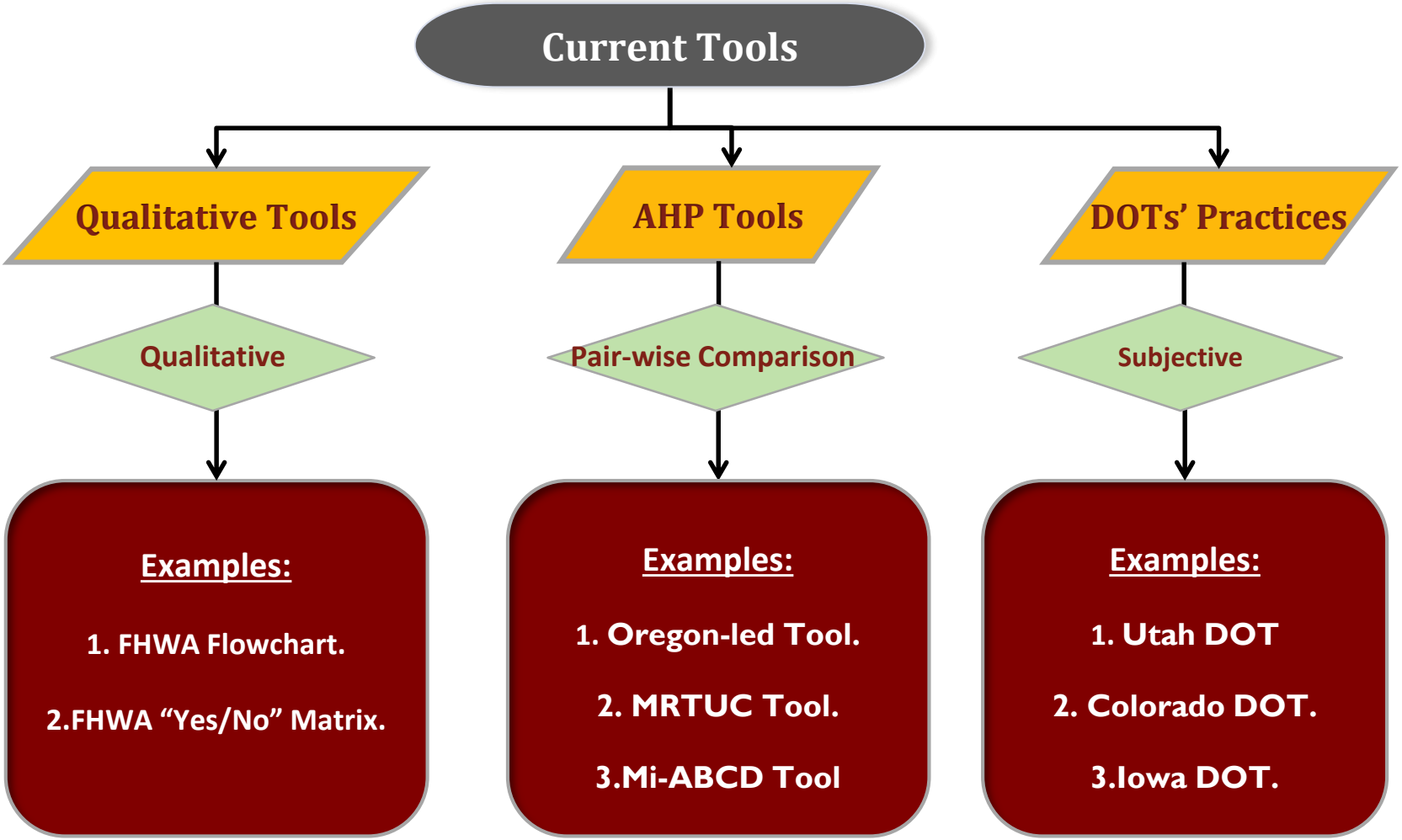
Outline

- Project Background
- Current Practices in ABC Decision Making
- Project Objectives
- Cost Breakdown
- Total Cost Estimation:
  - Construction Cost Estimation Tool
  - Agency & Indirect Cost Estimation
  - ABC vs. Conventional

Background

- ABC methods can have with high initial costs.
- Present a major barrier for the wide adoption of ABC.
- Current decision making tools → construction cost as user input.
- Need to provide decision makers with a quantitative tool to estimate the construction cost.
- Limited information about agency, and indirect cost.

