Human-Machine Interaction Design for Freight Planning Systems

Motivation / Background

- Multi-Billion $ Industry
- Closed Loop Supply Chain

Key Question / Hypothesis

- Human-Machine Interaction (HMI) Principles can be applied to
  • Retrofit an existing Freight Planning System, and
  • Improve the Joint Cognitive System's cost and efficiency

Relevant Literature


The Problem

Automated Planning System > 10,000 Loads Daily
45% Manual Interventions
35% More Costly (Manual > Automated)
Decreased Strategic Focus
System Stagnation

What does Human-Machine Interaction (HMI) design have in common with a common pallet?

Methodology

- Systems Evaluation
  • Map 3 Automated Systems
  • Map Manual System
  • ID Automated Drops
  • ID Human Interventions
- Data Collection
- Data Analysis
- HMI Iterative Design Process
- Retrofit Existing System

HMI Iterative Design Process

- Scenario Modeling
- Displaced Transparency: Pre and Post-Briefings
- Recursive Nested Behavior-Based Control
- Human Sensing
- Task Batching

Initial Conditions

Manual Planning Costs > Automated Planning Costs by 35%

Expected Contributions

Practical Contributions to Company:
• Reduce Manual Interventions
• Reduce Overall Cost
• Increase Strategic Focus of Human Planners
• Retrofit System for Iterative Continual Improvement

Research Contributions:
• Apply HMI principles to a Novel Application
  ▪ Freight Planning System
  ▪ Loosely Coupled Joint Cognitive System
  ▪ Retrofit HMI Solution to Existing System
  ▪ Existing High Volume Freight Planning System
  ▪ Model for Other Joint Cognitive Systems

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