Project title: Simulation Modeling of Domestic and International Intermodal Supply Paths.

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Project description:

Most material that is input to a manufacturing process is transported to the manufacturing facility via multiple modes of transportation, i.e., it involves intermodal transportation. The inbound logistics of manufacturing material through various intermodal transportation paths affect cost, timeliness of production, quality, batch size, inventory, etc. Therefore, the sourcing decision, especially when considering domestic versus international alternatives, is a critical part of the acquisition process and in most industries is a major driver of manufacturing and product performance. This multifaceted decision involves numerous interrelated factors, many of which contain high degrees of variability and uncertainty. One type of sourcing consideration – reshoring (see Reshoring Initiative, www.reshorenow.org) – is becoming a major national issue. Many manufacturers are reconsidering their earlier decision to offshore operations or suppliers. Others who have not yet offshored, but are considering it, are starting to view the decision in a more holistic way. This project, using simulation modeling and analysis, will enhance the sourcing process through a software toolset that helps decision makers more effectively deal with these issues.

The software toolset for analyzing and assessing alternative domestic and international intermodal supply chain performance will use a library of generalized transportation-related objects that are being developed as part of this project. The objects can quickly be configured to represent specific intermodal routes or paths between suppliers and consumers (domestic manufacturers). The paths are composed of a series of intermodal nodes (e.g. container port, rail yard) and links (e.g., roadways, rail lines, sea lanes). These general nodes and links contain basic operational logic and data values for properties that describe the operation and performance of the specific element. The project also provides the means to easily assemble the nodes and links into paths. Once assembled, the paths are simulated, i.e., used to perform sophisticated what-if analyses, to assess the performance of alternative intermodal supply paths in terms of lead times, lead time distributions, costs, etc. Since simulation models include random variables, a portion of the output measures variability and risk. In addition to the software, the project will provide a case study illustrating how the toolset is applied in a real setting to assess at least one domestic supply path and one international supply path.

One key aspect of this project is to determine how detailed the node and link elements need to be in order to provide high-level estimates of cost, risk, lead time, etc. The sourcing decision processes, measures used to make sourcing decisions, and input data that are key drivers of the different types of intermodal nodes and links are defined through domain experts in industry and literature research. Another key aspect is the definition of primary use cases for the toolset, i.e. definition of how the tools will be used, by whom, the type of data to be provided, and the types of output expected.