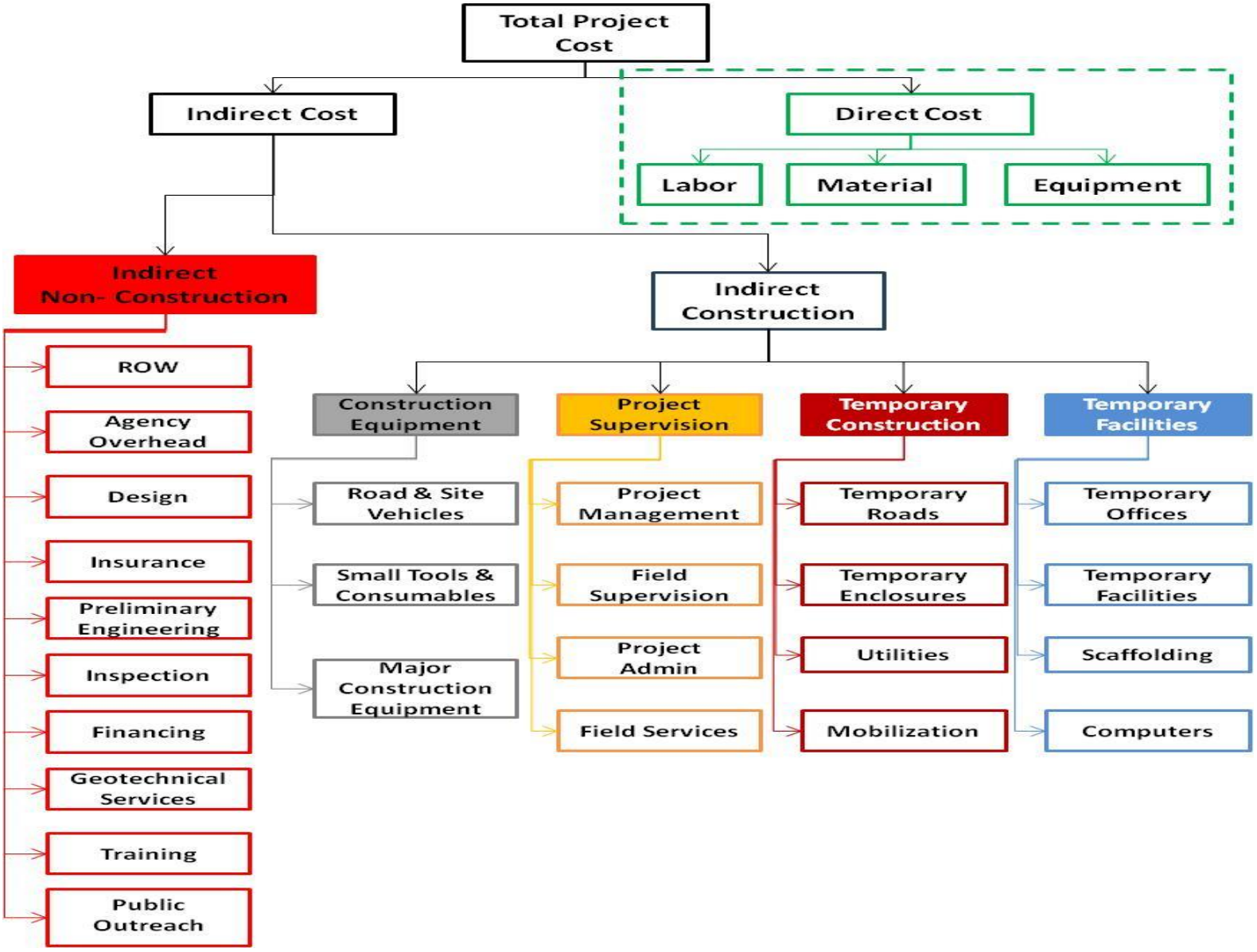
Decision Making Tools



Project Objectives

- Better understand the construction costs associated with the ABC methods.
- Develop a tool/tools to estimate the different construction cost components associated with the ABC projects.

