A COMPREHENSIVE EVALUATION PROCESS FOR TRANSPORT PROJECTS

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Degree of Doctor of Philosophy

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Thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy

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DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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ABSTRACT

A Comprehensive Evaluation Process for Transport Projects

Transport projects underpin the economic development of a country and thus attract substantial demand imposing immense pressure on many governments primarily due to scarcity of the public resources required to implement them. This particular context demands the governments and other related agencies to allocate public resources efficiently when investing in transport projects. Thus, the evaluation of transport projects becomes an important feature as it indicates how efficiently resources can be or were allocated to a given project. Nonetheless, the literature does not reveal a collectively agreed-upon process for evaluating transport projects despite its rationalization being accepted from the mid 19th century.

The processes predominantly using to evaluate transport projects range from the single-criteria cost-benefit analysis (CBA) to the multi-criteria analysis (MCA) methods and their different combinations. CBA is often criticized for its input- incompleteness raised due to inability to cope with non-monetizable impacts while MCA for its result-incompleteness raised due to those results not being able to demonstrate the implementation feasibility of projects and comparable absolutely. Thus, the most recent trend, combining CBA and MCA, is becoming more popular globally as it is capable of negating each other's disadvantages to a certain extent. However, even these combined models have failed to sort result-incompleteness effectively, primarily due to using MCA methods as their platforms. In view of solving the said input and result-incompleteness issues in existing processes, this research aimed to develop a new evaluation process for transport projects capable of ensuring (i) input-completeness by taking both monetizable and non-monetizable impacts into account and (ii) result-completeness by producing results enabling to test the implementation feasibility of each evaluated project and their performance-based prioritization.

This new evaluation process, termed as comprehensive evaluation process (CEP), was formulated by first establishing a Theoretical Comprehensive Evaluation Process (TCEP) using an inductive approach and then functionalizing it through an approach of deductive reasoning. The TCEP was developed on a MCA platform, ensuring input and result-completeness, and minimizing MCA method related issues such as subjectivity, arbitrariness, and double counting, and common issues of transparency, robustness, simplicity, and accountability. The functionalization improved the practicality issues associated with the TCEP in solving transport project evaluation problems and eventually established the Functionalized Comprehensive Evaluation Process (FCEP). Such formulated FCEP was incorporated with a methodological adjustment to test the implementation feasibility of each evaluated project and thereby established the CEP.

The CEP ascertains both input and result-completeness in its practical application to solve transport project evaluation problems and hence achieves originally set features for the new evaluation process in the research aim. This new process was demonstrated by applying it to an evaluation problem targeted to improve public transportation on the Galle Corridor in Sri Lanka. The results of the same demonstration were compared with their originals estimated using the CBA to validate the CEP justifying deviations through rational reasoning.

Keywords: input-completeness, result-completeness, multi-criteria analysis, functionalization

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AHP	Analytic Hierarchy Process
ANP	Analytic Network Process
BCA	Benefit-Cost Analysis
BCR, B/C	Benefit-Cost Ratio
BPL	Bus Priority Lane
BRT	Bus Rapid Transit
BVM	Benefit Valuation Module
CBA	Cost-Benefit Analysis
CEP	Comprehensive Evaluation Process
COSIMA	Composite model for assessment
CVM	Cost Valuation Module
DAP	Dummy Alternative Project
DOT	Department of Transport
EFFECT	Evaluation Framework of Environmental Impacts and Costs of Transport
ELECTRE	ELimination Et Choix Traduisant la Realité
EU	European Union
EUNET	European Network for Education and Training
FCEP	Functionalized Comprehensive Evaluation Process
FVM	Final Valuation Module
GDP	Gross Domestic Product
GPV	Global Priority Value
HEATCO	Harmonized European Approaches for Transport Costing
ICM	Impact Categorization Module
IRR	Internal Rate of Return
IS	Isolated Score
LPV	Local Priority Value
MAMCA	Multi-Actor Multi-Criteria Analysis
MAUT	Multi-Attribute Utility Theory
MCA	Multi-Criteria Analysis
NATA	New Approach for Transport Project Appraisal
NIS	Negative Ideal Solution
NPV	Net Present Value
OECD	Organization for Economic Cooperation and Development
PIS	Positive Ideal Solution
RO	Research Objective
RQ	Research Question
RWM	Railway Modernization
TCEP	Theoretical Comprehensive Evaluation Process
TOPSIS	Technique for Order of Preference by Similarity to Ideal Solution
UK	United Kingdom
US	Universal Score
USA	United States of America
WEIs	Wider Economic Impacts
w.r.t	with respect to