Transit Beyond Travel Time and Cost

Incorporation of Premium Transit Service Attributes in the Chicago Activity-Based Model

CATMUG | April 2013

Project Team

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Sources of Inspiration

- TCRP H-37
- SANDAG, MAG, SACOG
- Chicago New Starts Model
- Portland Metro
- LACMTA/FTA

Model Improvements

Model Component	Phase 1	Phase 2
Advanced “non-labeled” mode choice	X	X
Transit access / spatial resolution		X
Station characteristics	X	X
In-vehicle characteristics	X	X
Capacity constraints		X
Crowding effects		X
Service reliability		X
Transit frequency / wait time	X	X
Fare / cost structures	X	X
Individualized transit path choice		X
Mobility attributes and modality		X

Non-Labeled Mode Approach

- Refer to actual service characteristics and understand traveler perceptions
- Limit mode & geography-specific constants

Mode Choice Alternatives

Previous (Labeled) >>	Phase 1 (Interim) >>	Phase 2 (Final)
Walk to bus	Walk to conventional transit	Walk to transit
Walk to rail	Walk to premium transit	
Drive to rail	PNR	PNR
Drive to bus	KNR	KNR

Spatial Resolution

- 17K MAZs nested in 2K TAZs
  - All transit trip ends at MAZ geography
- Virtual path building
  - Access time (Python)
  - Station-to-station time (EMME)
  - Access + Station-to-station time (Java)

Transit Stop Types

1. Pole

2. Bus Shelter

3. Bus Plaza

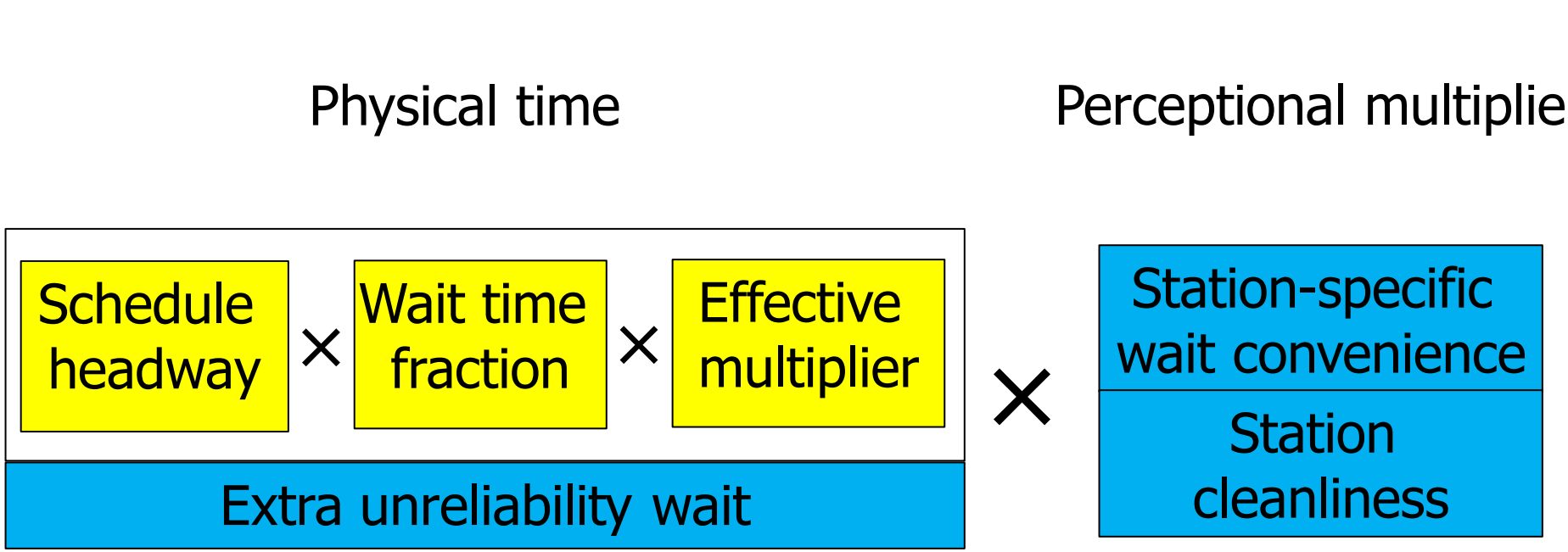
4. Rail Station

5. Major Terminal

Transit Stop Parameters

- Additional variables considered
  - Proximity to commercial services
  - Stop/station environment
  - Ease of paying (fare policy & media)
  - Ease of boarding (in combination with vehicle type)
  - Cleanliness
  - Security