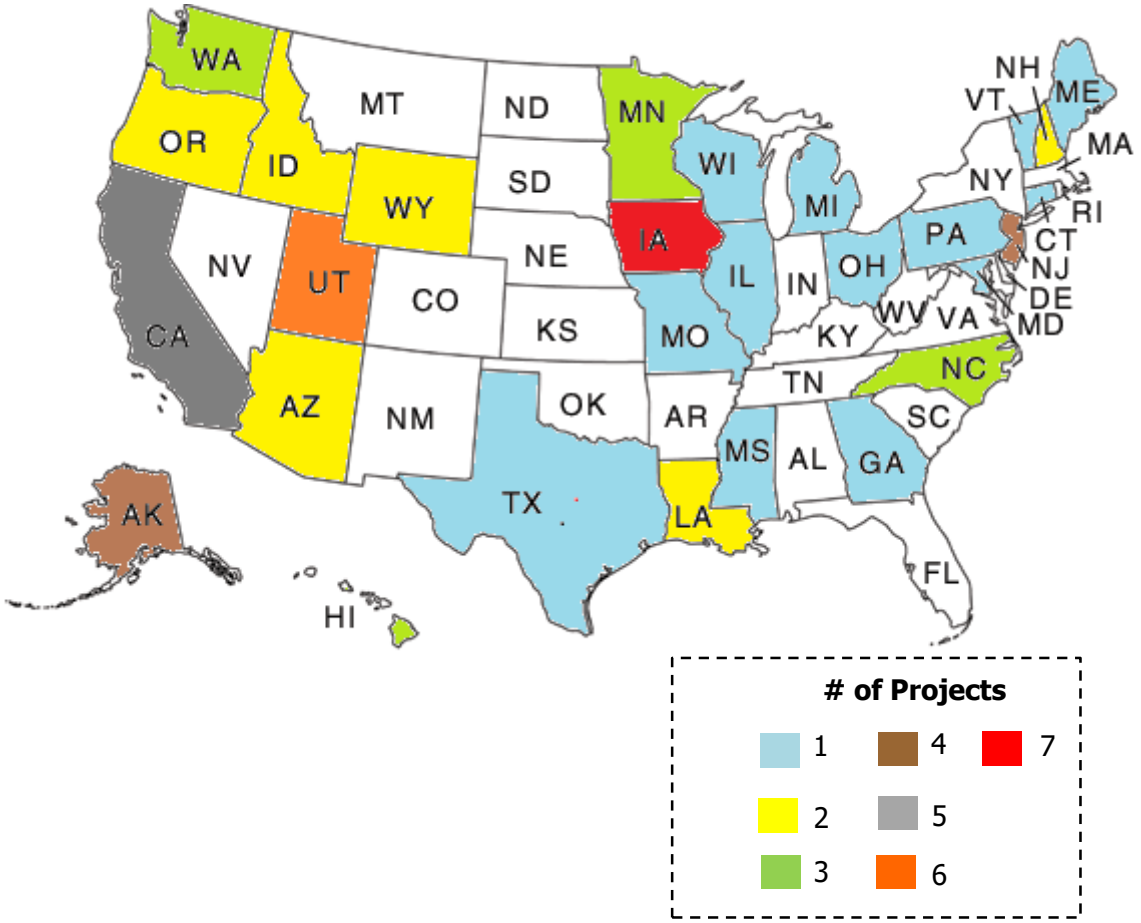
Cost Breakdown



I. Construction Cost Tool

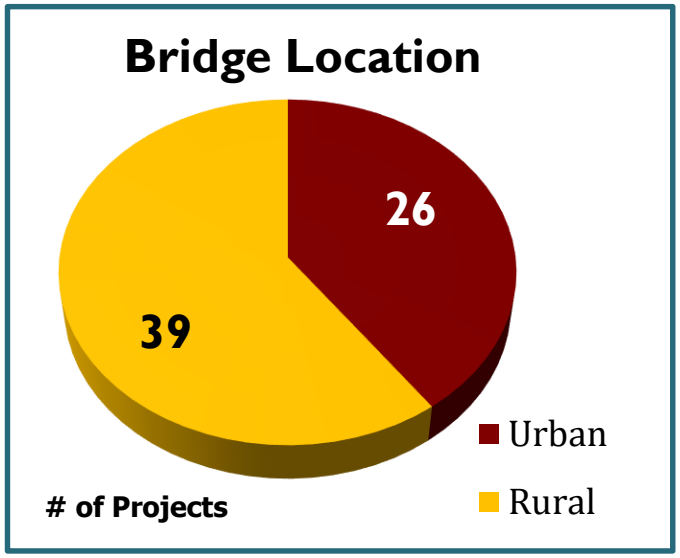
1. Data Collection

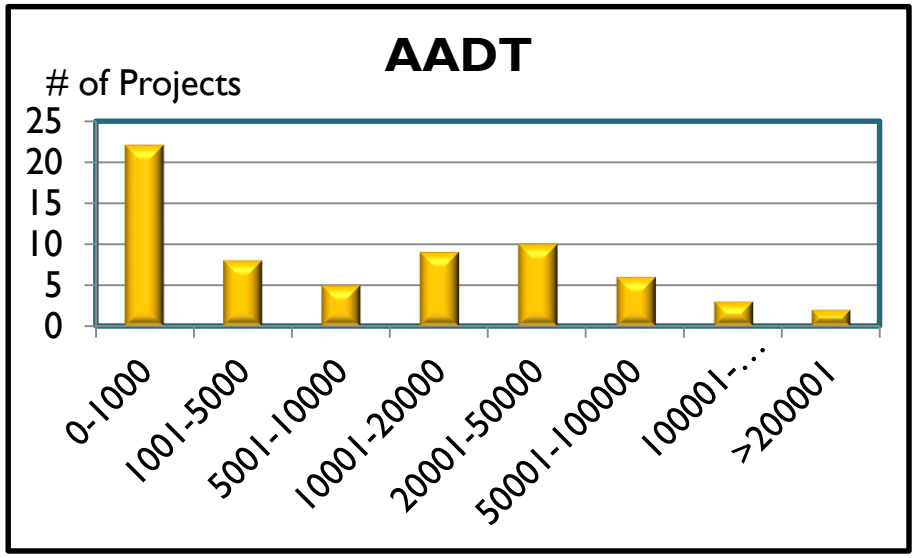
- A total of 65 projects from 1998-2013.
- Projects from 29 different states

