FIU FLORIDA INTERNATIONAL UNIVERSITY

ABC-UTC Research Seminar

October 2022

Alternative Technical Concepts for Contract Delivery Methods in Accelerated Bridge Construction

ABC UTC
ACCELERATED BRIDGE CONSTRUCTION
UNIVERSITY TRANSPORTATION CENTER

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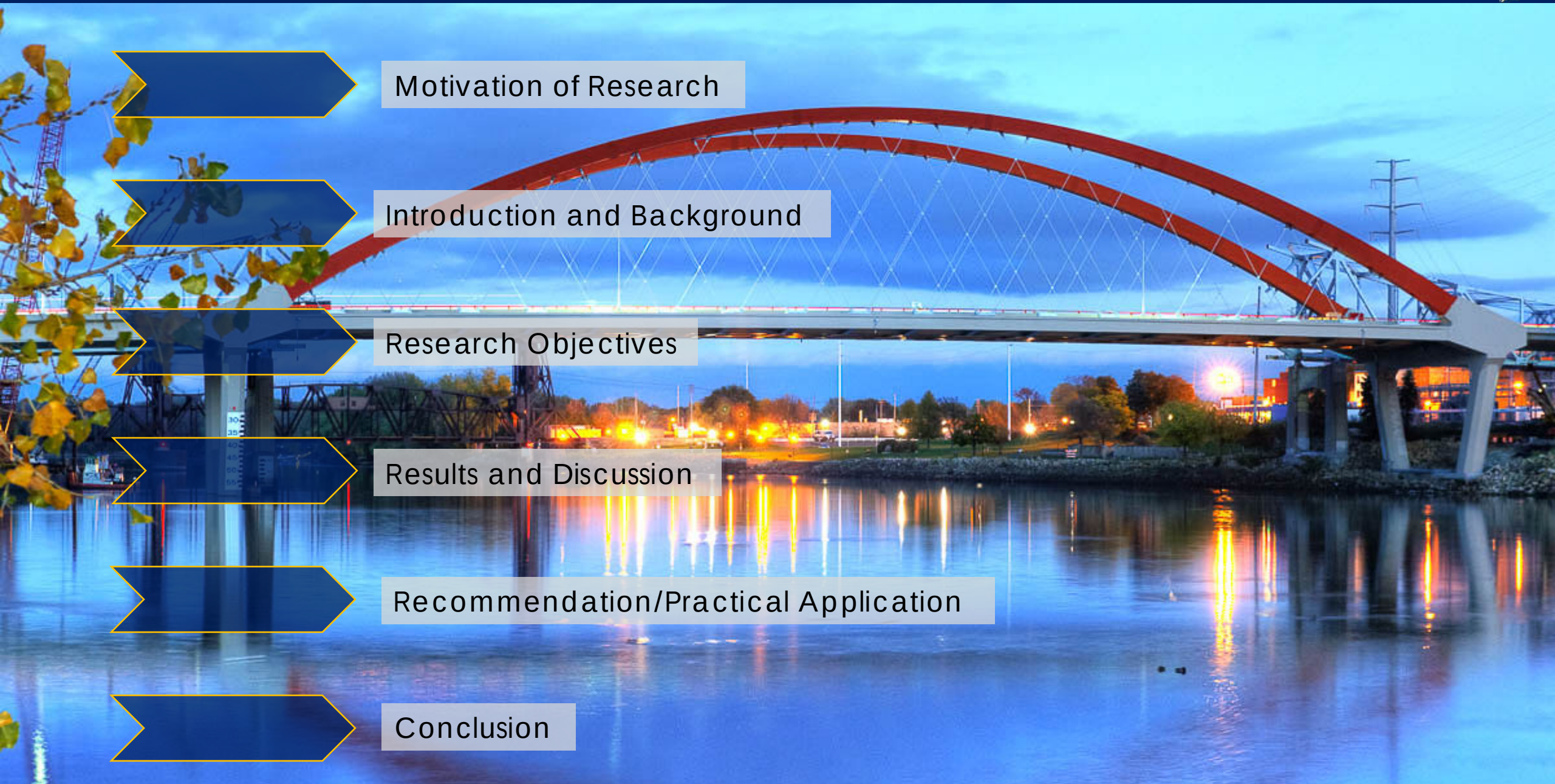
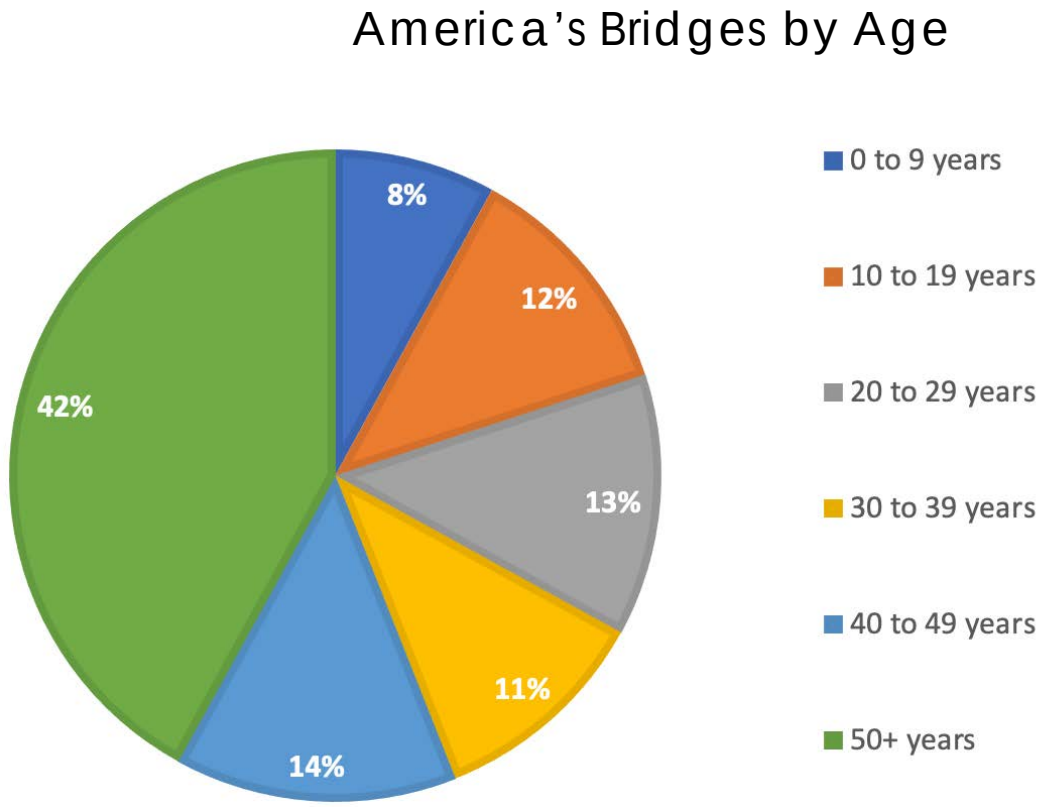
Outline



