A Model for the Evaluation of Transport Safety Policies in Commercial Motorcycle Operation in Nigeria

A PhD research work undertaken by
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Research Background and Objectives

• Commercial motorcycles play important role in developing countries’ transport
  – Accessibility
  – Employment

• Lack of regulation and enforcement lead to significant safety problems

Objectives:

A. Identify and understand factors contributing to the safety problem and their relationships (focus on violations)

B. Develop a dynamic model to understand how driver behaviour develops and is influenced by external conditions
Case-study peculiarities

- Here: Nigeria (Ado Ekiti)
- Similar issues encountered in most developing countries
- Safety often analysed without considering possible feedbacks

Unavailability of data

Opposing views about the benefit of the mode
Interviews were conducted to obtain mental pictures of stakeholders about how the system is operating.

This helps to provide reference modes, initial conditions, and constants.
Data analysis

Helped to identify themes and linkages

Helped to provide an audit trail of the analysis process

Nvivo Data analysis
Data analysis (cont’d)

Development of causal network

Generation of a narrative

• … more violations (10) led to more enforcement capacity (1) which led to reduced drivers’ income (7)… This was because violations (10) offered some financial benefits too (increased drivers’ income (7)).
Excerpt from the narrative
“Whenever violations increased, more officers were drafted to increase enforcement capacity (1) and match the problem. This obviously would result in increase in the probability of detection (4) and violation would go down…In this way, increasing enforcement capacity (1) could reduce the total number of violation (10)”

Corresponding hypothesis
Officers enforce law by detecting and arresting violators.
SD Submodels (Modules)

Key:
A: Detection loop
B: Payment of rent loop
C: Expensive Ownership loop
D: Deterrence loop
E: “…not a lifetime trade and Competition loops
F: Drivers population growth and time for training loops
G: Trade is strenuous loop
Stock and Flow model

Enforcement Workforce

- net hire
- total legal enforcement
- initial workforce
- time to draft more hands
- <public perception about risk in operation>
- time to raise target
- <public perception about risk in operation>

Additional Officers' Support

- drafting officers
- rest
- excess support removal
- enforcement size
- enforcement coverage
- <equivalence of number of officers motivated for overtime service>
- time for removal
- <Attention To Mode>
- time to reduce target
- <initial attention>
- <public perception about risk in operation>

Target Perception

- change in target
- initial target
- time to draft more hands
- rest
- enforcement coverage
- <equivalence of number of officers motivated for overtime service>
- time for removal
- <Attention To Mode>
- time to reduce target
- <initial attention>
- <public perception about risk in operation>

Enforcement sub-model
Baseline result interpretation:

- Tendency to violate
- Total violations
- Enforcement coverage
- Total drivers
- Driver income
Double recruitment rate:

- Insignificant changes to tendency to violate
- Insignificant changes to total violations
- Significant additional enforcement coverage

Graph of doubled recruitment rate scenario
Remove expensive ownership options:

- Minor changes to tendency to violate
- Substantial reduction in total violations
- Significant reduction in enforcement coverage

Graph of removal of expensive ownership options scenario
Scenario 3

Raise prosecution rate:

- Substantial changes to tendency to violate
- Less than expected reduction in total violations
- Significant reduction in enforcement coverage

Graph of increase in prosecution rate scenario
Combination of increased prosecution and removal of expensive ownership options:

- Substantial reduction in tendency to violate
- Substantial reduction in total violations
- Significant reduction in enforcement coverage

Graph of combination of increased prosecution and removal of expensive ownership options
Extracts from findings

- SDM can be used in modelling the system
- The entry method into the trade contributes to the system problem substantially
- Improving sanction is not the same thing as increasing enforcement capacity
- A leverage is achieved by a combination of measures