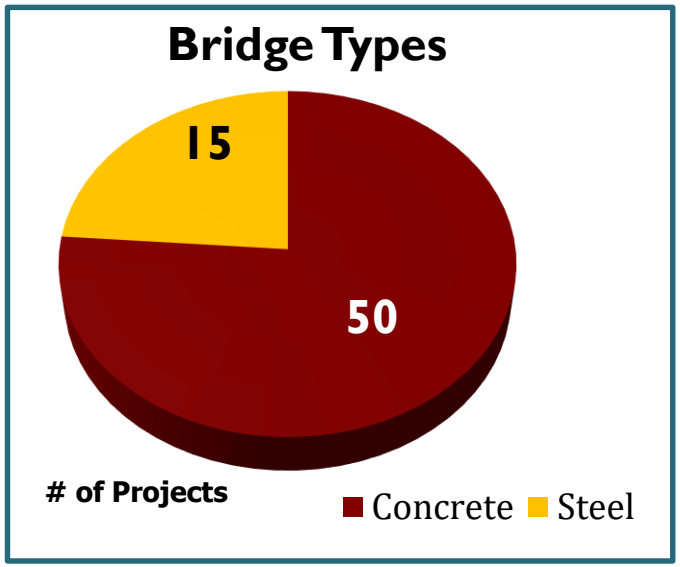


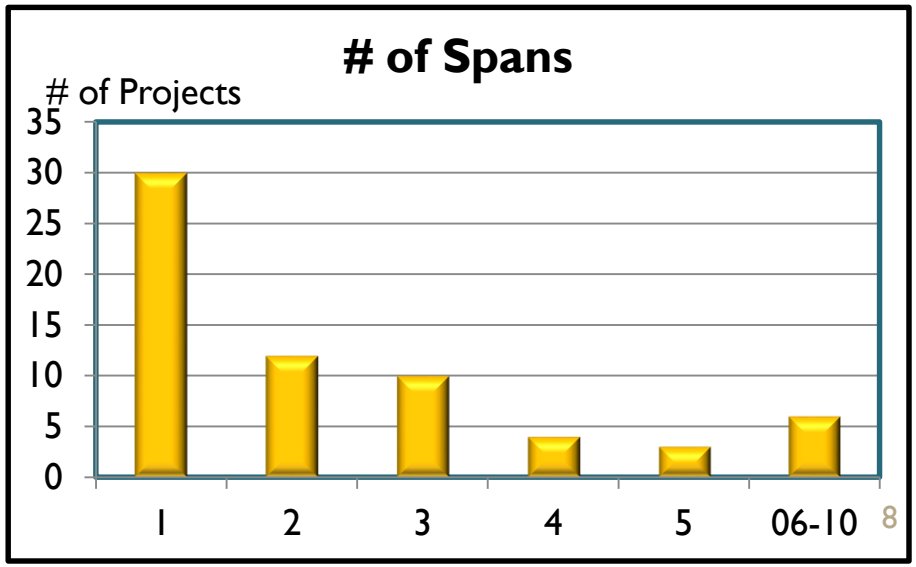
I. Construction Cost

2. Data Analysis



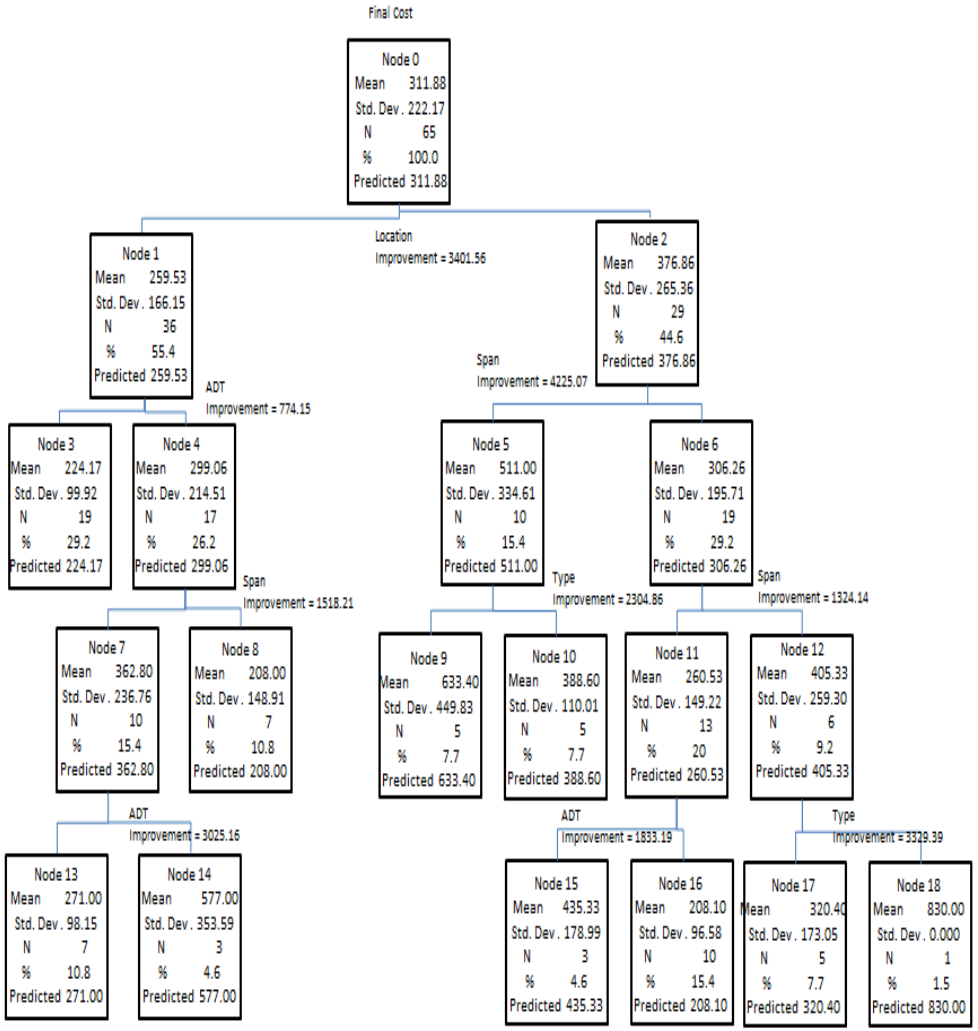






I. Construction Cost Analysis

C&RT Tree Analysis

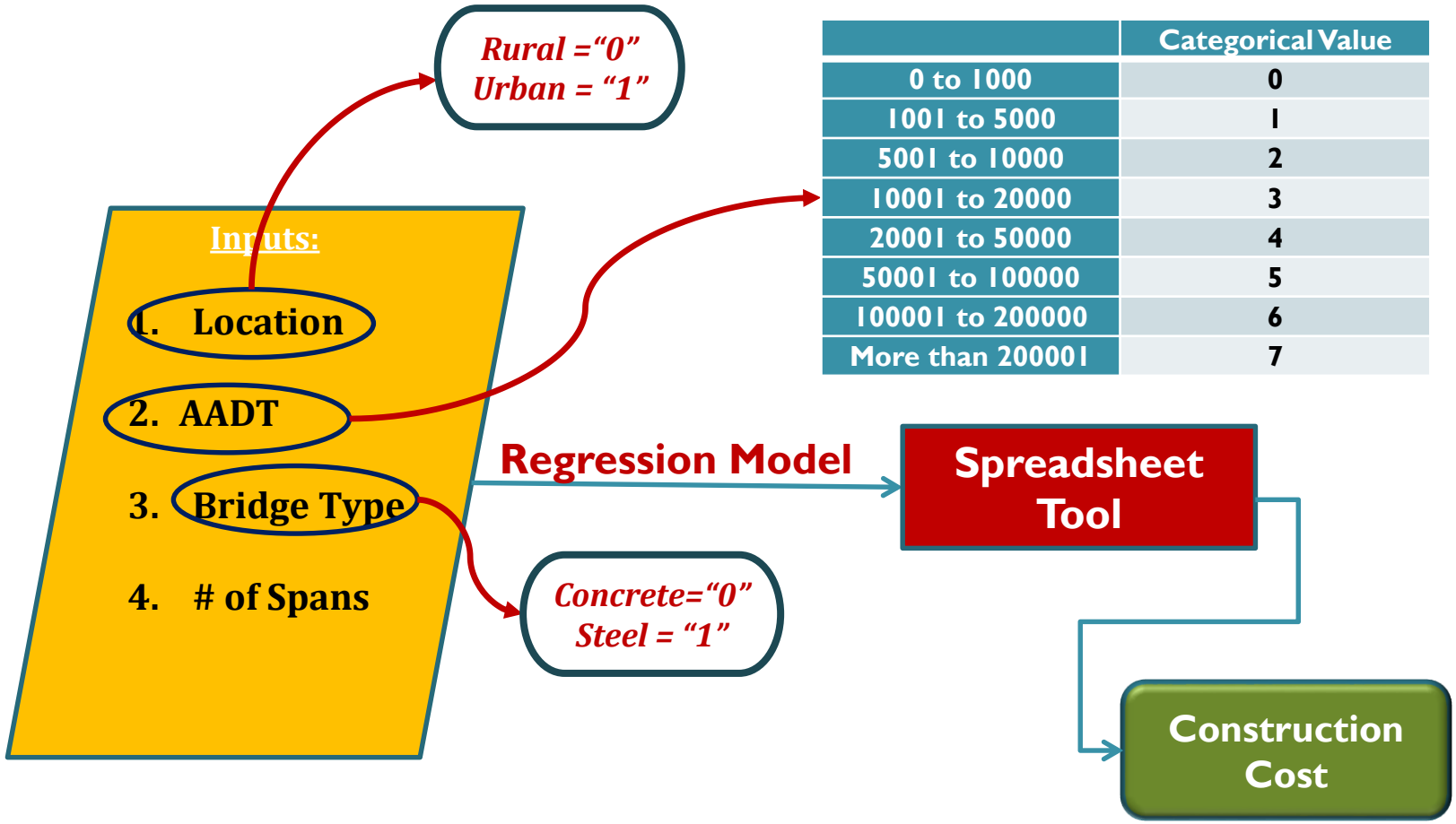


- A total of 65 projects (cost/sq.ft)
- Data normalized for time & location using RS Means indices.

Independent Variable Importance

Independent Variable	Importance
AADT	100.0%
Number of Span	99.2%
Type	59.4%
Location	35.3%

I. Construction Cost Tool



	Categorical Value
0 to 1000	0
1001 to 5000	1
5001 to 10000	2
10001 to 20000	3
20001 to 50000	4
50001 to 100000	5
100001 to 200000	6
More than 200001	7

90.9%

Category	1	2	3	4	5	6	7	8	9	10
Range ($/ft^2)	0-100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000