- Motivation of Research
- Introduction and Background
- Research Objectives
- Results and Discussion
- Recommendation/Practical Application
- Conclusion

MOTIVATION

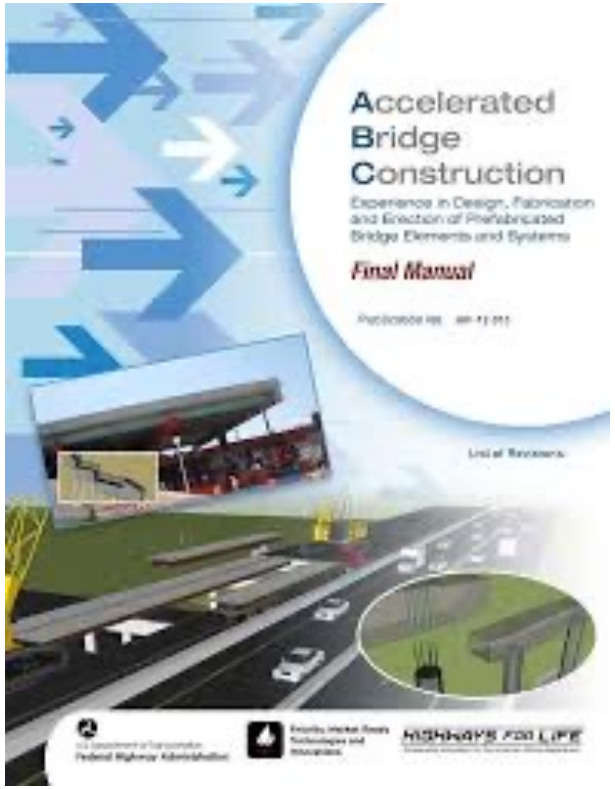


Structurally deficient bridges in the U.S. based on most recent ASCE Report-Card 2021

https://infrastructurereportcard.org/wp-content/uploads/2020/12/National_IRC_2021-report.pdf

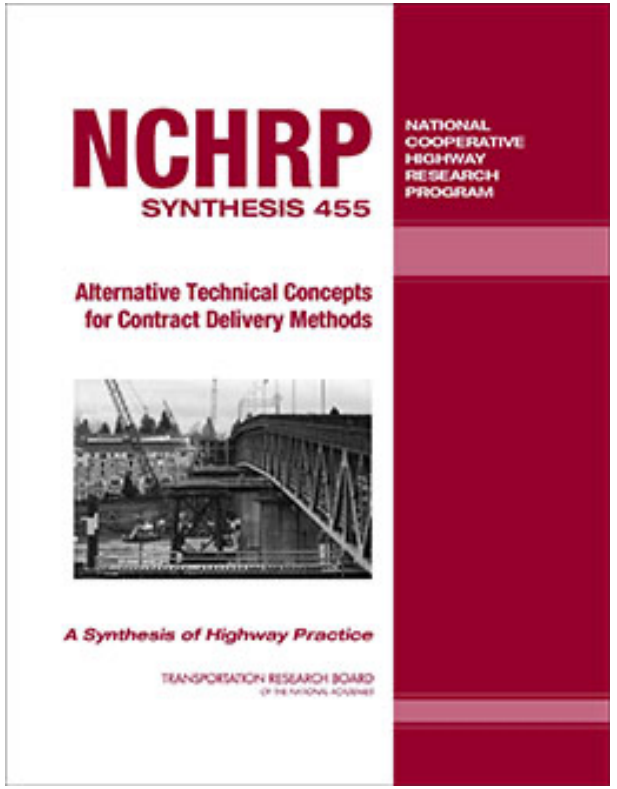
INTRODUCTION: Differences between ABC & ATC

- Prefabrication of bridges in a controlled setting/Offsite construction
- Acceleration in schedules
- Reduction in Safety Hazards
- Reduction in Traffic Delays



Accelerated Bridge Construction (ABC) Manual

https://www.fhwa.dot.gov/bridge/abc/docs/abcmanual.pdf



Alternative Technical Concept (ATC) Guideline for Highway Projects

https://www.trb.org/Publications/Blurbs/170465.aspx

- Request by proposer to modify a contract requirement
- Incorporate innovation and creativity
- Early contractor involvement
- Risk mitigation
- Reduce cost of construction
- Best-value for the owner

