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Development of a Decision Making Process for the HSM Implementation

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NATIONAL CENTER FOR TRANSPORTATION SYSTEMS PRODUCTIVITY AND MANAGEMENT

Research Team

Researchers

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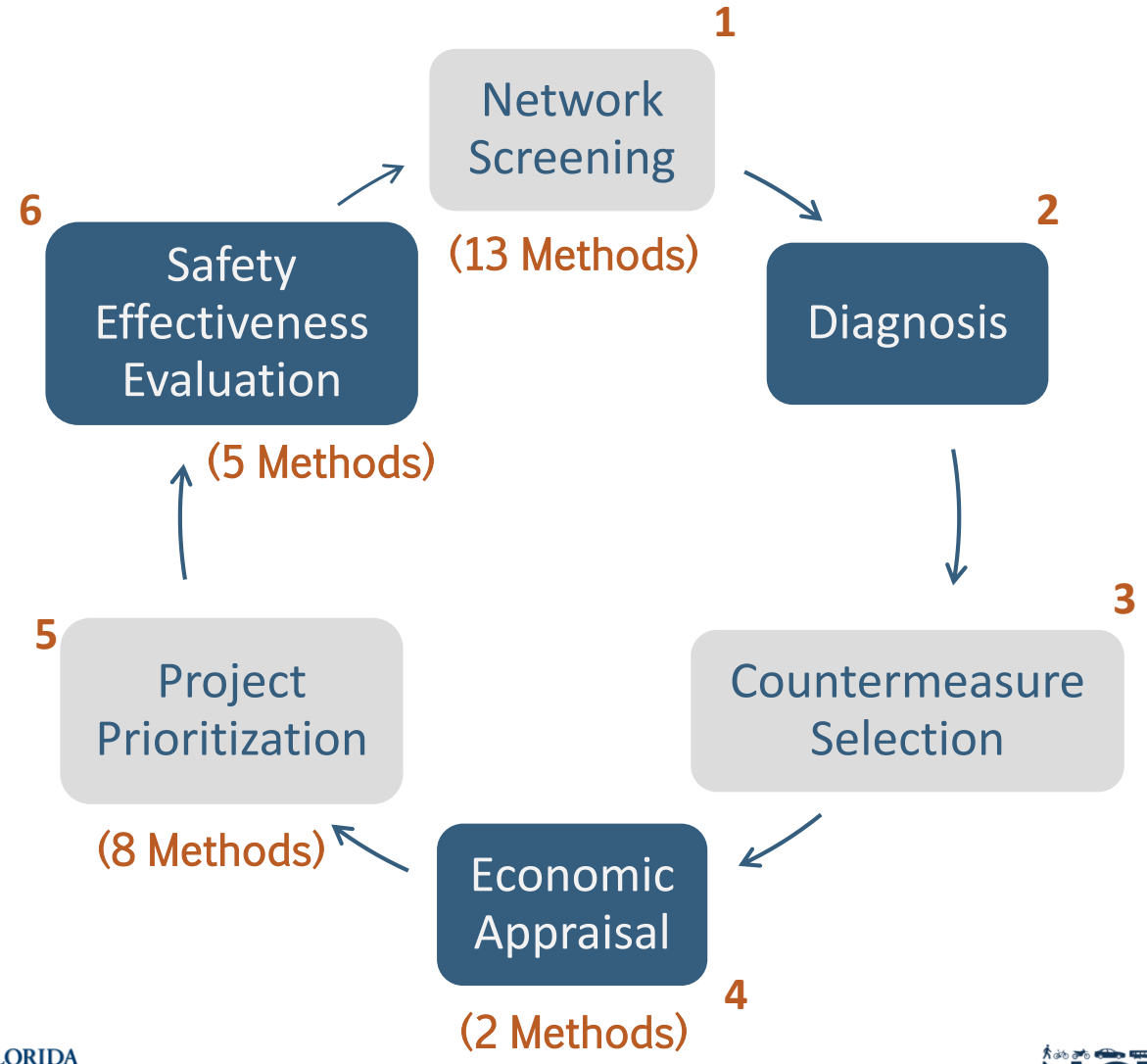
- Md. Asif Raihan, Ph.D. Student

Challenges to Implementing HSM

- Data quality and availability
- Determining the appropriate performance metrics
- Resources to conduct additional analysis
- Difficulty in interpreting results
- HSM's complexity
- Development of calibration factors for the HSM SPFs

(Source: Louisiana Department of Transportation and Development)

Roadway Safety Management Process in the HSM



Project Objective

- To develop a web-based decision making tool to assist agencies tailor the HSM to their needs by helping them select the most suitable methods among those discussed in the HSM.
- Recommend the most appropriate method that best meets the agency's needs, data, available statistical expertise, available software tools, etc.