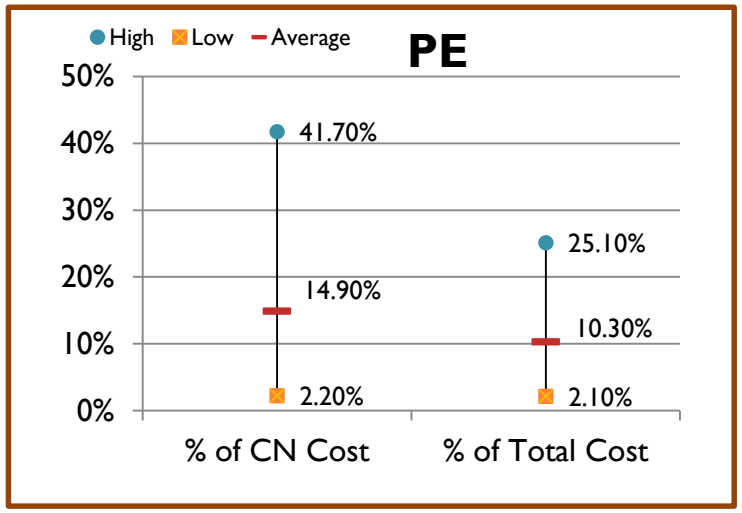
II. Indirect & Agency Cost Tool

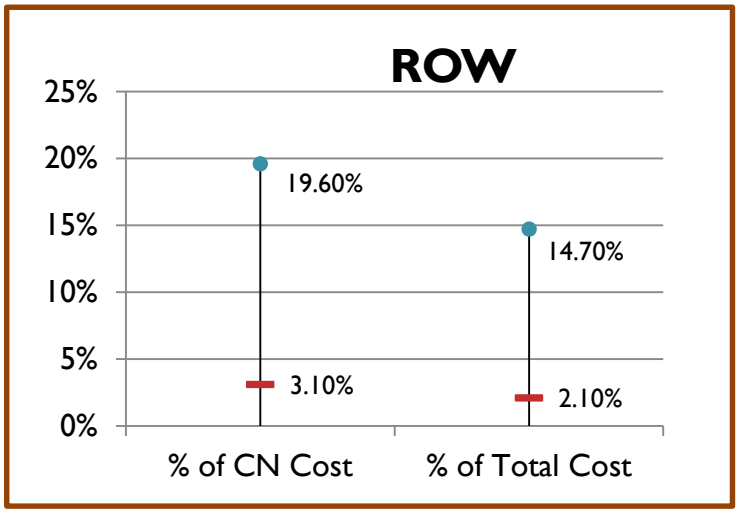
1. Data Collection

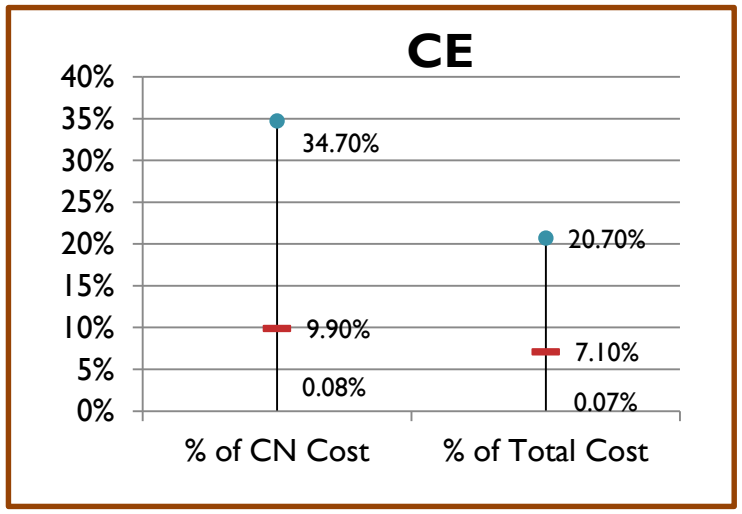
- Data for indirect costs will be collected from a number of agencies:
  - *ODOT*
  - *MassDOT*
  - *TDOT*
  - *TxDOT*
  - *VDOT*