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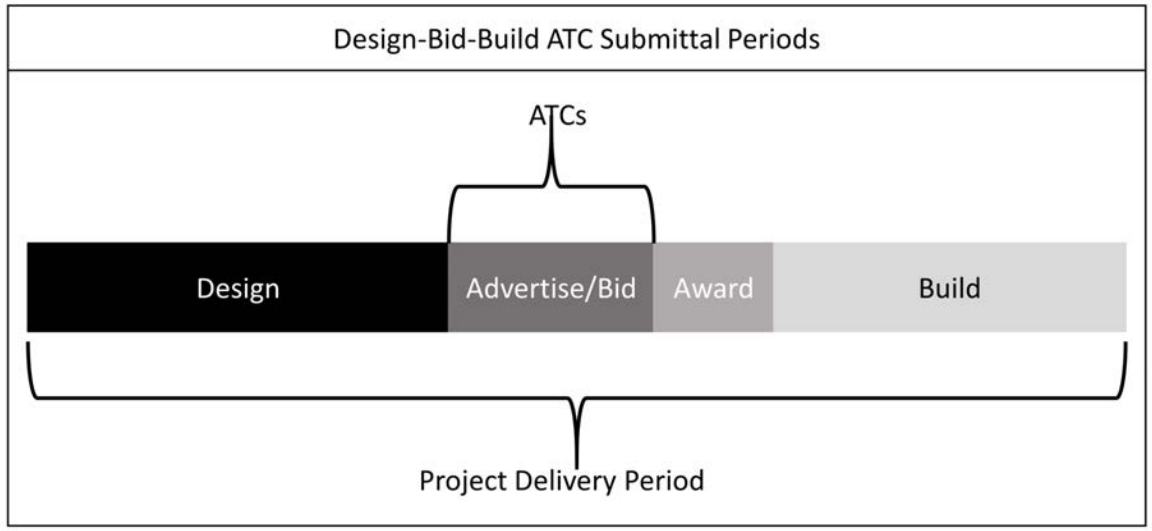
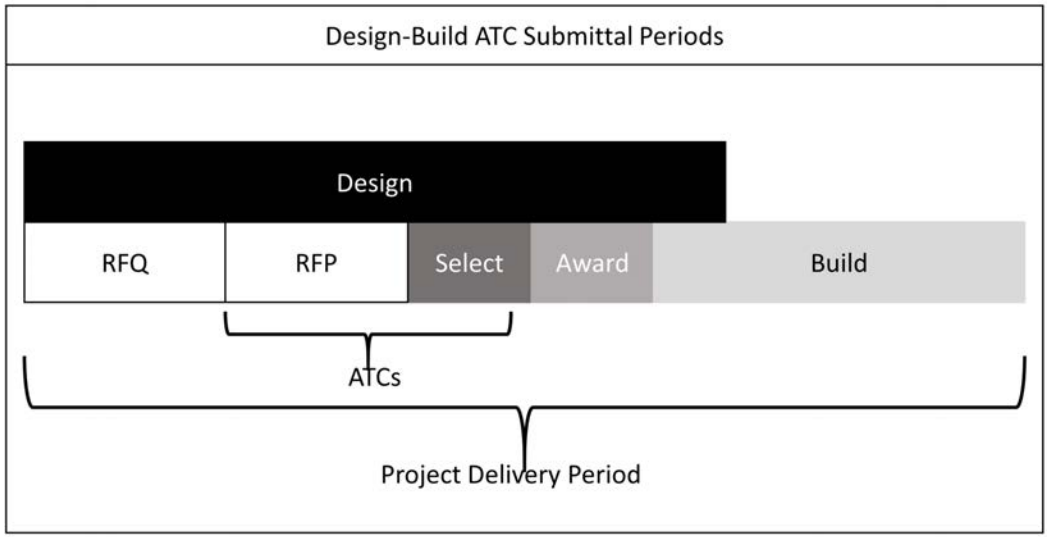
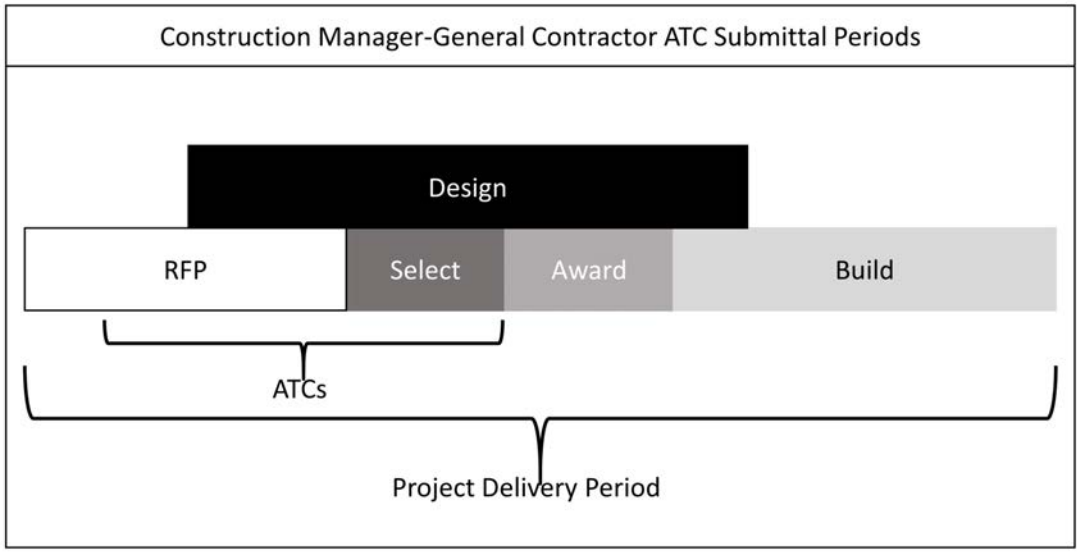
INTRODUCTION: Alternative Technical Concept Submittal Period