Transit Stop Wait Time



Transit Stop Parameters

Station Type	Wait convenience factor	Real-time information factor	Boarding / transfer time, min
1=Pole	2.50	0.9	2.0×2.5
2=Bus Shelter	2.25	0.9	2.0×2.5
3=Bus Plaza	2.00	0.9	3.0×2.5
4=Rail Station	1.75	0.9	3.0×2.5
5=Major Terminal	1.75	0.9	4.0×2.5

Transit Stop Cleanliness

Calibrated to reproduce observed cleanliness estimates

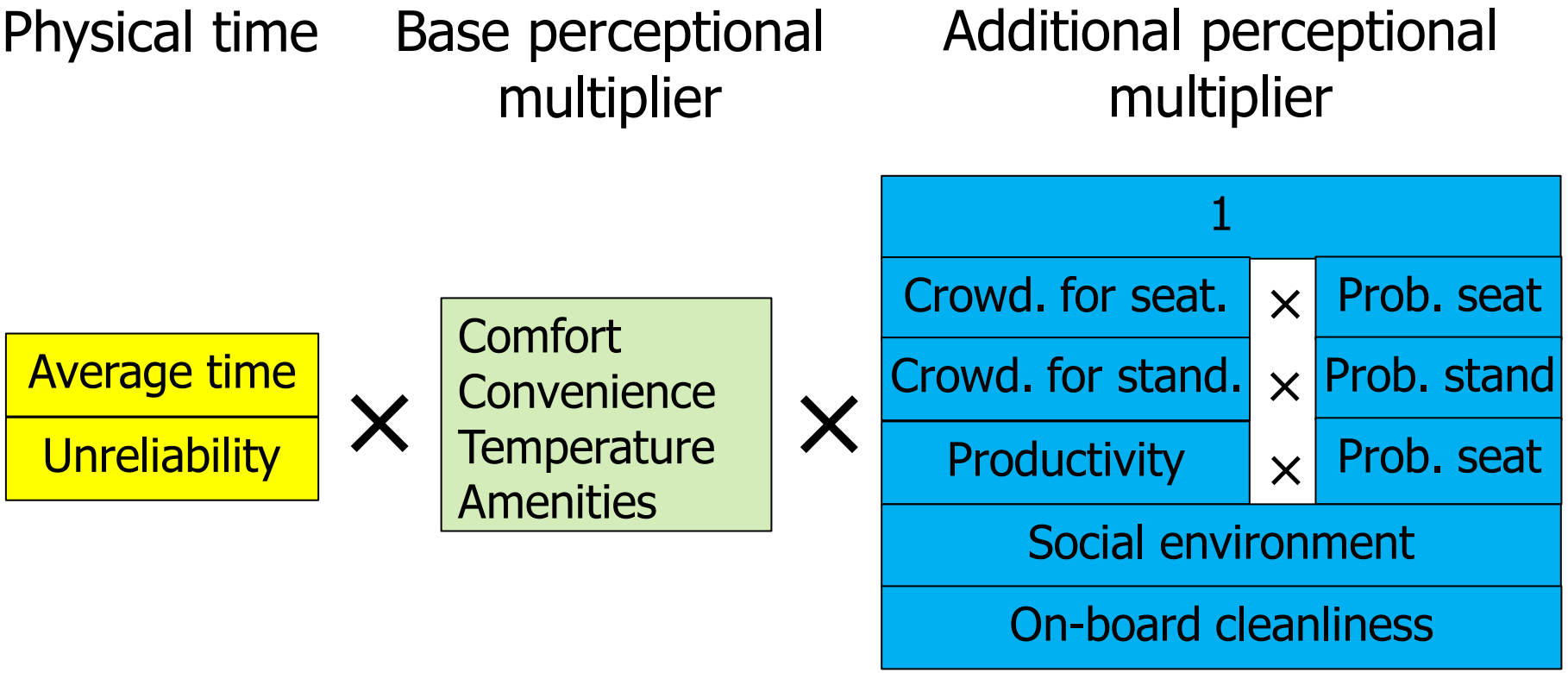
Station-specific cleanliness estimate = Station-specific base cleanliness estimate - Station-specific function of boarding & alighting passengers