Research Tasks

1. Identify Factors
2. Develop Decision Making Process
3. Develop and Test Web-based Decision Making Tool
4. Conduct Technology Transfer Activities
5. Prepare, Submit, and Revise Final Report

Task One: Identify Factors

Network Screening

- Avg. Crash Freq.
- Crash Rate
- EPDO Avg. Crash Freq.
- Relative Severity Index
- Critical Rate
- Excess Predicted Avg. Crash Freq. using Method of Moments
- Level of Service of Safety
- Excess Predicted Avg. Crash Freq. Using SPFs
- Prob. of Specific Crash Types Exceeding Threshold Proportion
- Excess Proportion of Specific Crash Types
- Expected Avg. Crash Freq. with EB Adjustments
- EPDO Avg. Crash Freq. with EB Adjustment
- Excess Expected Avg. Crash Freq. with EB Adjustment

- Agency Goals
- Data Availability
- Reqd. Statistical Expertise
- Reliability of Results
- Method's Robustness
- Facility Type
- Available Resources

Economic Appraisal & Project Prioritization

- Net Present Value
- Benefit-Cost Ratio
- Project Costs
- Monetary value of project benefits
- No. of total crashes reduced
- No. of fatal and incapacitating injury crashes reduced
- No. of fatal and injury crashes reduced
- Cost-effectiveness index

Safety Effectiveness Evaluation

- Observational before/after studies
  - Using SPFs – the EB method
  - Using the comparison-group method
  - To evaluate shifts in collision crash type proportions
- Observational cross-sectional studies
- Experimental before/after studies

Review of the States' 2014 HSIP Reports

- Available software applications
- New practices used to implement the HSIP
- Data (Crash, Exposure, Roadway Characteristics)
- Methods used
- Are local roads included? If yes, are the methods similar to the ones used to analyze state roads?
- Process to prioritize projects
- Process to identify potential countermeasures
- Recently adopted methodology practices

Data Available to the States

- Crash Data (Location, Type, and Severity)
  - All crashes
  - Severe crashes (i.e., fatal or fatal & severe injury crashes)
  - Specific crashes such as pedestrian crashes, bicycle crashes, crashes involving commercial motor vehicles
- Exposure Data
  - Traffic volume
  - Population for pedestrian and bicycle safety
  - For intersections, sometimes only mainline traffic

State-of-the-Practice Network Screening Methods

- Traditional Methods
  - Crash Frequency
  - Crash Rate
  - Critical Crash Rate
  - Relative Severity Index
  - EPDO
  - Probability of Specific Crash Types
  - Systemic Approach
- Advanced Methods
  - Level of Service of Safety (LOSS)
  - Expected Crash Frequency With EB Adjustment
  - Excess Expected Crash Frequency With EB Adjustment

Safety Improvement on Local Roads

- Methods depend on the facility type and the program of interest (i.e., focus area)
- Inclusion of local roads depend on data availability and agency policy
- If the method to analyze local roads is different from state roads, local roads are mostly ranked based on crash frequency because of lack of exposure data

States' Project Prioritization Processes

- Ranking Based on B/C or Net Benefit
- Available Funding
- Cost Effectiveness
- Relative Weight in Scoring
- Others, such as:
  - Systemic Safety Initiative
  - Project Readiness

States' Processes to Identify Potential Countermeasures

- Engineering Study
- Road Safety Assessment
- Others, such as:
  - Crash Data Evaluation
  - Field Review of Location
  - Enforcement and Other Stakeholders Input

Recently Implemented Methodology Practices

- HSM – mostly on a case-by-case basis
- Road Safety Audits
- Systemic Approach

Upcoming Steps

- Finalize the factors
  - Data Availability
  - Required Statistical Expertise
  - Methods' Robustness
- Develop the decision making process
- Implement the decision making process in a web-based application

Research Impact

- Determining the appropriate performance metrics is a challenge in implementing the HSM
- It is the first known study to assist agencies in selecting the most appropriate methods
- It provides the much needed guidance in selecting the most appropriate methods through an easy-to-use web-based decision making tool

Technology Transfer & Research Implementation

- Distribute the tool to the HSM champions in local agencies
- Present the decision making process and the web-based tool at regional and national conferences
- Advertise the tool on the NCTSPM and the LCTR websites

Education Efforts

- The tool will be introduced to the graduate and undergraduate students at FIU
- The research involves one graduate student
- The student aims to present the research results at:
  - FIU graduate seminar event
  - 2016 TRB Annual Meeting
  - Florida-section and International ITE meetings

Thank You!

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