ABOUT THE CHAIR

Established in January 2012 under the leadership of Dr. Aminah Robinson Fayek, the Industrial Research Chair in Strategic Construction Modeling and Delivery operates within the Department of Civil and Environmental Engineering at the University of Alberta.

The Chair brings together construction industry owners, contractors, and labour groups working in Alberta and across Canada to develop comprehensive research-based solutions to key industry problems. Giving particular attention to Canada’s oil and gas, utilities, industrial, and commercial construction sectors, the Chair focuses on strategic concerns related to construction management—such as construction industry productivity, project delivery, and performance. Research undertaken includes improvements to labour productivity, structuring projects and teams, assessing owner and contractor competencies, and reducing project execution risk.

The Chair’s research program takes advantage of fuzzy logic’s ability to capture and quantify the many subjective uncertainties that challenge construction projects. Researchers combine fuzzy logic with other forms of uncertainty modeling, artificial intelligence, and simulation techniques to develop advanced decision-support tools and approaches.

BACKGROUND

• The complex and dynamic nature of construction projects imposes considerable uncertainty and subjectivity on risk analysis and contingency determination processes.
• Traditional risk analysis approaches rely heavily on historical data and fail to capture subjective uncertainties.
• Fuzzy logic allows for the probability and impact of risks and opportunities to be defined linguistically and for work package and project contingencies to be calculated based on natural language terms, which are suited to human expert judgement.

OBJECTIVES

• Develop a contingency determination procedure based on fuzzy arithmetic that does not require historical data and is capable of handling the subjective uncertainty that arises when experts assess risks and opportunities.
• Address both critical risk and opportunity events in determining work package and project contingencies.
• Develop a software tool (i.e., Fuzzy Contingency Determinator© (FCD©)) that is capable of implementing the procedure in an automated manner.

METHODODOLOGY

1. Develop event breakdown structure
2. Develop fuzzy scales
3. Assess probability and impact
4. Determine contingency using FCD©
5. Test and validate

PROJECT PARTNERS

NSERC CRSG  
Capital Power
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FUTURE RESEARCH

- The procedure addresses risk uncertainty and inaccuracy in determining contingency by using linguistic terms and fuzzy numbers to assess probability and impact of critical events.
- Fuzzy Contingency Determinator©: a simple, transparent, and user-friendly software tool that considers both risks and opportunities in determining work package and project contingencies.
- Addresses key limitations of the deterministic and probabilistic risk assessment approaches.

INDUSTRY APPLICATIONS

- Fuzzy Contingency Determinator©: A Fuzzy Arithmetic-Based Risk Analysis Tool for Construction Projects

Contingency determination procedure

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\sum \text{Net severity in } $\text{ due to local event, } \sum \text{Net severity in } $\text{ due to global event, } = \text{ Work package, contingency in } $ \text{; } \sum \text{ Work package, contingency in } $ \text{ } = \text{ Project contingency in } $\]