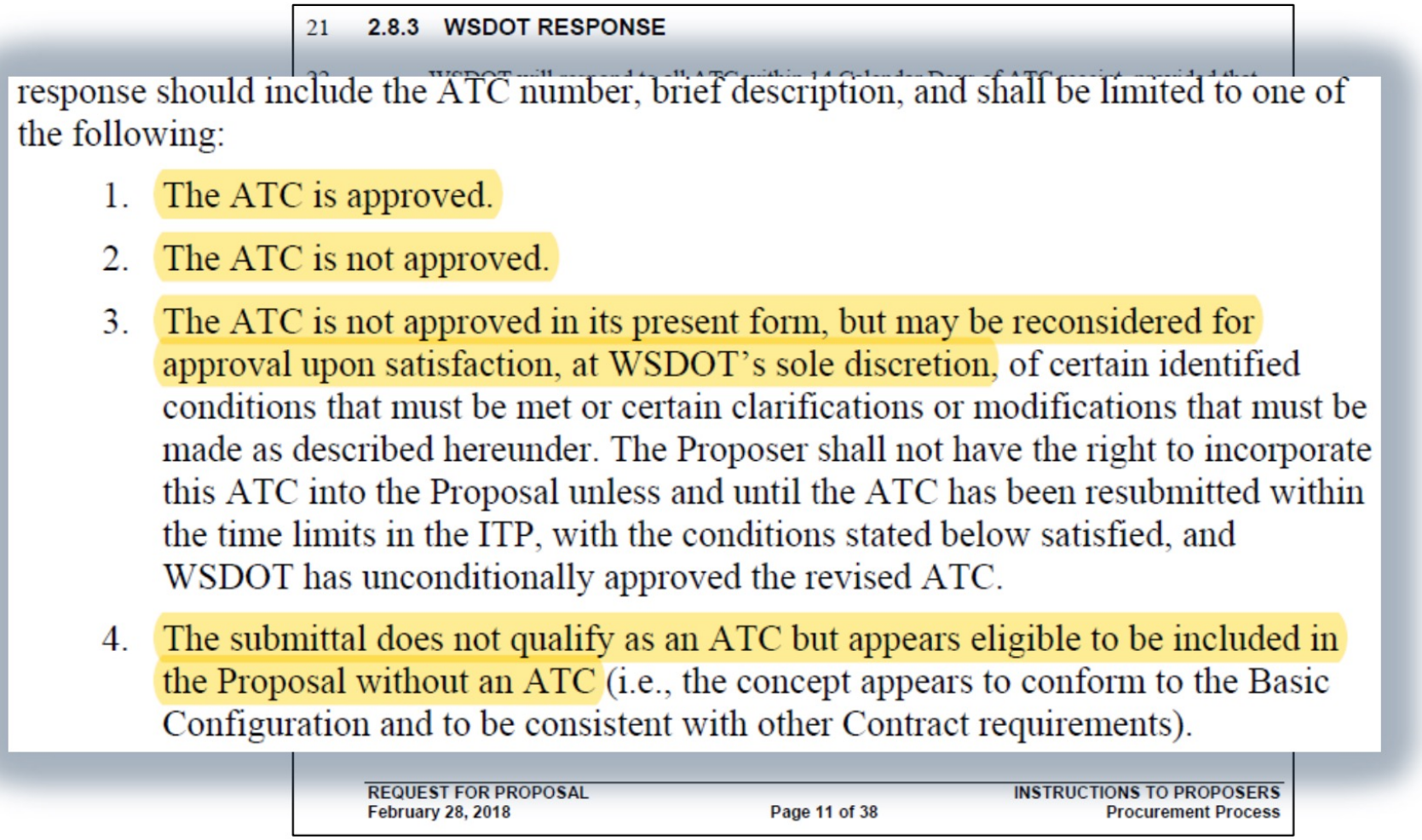






https://journals.sagepub.com/doi/epdf/10.3141/2504-10

INTRODUCTION: Potential Response for Proposed ATC

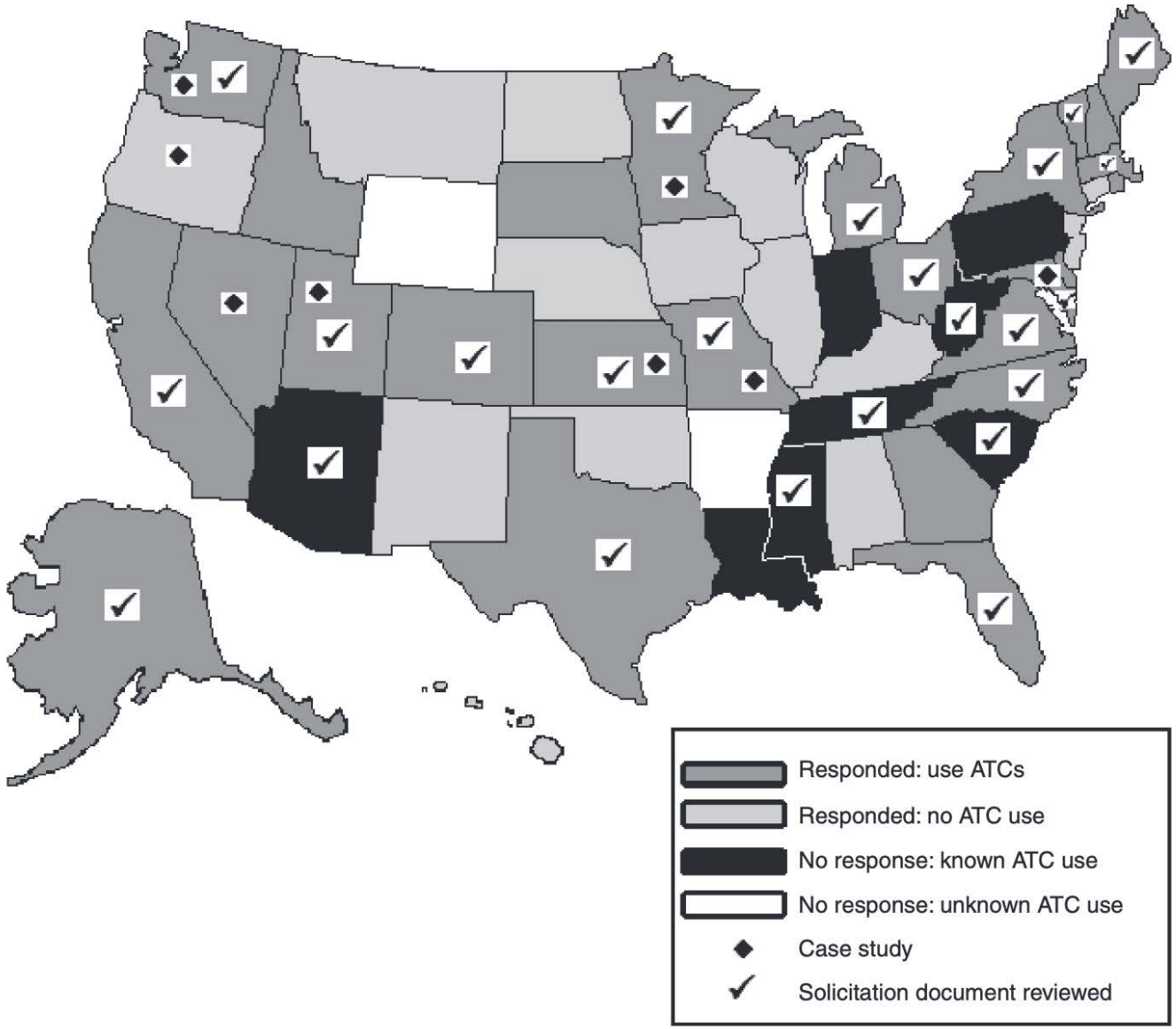


21 **2.8.3 WSDOT RESPONSE**

response should include the ATC number, brief description, and shall be limited to one of the following:

1. The ATC is approved.
2. The ATC is not approved.
3. The ATC is not approved in its present form, but may be reconsidered for approval upon satisfaction, at WSDOT's sole discretion, of certain identified conditions that must be met or certain clarifications or modifications that must be made as described hereunder. The Proposer shall not have the right to incorporate this ATC into the Proposal unless and until the ATC has been resubmitted within the time limits in the ITP, with the conditions stated below satisfied, and WSDOT has unconditionally approved the revised ATC.
4. The submittal does not qualify as an ATC but appears eligible to be included in the Proposal without an ATC (i.e., the concept appears to conform to the Basic Configuration and to be consistent with other Contract requirements).

INTRODUCTION: Map of ATC Use Across the U.S.



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Research Objectives

- Document case-studies of ABC projects with and without alternative technical concepts (ATCs)
- Investigate SWOT (strengths, weaknesses, opportunities, and threats) of ATC integration in ABC projects
- Identify critical factors impacting ATC integration in ABC projects and determine normalized weight of each factor
- Develop decision making framework for integration of ATC for contract delivery of ABC project

RESULTS: Summary of Case-Study Projects

Agency	Case Study Project (Value)	Project Scope and Location	Project Delivery Method	Payment Mechanism	Selection Method	Cost/Time Savings
Case-Studies of ABC projects without ATCs						
Idaho DOT	$13.3 Million, Black Creeks Bridge	Bridge replacement (I-84, Blacks Creek Interchange, Idaho)	DBB	Unit Price	Low Bid	Demolition of old bridge in five months & construction of new bridge completed in 14 days
Idaho DOT	$1.8 million, Wiser Bridge	Bridge Replacement (US-95 Wiser, Idaho)	DB	Lump-Sum	N/A	N/A
Case-Studies of ABC projects with ATCs						
Minnesota DOT	$12 Million Hastings Bridge	Bridge Replacement (Hastings, MN)	DB	Lump-Sum	Best Value Bid	$80 to $100 million
Connecticut DOT	$22.7 Million Route8, Bridge	Bridge Replacement (Route8/25 Southbound, Bridgeport, CT)	DB	Lump-Sum	N/A	Reduced 2-year Bridge Replacement process to 28 days
Idaho DOT	$3.64 Million, Lardo Bridge	Bridge replacement (Payette Lake, SW shore, Lardo, Idaho)	DB	Lump-Sum	A+B Bidding	$2.8 million cost savings completed within eight months

