

Master's Thesis

Development of a novel Impact Index for Planning and Execution of Railway Infrastructure Projects in Germany: A Comprehensive Qualitative and Quantitative Study with special emphasis on Stuttgart 21

Introduction

Railway infrastructure projects globally are influenced by diverse factors, their impacts varying based on specific national contexts. Germany, renowned for its excellence in project management and infrastructure implementation, faces its own set of challenges in this regard. The collaborative effect of several factors has impeded the successful implementation of railway infrastructure projects in Germany, resulting in poor project performance and reduced public satisfaction. It is crucial to identify these significant factors, determine their respective weights, and develop a composite index to assess overall project performance scientifically. This effort is essential for advancing informed decision-making and ensuring effective project management within the realm of railway infrastructure projects in Germany.

Research Objectives

- Identify Critical Factors affecting Railway Projects in Germany
- Formulate a composite index to scientifically evaluate the overall performance of German railway infrastructure projects
- Validate the composite Impact Index using empirical data, providing practical recommendations for improved decision-making

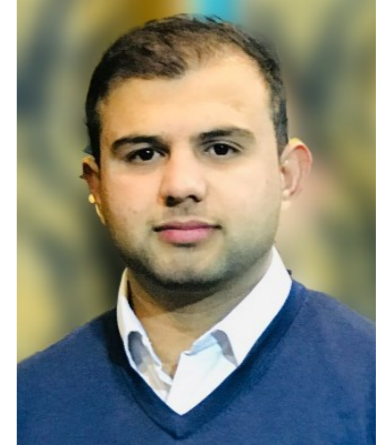
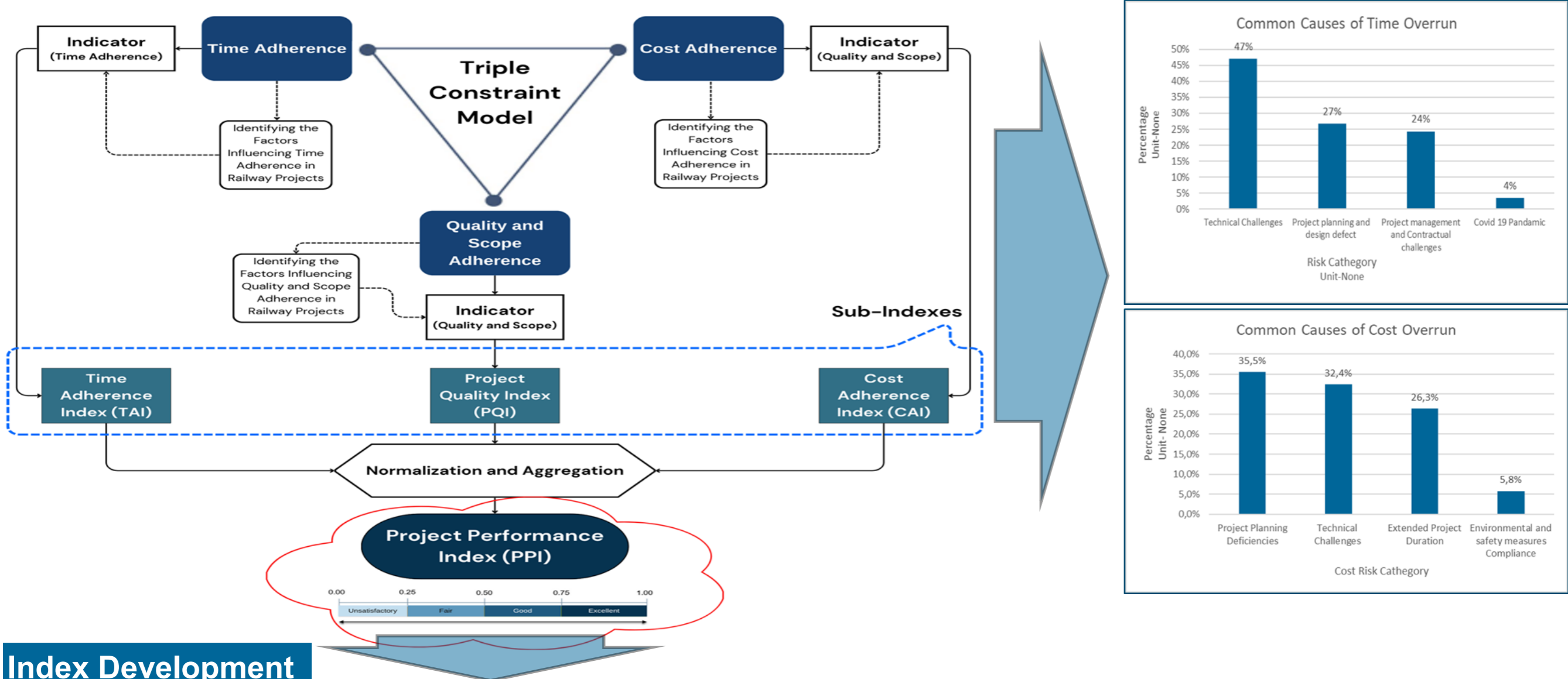


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Research Design and Analysis



Index Development

Where:

- PPI represents the Project Performance Index.
- TAI denotes the Time Adherence Index.
- CAI signifies the Cost Adherence Index.
- PQI stands for the Project Quality Index.
- $w_1, w_2,$ and w_3 are the respective weighting coefficients

$$PPI = w_1 \times TAI + w_2 \times CAI + w_3 \times PQI$$

$$Time\ Adherence\ Percentage = 1 - \left[\frac{D_{Total}}{Contract\ Duration} \right]$$

$$Cost\ Adherence\ Percentage = 1 - \frac{\sum_{i=1}^n (w_i * Cost\ Overrun)}{Contract\ Price}$$

$$PQI = \sum_{i=1}^n (W_i * Indicator_i)$$

Quality Adherence Percentage

- Standards Compliance Rate
- Satisfaction Rate
- Scope Variance Percentage
- Compliance Rate to Environmental Regulations
- Safety Incident Rate

Conclusion

- Identified key factors and respective weights influencing German railway projects
- Developed sub-indexes for focused assessment
- Created a composite index for overall project performance
- Used concrete data, ensuring replicability
- Proposed actionable recommendations for improvement
- Established a foundation for future scientific exploration

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