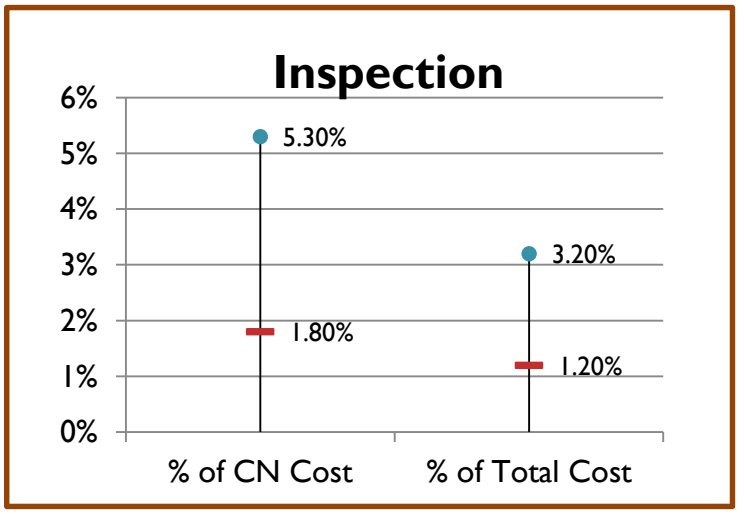
II. Indirect & Agency Cost Tool

2. Data Analysis









II. Indirect & Agency Cost Tool

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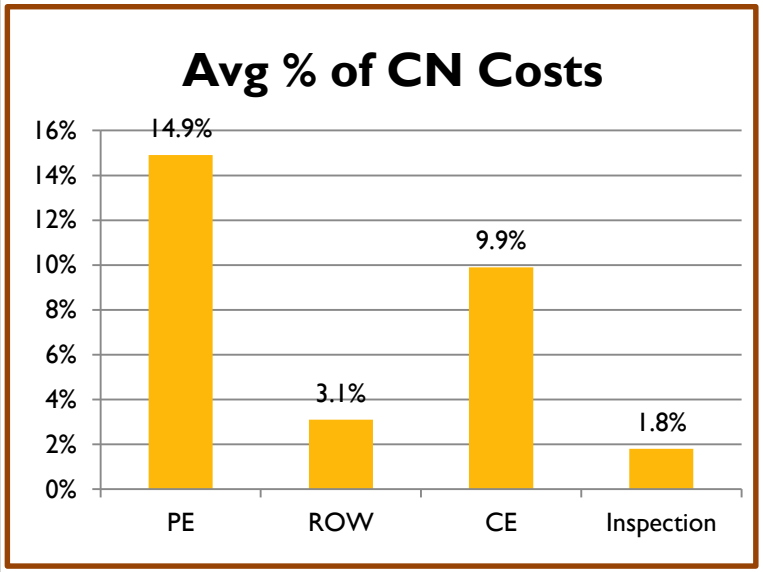
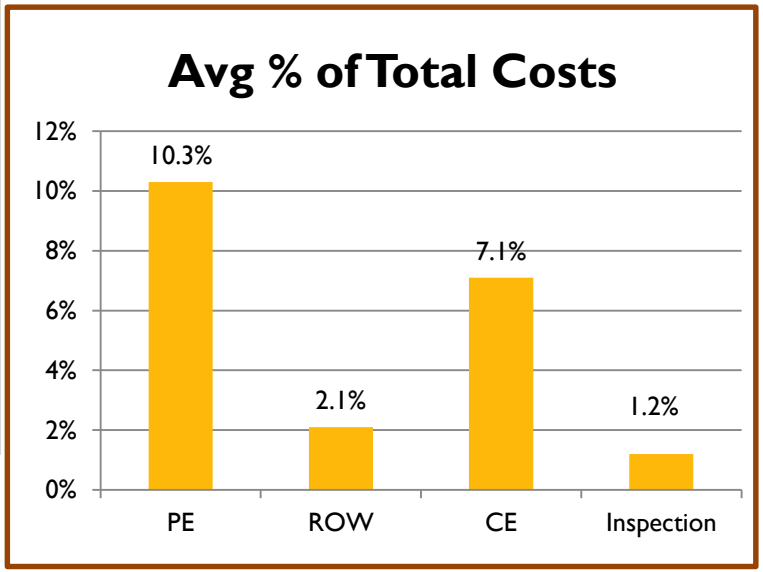
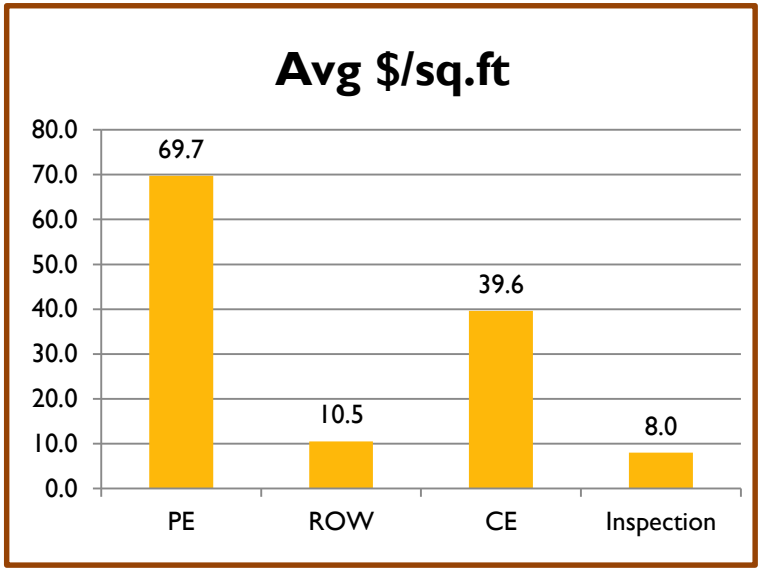




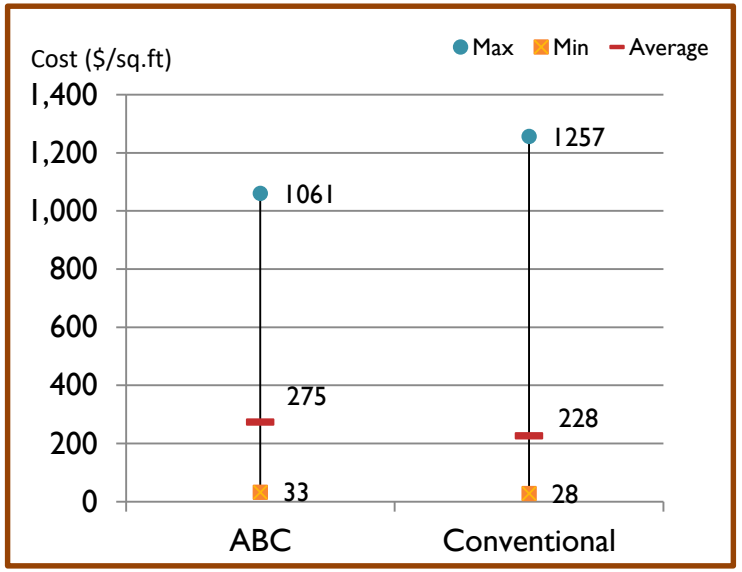


(ABC vs. Conventional)

