



In Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

Gustavo Marco Antonio Ugarte Irizarri

Will defend his dissertation

Energy and Carbon Dioxide Impacts from Lean Logistics and Retailing Systems: A Discrete-Event Simulation Approach for the Consumer Goods Industry

Abstract

Consumer goods supply chains have gradually incorporated lean manufacturing principles to identify and reduce non-value-added activities. Companies implementing lean practices have experienced improvements in cost, quality, and demand responsiveness. However certain elements of these practices, especially those related to transportation and distribution may have detrimental impact on the environment. This study asks: What impact do current best practices in lean logistics and retailing have on environmental performance?

The research hypothesis of this dissertation establishes that lean distribution of durable and consumable goods can result in an increased amount of carbon dioxide emissions, leading to climate change and natural resource depletion impacts, while lean retailing operations can reduce carbon emissions. Distribution and retailing phases of the life cycle are characterized in a two-echelon supply chain discrete-event simulation modeled after current operations from leading organizations based in the U.S. Southwest.

By conducting an overview of critical sustainability issues and their relationship with consumer products, it is possible to address the environmental implications of lean logistics and retailing operations. Provided the waste reduction nature from lean manufacturing, four lean best practices are examined in detail in order to formulate specific research propositions.

These propositions are integrated into an experimental design linking annual carbon dioxide equivalent emissions to: (1) shipment frequency between supply chain partners, (2) proximity between decoupling point of products and final customers, (3) inventory turns at the warehousing level, and (4) degree of supplier integration. All propositions are tested through the use of the simulation model.

Results confirmed the four research propositions. Furthermore, they suggest synergy between product shipment frequency among supply chain partners and product management due to lean retailing practices. In addition, the study confirms prior research speculations about the potential carbon intensity from transportation operations subject to lean principles.

Wednesday, November 9, 2011

2:00 p.m.

Decision Theater, Executive Conference Room

Faculty, students, and the general public are invited.

Supervisory Committee:

Dr. Jay Golden, Co-Chair

Dr. Kevin Dooley, Co-Chair

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