



Design-Build Performance Over the Years: An Exploration into Colorado's Experience

Presented by: Guillermo Nevett

Authors: Douglas Alleman, Guillermo Nevett, Dr. Paul Goodrum



Presentation Agenda

- Delivery Methods
- D-B History
- Existing Literature
- Findings/Discussion
- Future Work

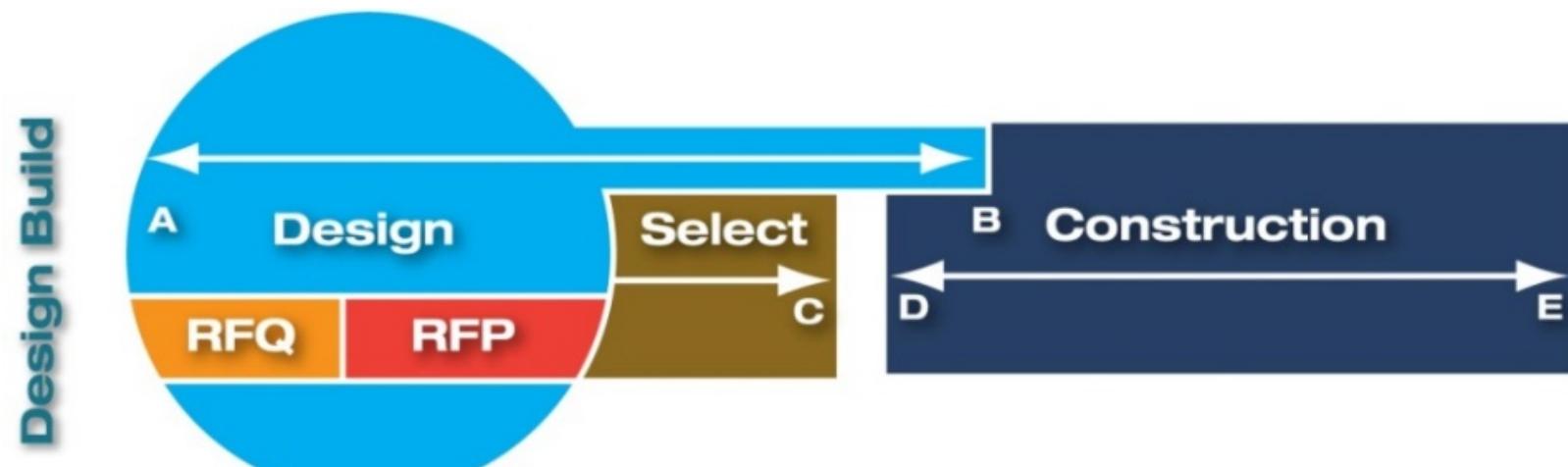
CDOT Project Performance (2008 – 2016): D-B-B vs. D-B



Design-Build

FDOT D-B Program	SEP-14	CDOT 1st D-B	D-B Final Rule	T-REX	EDC	CDOT PDSM
1987	1990	1999	2002	2008	2012	2012

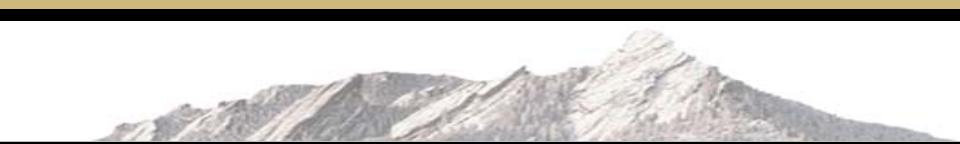
Timeline of D-B Milestones: FHWA and CDOT





Existing Literature

Research	Years	Agency	PDM	# Projects	Cost Growth Mean	P-Value
Ellis et al. (1991)	1987 - 1990	Florida	D-B-B	~400	8.8%	Not Sig.
			D-B	11	-2.0%	
Warne (2005)	1996 - 2005	9 Agencies	D-B	16	3.8%	N/A
FHWA (2006)	1996 - 2002	19 Agencies	D-B-B	9	4.3%	N/A
			D-B	11	6.0%	
Ellis et al. (2007)	1998 - 2006	Florida	D-B-B	1908	9.4%	N/A
			D-B	68	4.5%	
Shrestha et al. (2007)	2000 - 2006	Multiple	D-B-B	11	3.9%	0.55
			D-B	4	2.1%	
Goodrum et al. (2011)	2008 – 2011	Kentucky	D-B-B	5	3.5%	N/A
			D-B	9	4.2%	
Shrestha et al. (2011)*	2000 - 2009	Multiple	D-B-B	16	7.8%	0.751
			D-B	6	6.3%	
Minchin et al. (2016)	2002 - 2010	Florida	D-B-B	1,495	0.0%	N/A
			D-B	233	0.3%	
FHWA (2016)	2004 - 2015	26 Agencies	D-B-B	129	4.1%	Not Sig.
			D-B	110	3.6%	