Station type	Base cleanliness	Impact of log of passengers
1=Pole, 2=shelter	0.80	0.00
3=Bus plaza	0.85	-0.01
4=CTA/Metra station	0.90	-0.01
5=Metra terminal	0.95	-0.01

In-Vehicle Parameters

- Additional variables considered
  - Seating comfort
  - Unreliability
  - Crowding
  - Productivity (work, sleep, socialize)
  - Cleanliness
  - On-board amenities
  - Socio-economic compatibility between riders

In-Vehicle Time



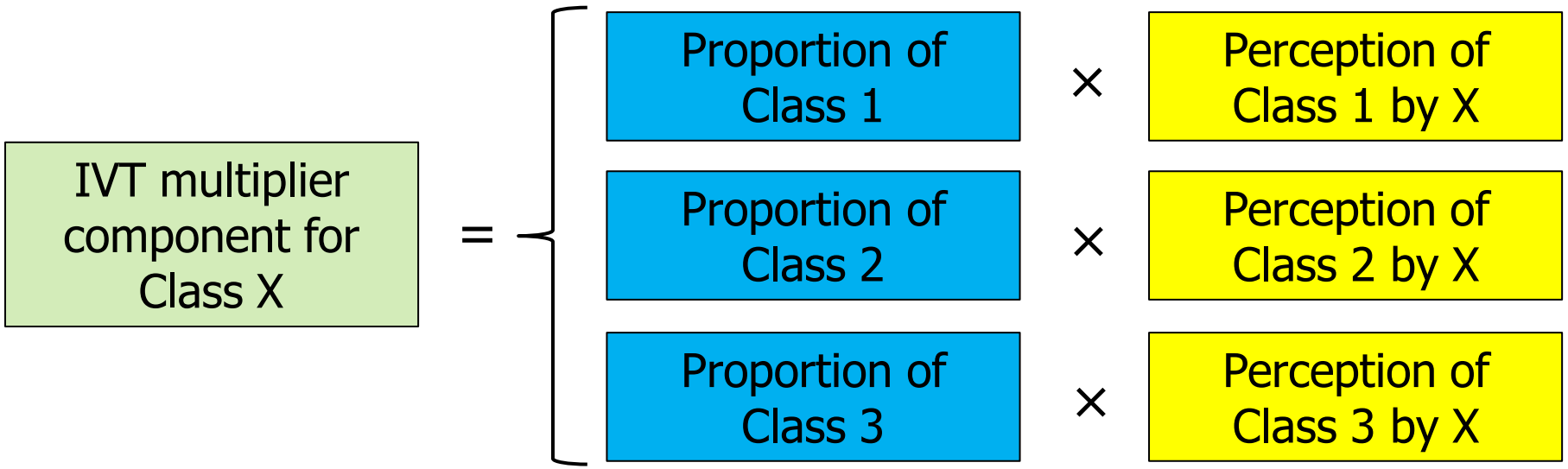
In-Vehicle Cleanliness

$$\text{Cleanliness diminishing factor} = \frac{\text{Cumulative number of passengers} \times \text{Effect of each passenger}}{\text{Line total capacity}}$$

In-Vehicle Social Environment

- Rarely modeled but…
  - Unpleasant social experiences discourage transit use
  - Secret of commuter rail attractiveness?
- Can be modeled
  - Proportion of different user classes encountered
    - User classes defined by age and HH income
  - Socio-economic friction factor part of perceived IVT multiplier