RESULTS: Lessons learned from Hastings Bridge Construction

Hastings Bridge construction, Minnesota, 2012

- Total engineer's estimate of $220 million
- Final cost after integration of ATC was $120 million
- The winning bidder integrated eight ATCs
- Reduced impact to the traffic by moving the bridge through water and the entire process was completed within 48 hours

RESULTS: Lessons Learned from Lardo Bridge Project

Lardo Bridge Project,
Idaho, 2014

- Replacement of an 83-year-old bridge
- Conventional construction bid was estimated to be $6.4 million with a construction schedule of 259 days
- Cost was reduced to $3.6 million with 194 days of construction duration with integration of ATC
- The ABC bridge was slid into place using a lateral slide accelerated construction method

RESULTS: Lessons learned from Route 8 Bridgeport Bridge

Route 8 Bridgeport Bridge, Connecticut, 2018

- Original Bridge constructed in the 1970s with an ADT of 88,000 vehicles per day
- Connecticut DOT originally estimated to complete the bridge overhaul within 2 years
- Reduced the total on-site work schedule to 28 days of bridge replacement process
- Use of modern weathering steel beams reduced the amount of maintenance required

RESULTS: SWOT analysis of ATC integration in ABC project

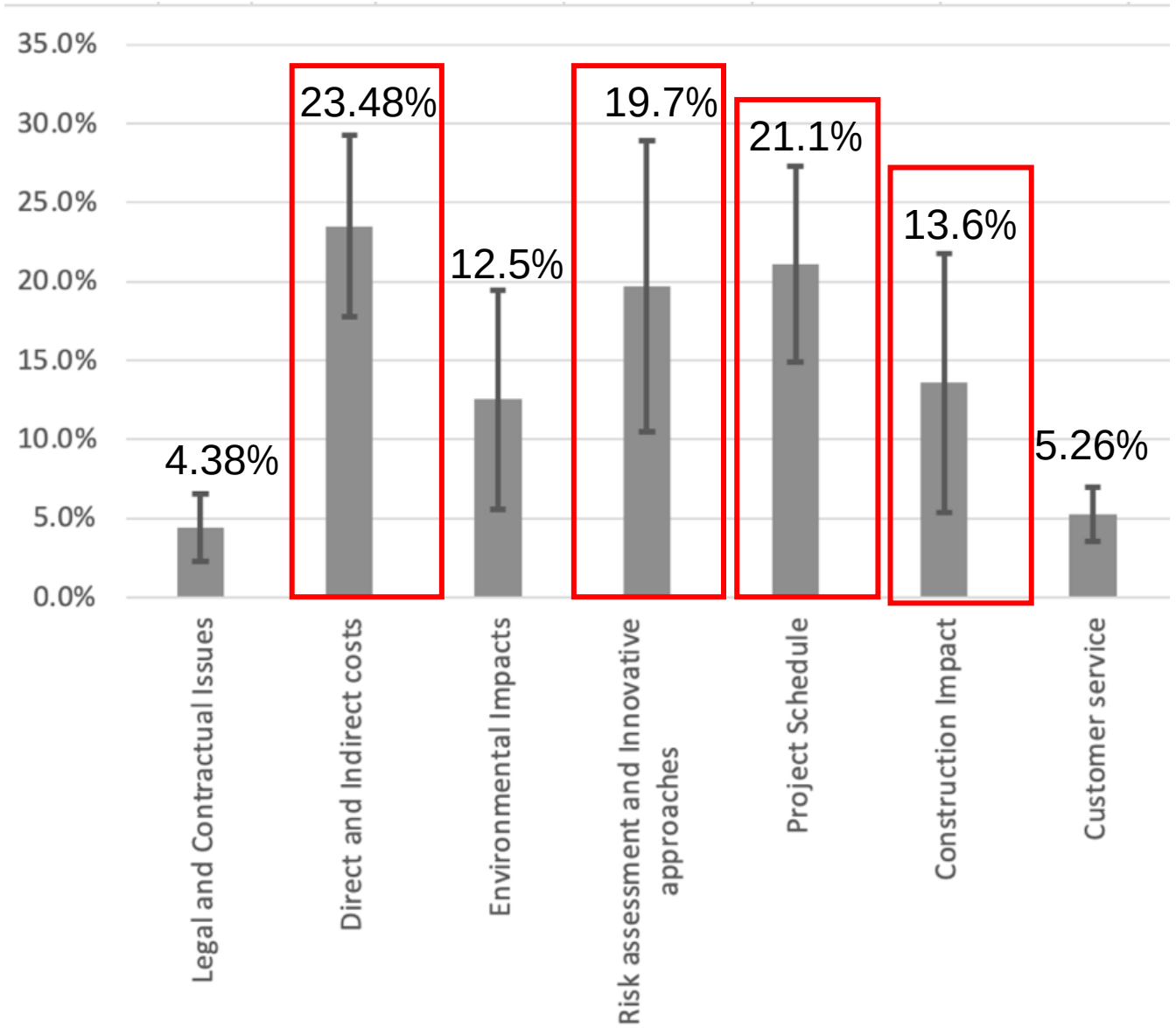
SWOT (Strength, Weaknesses, Opportunities, and Threats) Matrix

Strengths	Weaknesses
1. Early contractor involvement 2. Reduced duration and cost 3. ATCs are transferable 4. Equal or better design 5. Applicable to all Project Delivery Methods 6. Enhancement in constructability 7. Incorporation of innovative technologies	1. Contractor recuperation of design costs 2. Limitation in ATCs submittal 3. Lack of Trained ATC Reviewers
Opportunities	**Threats**
1. Encourages integration of sustainable practices 2. Encourages best-value solutions	1. Potential increase in cost due to innovation 2. Challenges to defining quality assurance 3. Direct and Indirect costs are not considered in ATC approval 4. Additional fees

