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Rethinking the application of engineering: Structural analysis of economic impact risk propagation in infrastructures

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Engineers are not only designing structures. They are developing technologies that have the capacity to enable tremendous progress; whether it is practical structures for services, or the movement of goods, or the creation of transportation systems, to strengthening economic prosperity. Engineering fosters a plethora of methods and concepts that can be applied beyond conventional thinking. My presentation will illustrate application of two integral structural analysis methods; Moment Distribution and the Stiffness Matrix methods, to analyze the impact of risk in the economic sector. It will exhibit how Moment Distribution and the Stiffness Matrix Methods in Structural Analysis are used to analyze impact risk in a network of infrastructures. The idea originates from considering 'infrastructures' as a network of physical assets, all connected, similar to a skeletal framed structure. This presentation introduces the term 'vulnerability coefficients,' which are analogous to stiffness coefficients and used to convey the impact of risk to dependent others. An analogous comparison is made between structural parameters and economic variables in order to explain this concept. A Vulnerability Coefficient Method (VCM) computes impact risk propagation due to interdependency and then converges to the widely cited Wassily Leontief's Economic Model. An example showing impact risk propagation will be provided to verify and demonstrate the application. Through this concept, the inevitable ripple effects of economic turmoil can be managed. Engineers have the opportunity to impart their knowledge to benefit other disciplines. A disruption or threat to economic stability has cascading effects in the infrastructure network system and engineers have the capacity to implement fast, powerful and effective solutions. This can benefit management of disruptions on a local and global scale. There is immense promise for improvement of the economic sector embedded within engineering methods, and engineers must not continue to limit their capabilities.

Biography

Albert Owusu is a Senior Consultant in Construction & Structures. He specializes in Construction Projects Management. He has worked as a Structural Engineer on Civil Infrastructure Projects and their construction for several years in different countries including New Zealand and Australia. His research interests are in structural modeling, risk impact assessment on network of infrastructures. More specifically, his research work has examined the expected impact risk from climate change on critical infrastructures and its interdependencies, natural and manmade disasters and their ripple effects to interdependent national economics.

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