1. Construction Cost

	ABC	Conventional	% Difference
Average	275	228	20%
Min	33	28	17%
Max	1061	1257	-16%

Number of case studies where the cost of ABC was less than Conventional = 21%



Hypothesis Testing

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	ABC - Conventional	46.609	110.091	15.122	16.265	76.954	3.082	52	.003

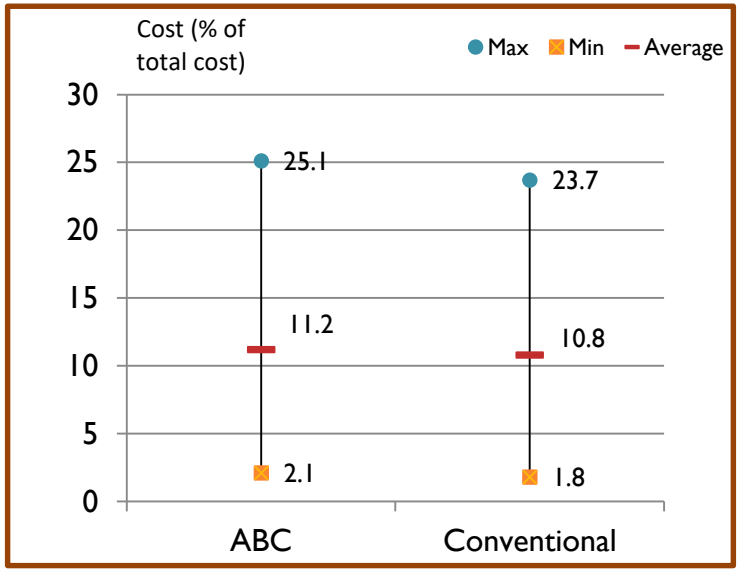
1- Significant evidence that Means are not equal.
2- ABC > Conventional

(ABC vs. Conventional)

2. Preliminary Engineering Cost (PE)

	ABC	Conventional	Difference
Average	11.2%	10.8%	0.4%
Min	2.1%	1.8%	0.4%
Max	25.1%	23.7%	1.4%

Number of case studies where the cost of ABC was less than Conventional = 50%



Hypothesis Testing

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	ABC - Conventional	.380	10.709	3.387	-7.281	8.041	.112	9	.913

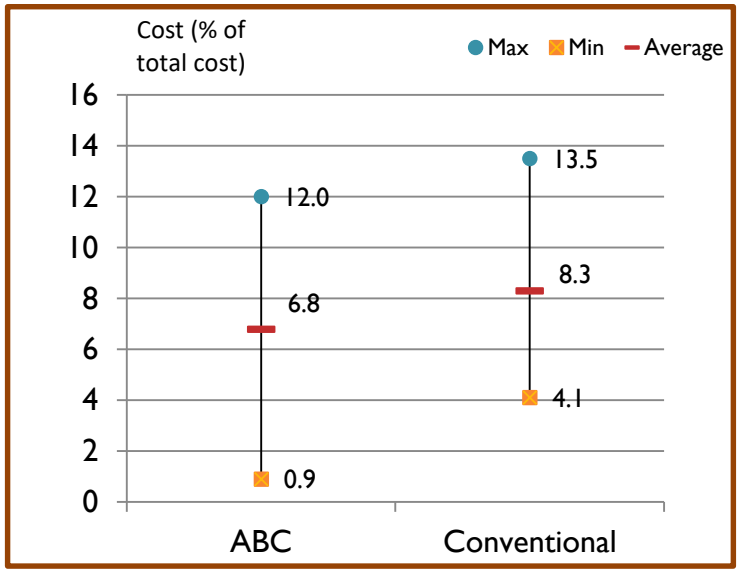
1- NO Significant evidence that Means are not equal.

(ABC vs. Conventional)

3. Construction Engineering Cost (CE)

	ABC	Conventional	Difference
Average	6.8%	8.3%	-1.5%
Min	0.9%	4.1%	-3.2%
Max	12%	13.5%	-1.5%

Number of case studies where the cost of ABC was less than Conventional = 70%



Hypothesis Testing

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	ABC - Conventional	-1.51	5.429	1.717	-5.394	2.374	-.880	9	.402

1- NO Significant evidence that Means are not equal.

Conclusion

- A tool to estimate the construction cost associated with ABC at the early stages of the projects (in terms of $/sq.ft)
- Better understanding of the different types of indirect costs associated with ABC projects, their magnitude, and impacts.
- Comparison between ABC and conventional construction methods to determine the significant sources of difference between the two methods.

Thank You