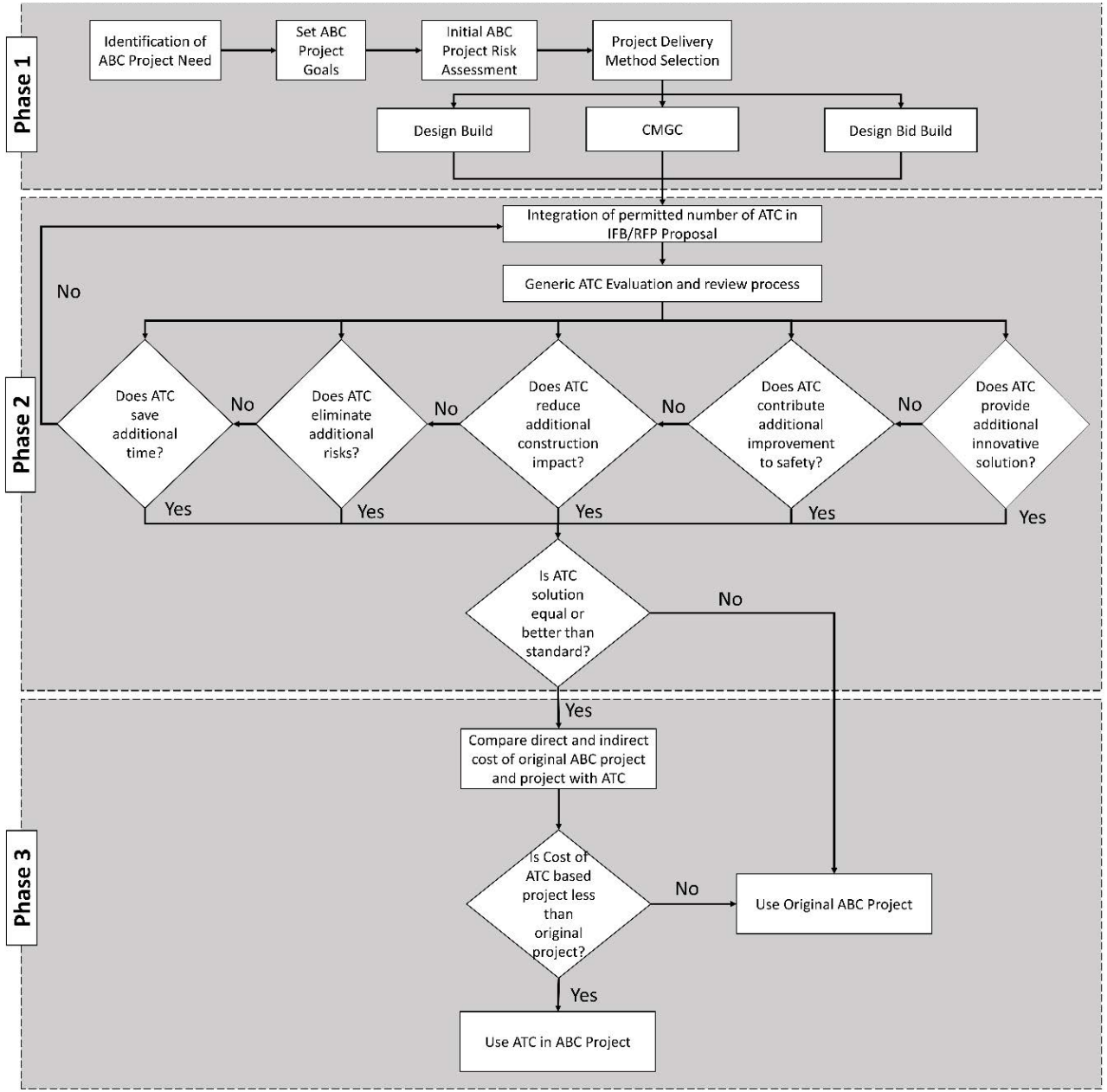
RESULTS: Essential Criteria for ATC integration in ABC project

S.N.	Criteria	Definition	References
1.	Legal and contractual issues	This criterion captures diverse issues associated with ATC implementation that create challenges for the procuring agencies and those entities responding to the procurement. E.g., Confidentiality, protest rights, and criteria for consideration and acceptance.	(Gad et al. 2015a, 2020)
2.	Direct and Indirect costs	This criterion captures direct costs including estimated construction cost, maintenance cost, design and construction of detours, right of way, project design and development, maintenance of essential services, and toll revenue as well as indirect costs including user delay, freight mobility, revenue loss, livability during construction, road user exposure and construction personal exposure.	(Gransberg 2014; Gransberg and Shane 2015; Saeedi et al. 2013)
3.	Environmental impacts	This criterion captures the constraints placed on the project in terms of reducing the impact on the environment (both social and natural, including commitments).	(Boylston 2014; Freeseman et al. 2020)
4.	Risk assessment and Innovative approaches to project execution	This criterion captures innovative opportunities to allocate risks to different parties (e.g., schedule, phasing, and means and methods), and resolve complex design issues through innovative designs.	(Carfagno and Dickerson 2018; Ormijana and Rubio 2013)
5.	Project Schedule / Duration	This criterion evaluates the total project delivery as measured from the time of the value analysis study to completion of construction.	(Freeseman et al. 2020; Mattox 2019)
6.	Construction impact	This criterion captures the temporary impact to the public during construction related to traffic disruption, detours, and delays; impacts to business and residents in association with noise, visual, dust, access, vibration, and traffic.	(Clark and Angeles 2018; Mattox 2019; Saeedi et al. 2013)
7.	Customer service (Public perception and relation)	This criterion captures the publics' perception of construction progress, their overall satisfaction level as well as costs linked to the communication and management of public relations before and during construction.	(Freeseman et al. 2020; Gad et al. 2015b; Saeedi et al. 2013)

RESULTS: Normalized weighted score of criteria



RESULTS: Decision Making Flowchart for Integrating ATC in ABC



Link to the Publication related to flowchart

https://doi.org/10.1061/9780784483978.010

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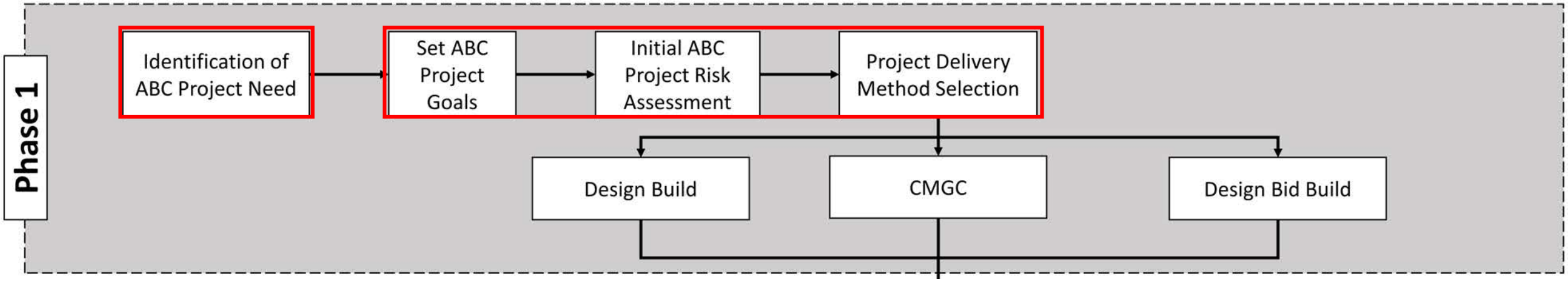

