Quality and diversity of transit alternatives

5e Annual Meeting of the Mobilité Chair – May 26th 2015

Alexis Frappier
M.Sc.A. candidate

Supervisors: Prof. Catherine Morency
Prof. Martin Trépanier
Outline

1. Context of the project
   - Findings
   - Objectives of the project

2. Methodology
   - General overview
   - Steps of the method

3. Perspectives
   - Multimodality
   - Trip chains
   - Users with specific needs
Typical modelling of transit trips

\[ U = a_0 + a_1 X_1 + a_2 X_2 + \ldots + a_k X_k \]

Probability that a person chooses the alternative \( i \) among \( n \) alternatives

\[ P_i = \frac{e^{U(i)}}{\sum_{r=1}^{n} e^{U(r)}} \]

LOGIT model

5e colloque annuel de la Chaire Mobilité
Often neglected Components (1)

Probability of being seated
Trip’s total cost

Transfers

Value of time to be considered for individuals

Kaufmann, 2012

Tirachini, 2013
Often neglected components (2)

- Trip directness
- Reliability (delays)
- Real-time information availability

Waiting times and delays are better perceived by the user.
What are the 3 criterias, in order of importance, which determine the choice of your transit trip?

A. The type of mode used
B. The service reliability
C. The number and type of transfers
D. The probability of being seated
E. Possibility of using the travel time to do something else
The typical mode choice modelling approach

Largest CAR utility

Largest BIKE utility

Largest TRANSIT utility

Discrete choice model

Largest utility

ALL MODE

MODE chosen for the trip
The plan B impact

User with 5 transit alternatives

User captive in a single transit route

Impact on the transit use
Does having a 2nd transit route alternative influence your decision to use transit?

A. YES
B. NO

50% 50%
Objectives of the project

Evaluate and classify the available alternatives for the trip by improving the concept of « utility function »

Determine the diversity and the quality of all of the available alternatives for the trip

How to evaluate all of the available alternatives to make a trip?
General overview

ALTERNATIVES ENUMERATION

INDIVIDUAL EVALUATION

ALTERNATIVES CLASSIFICATION

Sorted by value of indicators

COMPUTATION OF INDICATORS Q AND D

Evaluation of all of the alternatives

Production of indicators for each ALTERNATIVE

1
2
3

Sorted by value of indicators

Evaluation of all of the alternatives

D
Q
68%
23%
Different trip alternatives (different lines and transfers sequences)

Definition of independence and relevance criteria
If your fastest transit trip takes 30 min, what is the maximum duration of another route so that you consider it as an alternative?

A. 35 min
B. 40 min
C. 45 min
D. 60 min
E. + de 60min
Alternatives evaluation

- Time perception
- Total cost
- Total time
- Average speed
- Capacity hour
- Used modes

**EFFECTIVENESS**

**DIRECTNESS**

**COMFORT**

**RELIABILITY**
Alternatives evaluation

- Effectiveness
- Comfort
- Directness
- Reliability

INDIVIDUAL EVALUATION

- Tortuosity
- Transfer quality
- Stop km
- Geometric distortion

Alternatives evaluation
Alternatives evaluation

- EFFECTIVENESS
- DIRECTNESS
- COMFORT
- RELIABILITY

- Person - seat
- Average ridership rate
- Stop quality
- Used modes
- Access quality
- Transfer quality
- Average ridership rate
Alternatives evaluation

**INDIVIDUAL EVALUATION**

- **EFFECTIVENESS**
- **DIRECTNESS**
- **COMFORT**
- **RELIABILITY**

- Minimum frequency
- Average delay
- Information quality
- Delay proportion

**Dimensions**
- Delay proportion
- Information quality
- Minimum frequency
- Average delay

**Criteria**
- EFFECTIVENESS
- DIRECTNESS
- COMFORT
- RELIABILITY
Classification and computation of indicators

1. Establishment of a classification for each theme

2. Weighted Indicators

3. Selection of relevant indicators

Decreasing following the number of alternatives

Score for each theme

Etablissement de la Chaire Mobilité
Research perspectives

- Alternative evaluation for ALL modes

- Inclusion of trip chains

- Users with specific needs (elderly, young, disabled... )
Thank you

Questions?