

ABSTRACT

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Title: Detecting and Measuring Corruption and Inefficiency in Infrastructure Projects Using Machine Learning and Data Analytics

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Corruption is a social evil that resonates far and deep in societies, eroding trust in governance, weakening the rule of law, impairing economic development, and exacerbating poverty, social tension, and inequality. It is a multi-dimensional and complex societal malady that occurs in various forms and contexts. As such, any effort to combat corruption must be accompanied by a thorough examination of the attributes that might play role in exacerbating or mitigating corrupt environments. This dissertation identifies a number of attributes that influence corruption, using machine learning techniques, neural network analysis, and time series causal relationship analysis, and aggregated data from 113 countries from 2007 to 2017. The results suggest that improvements in technological readiness, human development index, and e-governance index have the most profound impacts on corruption reduction. Furthermore, this dissertation discusses corruption at each phase of infrastructure systems development, and engineering ethics that serve as a foundation for corruption mitigation. The dissertation then applies novel analytical efficiency measurement methods to measure infrastructure inefficiencies, and to rank infrastructure administrative jurisdictions at the state level. An efficiency frontier is developed using optimization and the highest performing jurisdictions are identified. The dissertation's framework could serve as a starting point for governmental and non-governmental oversight agencies to study forms and contexts of corruption and inefficiencies, and to propose influential methods for reducing the instances. Moreover, the framework can help oversight agencies to promote the overall accountability of infrastructure agencies by establishing a clearer connection between infrastructure investment and performance, and by carrying out comparative assessments of infrastructure performance across the jurisdictions under their oversight or supervision.