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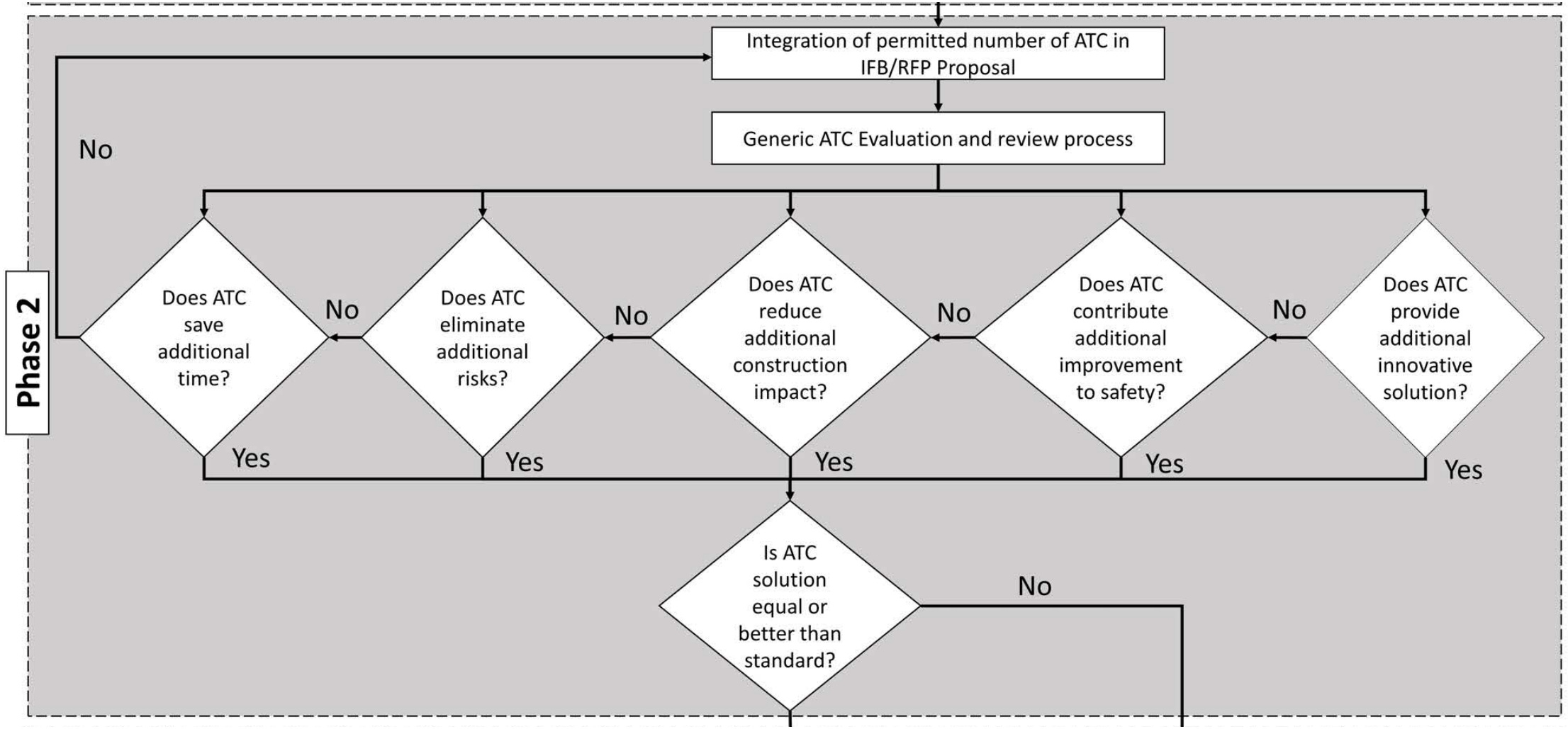