Existing Literature

Few Statistically
Significant Findings

Research	Years	Agency	PDM	# Projects	Cost Growth Mean	P-Value
Ellis et al. (1991)	1987 - 1990	Florida	D-B-B	~400	8.8%	Not Sig.
			D-B	11	-2.0%	
Warne (2005)	1996 - 2005	9 Agencies	D-B	16	3.8%	N/A
FHWA (2006)	1996 - 2002	19 Agencies	D-B-B	9	4.3%	N/A
			D-B	11	6.0%	
Ellis et al. (2007)	1998 - 2006	Florida	D-B-B	1908	9.4%	N/A
			D-B	68	4.5%	
Shrestha et al. (2007)	2000 - 2006	Multiple	D-B-B	11	3.9%	0.55
			D-B	4	2.1%	
Goodrum et al. (2011)	2008 – 2011	Kentucky	D-B-B	5	3.5%	N/A
			D-B	9	4.2%	
Shrestha et al. (2011)*	2000 - 2009	Multiple	D-B-B	16	7.8%	0.751
			D-B	6	6.3%	
Minchin et al. (2016)	2002 - 2010	Florida	D-B-B	1,495	0.0%	N/A
			D-B	233	0.3%	
FHWA (2016)	2004 - 2015	26 Agencies	D-B-B	129	4.1%	Not Sig.
			D-B	110	3.6%	



Existing Literature

Only 4 of 8 comparing D-B-B to D-B
find D-B with lower cost growth

Research	Years	Agency	PDM	# Projects	Cost Growth Mean	P-Value
Ellis et al. (1991)	1987 - 1990	Florida	D-B-B	~400	8.8%	Not Sig.
			D-B	11	-2.0%	
Ellis et al. (2007)	1998 - 2006	Florida	D-B-B	1908	9.4%	N/A
			D-B	68	4.5%	
Shrestha et al. (2007)	2000 - 2006	Multiple	D-B-B	11	3.9%	0.55
			D-B	4	2.1%	
Shrestha et al. (2011)*	2000 - 2009	Multiple	D-B-B	16	7.8%	0.751
			D-B	6	6.3%	
FHWA (2016)	2004 - 2015	26 Agencies	D-B-B	129	4.1%	Not Sig.
			D-B	110	3.6%	



Research Question

How does Colorado's project performance compare across delivery methods and over time?

Project Performance via Cost Growth

$$\text{Cost Growth (\%)} = \frac{\text{Contract Final Cost} - \text{Award Value}}{\text{Contract Final Cost}} * 100$$



Paper Findings

Finding 1: Cost Growth Comparison

Contract Type	N	Cost Growth	P-value
D-B-B	734	-8.3%	0.81
D-B	21	-21.5%	

No Statistically
Significant Difference



Paper Findings

Finding 2: Cost Growth Comparison Over Time

Contract Type	2008-2012			2013-2015		
	n	Mean	P-Value	n	Mean	P-Value
D-B-B	322	3.6%	0.1075	412	-17.7%	0.7341
D-B	8	14.3%		13	-43.5%	

No Statistically
Significant Difference



Paper Findings

1. D-B-B vs. D-B Cost Growth:

- No Stat. Finding

2. D-B-B vs. D-B Cost Growth Over Time:

- No Stat. Finding

3. D-B-B and D-B Mean Cost Growth Per Year (2008 – 2016):

- No trends of better or worse

4. CDOT Uses D-B for Approximately 3% of their projects



Discussion

1. Why Chose D-B if not for Cost Performance?



Discussion

1. Why Chose D-B if not for Cost Performance?

- FROM LITERATURE:
 - Schedule Acceleration
 - Cost Savings
 - Constructability/Innovation
 - Cost/Schedule Certainty



Discussion

1. Why Chose D-B if not for Cost Performance?

- FROM AGENCY MANUALS:
 - Schedule Acceleration
 - Innovation
 - Risk Assessment/Sharing of Risk
 - Project Cost



Future Work

1. Usage of historical data to create time estimation models
 1. Multiple Linear Regression Models
 2. Machine Learning Prediction Models



THANK YOU!

QUESTIONS?