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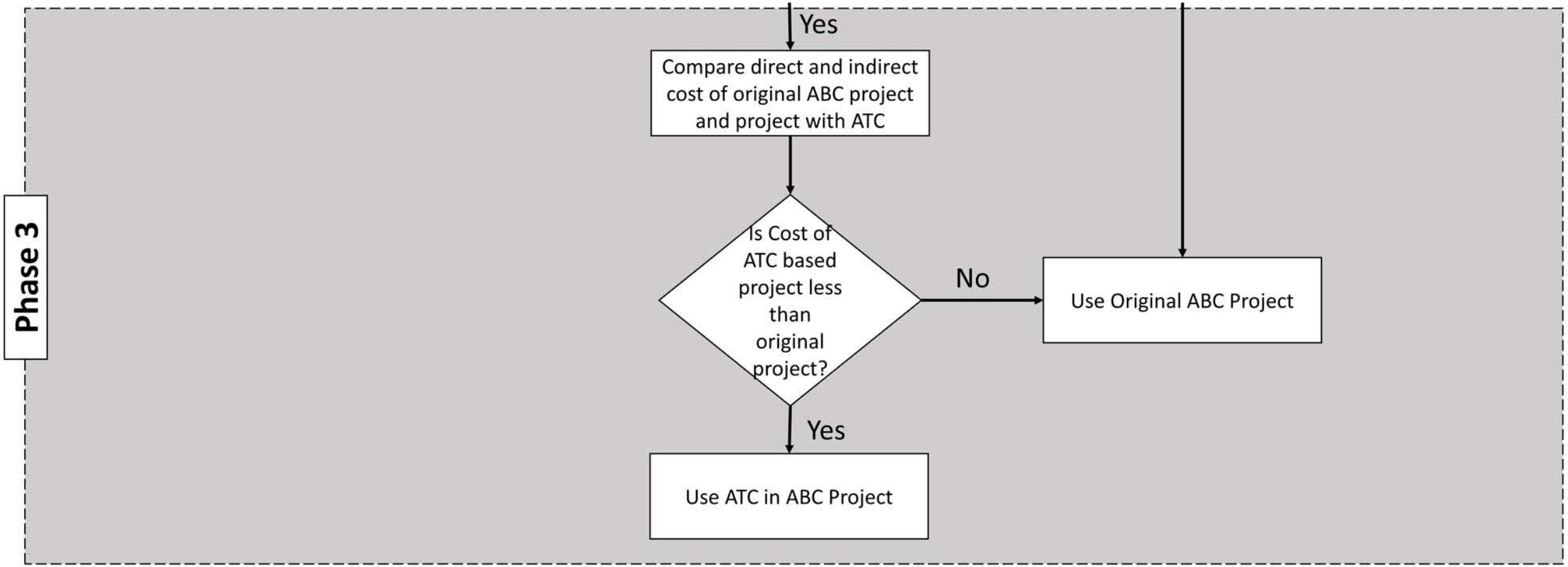
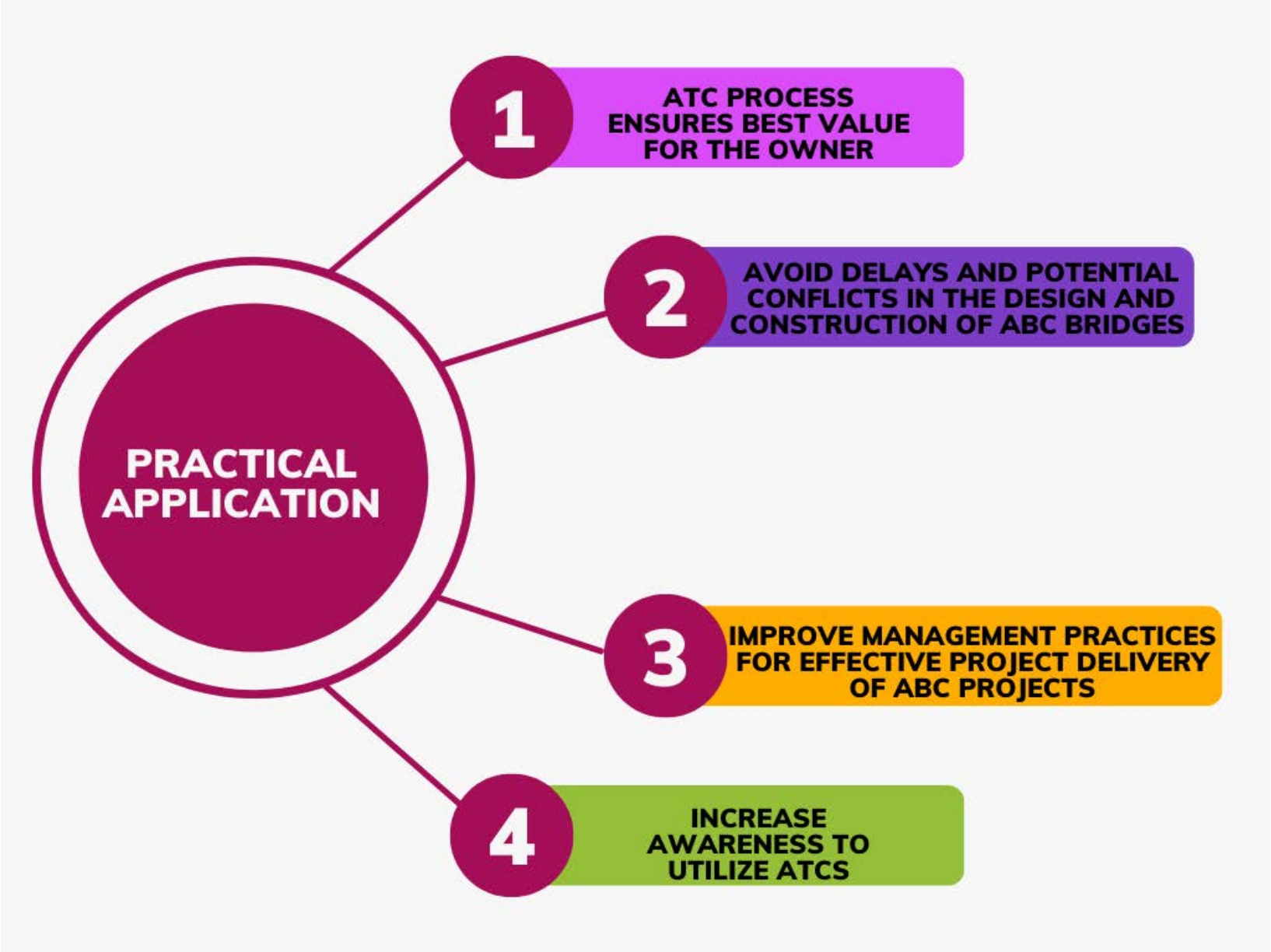


https://doi.org/10.1061/9780784483978.010

Recommendation/Practical Applications



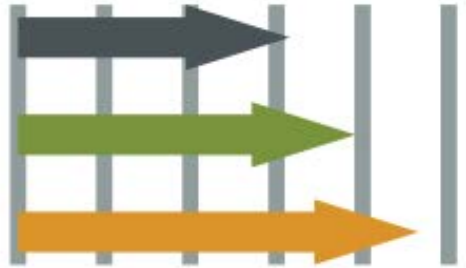
CONCLUSION

Promote Efficiencies

Reduce Project Costs

Innovations

Reduce Risks



Accelerate Project Delivery Schedules

Acknowledgement

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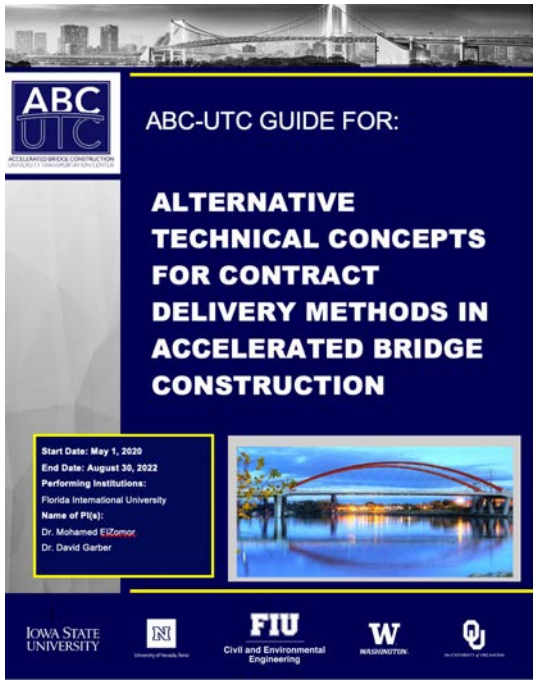
NCHRP

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Ahmad Abu-Hawash

(NCHRP, Transportation Research Board)

Our Publications



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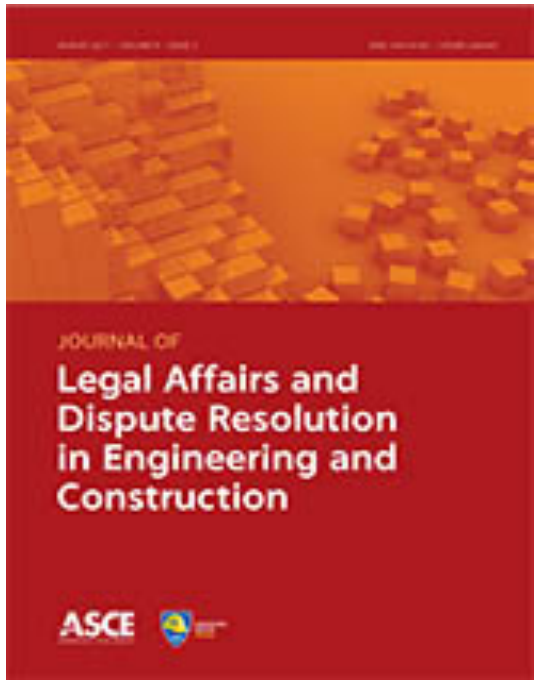

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thank you
merci
danke
gracias
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