In-Vehicle Social Environment

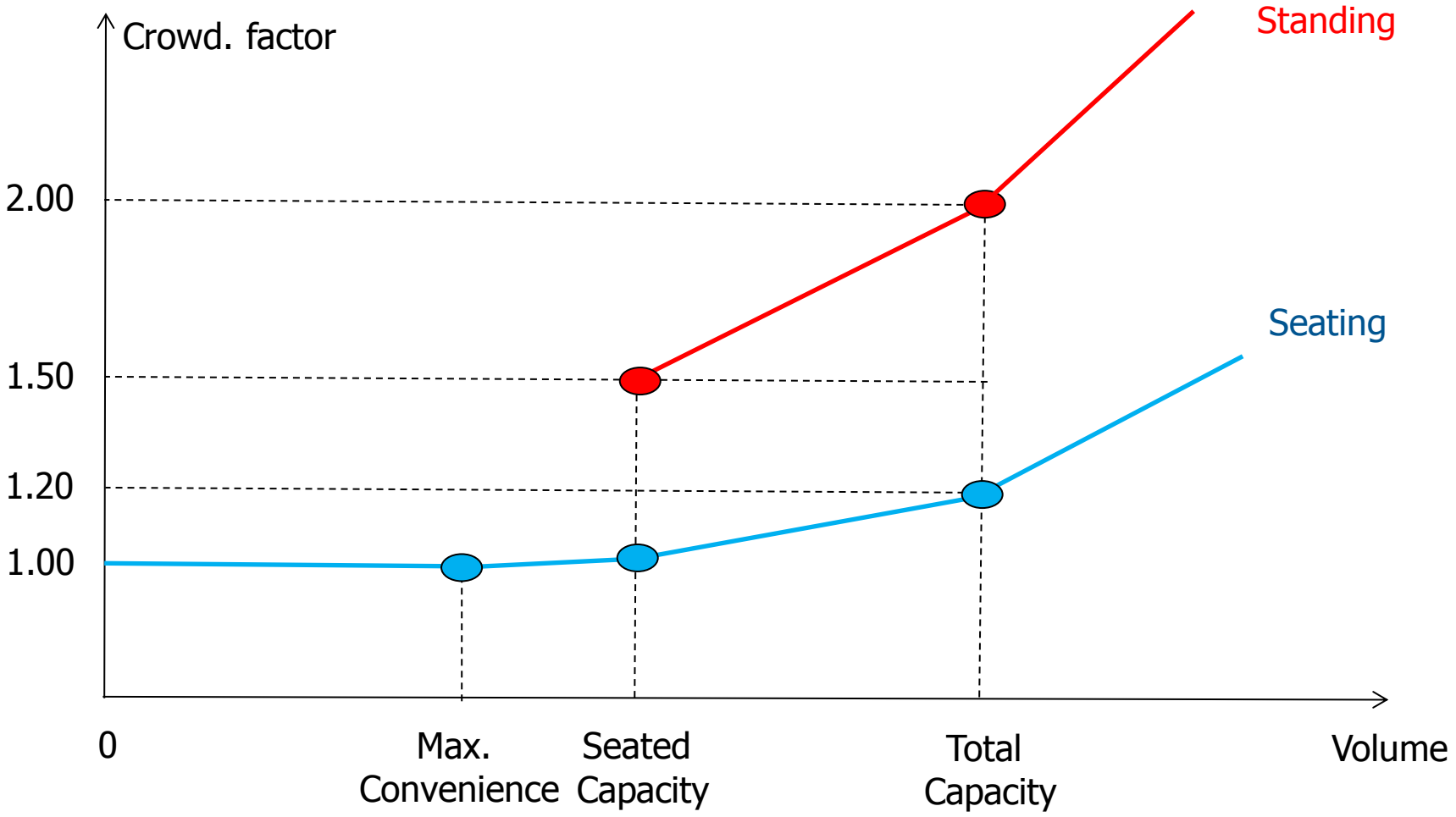


Modeled passenger	Perception of other passengers as additional IVT weight		
	Class 1	Class 2	Class 3
Class 1	0.00	0.00	0.00
Class 2	0.10	0.00	0.00
Class 3	0.50	0.00	0.00

In-Vehicle Productivity

Mode-vehicle type	Fixed IVT productivity bonus		
	User class 1	User class 2	User class 3
Local Bus	0.00	0.00	0.00
Express Bus	-0.05	-0.05	-0.10
Metro	0.00	0.00	0.00
Commuter Rail	-0.05	-0.10	-0.20

In-Vehicle Crowding



Transit Unreliability

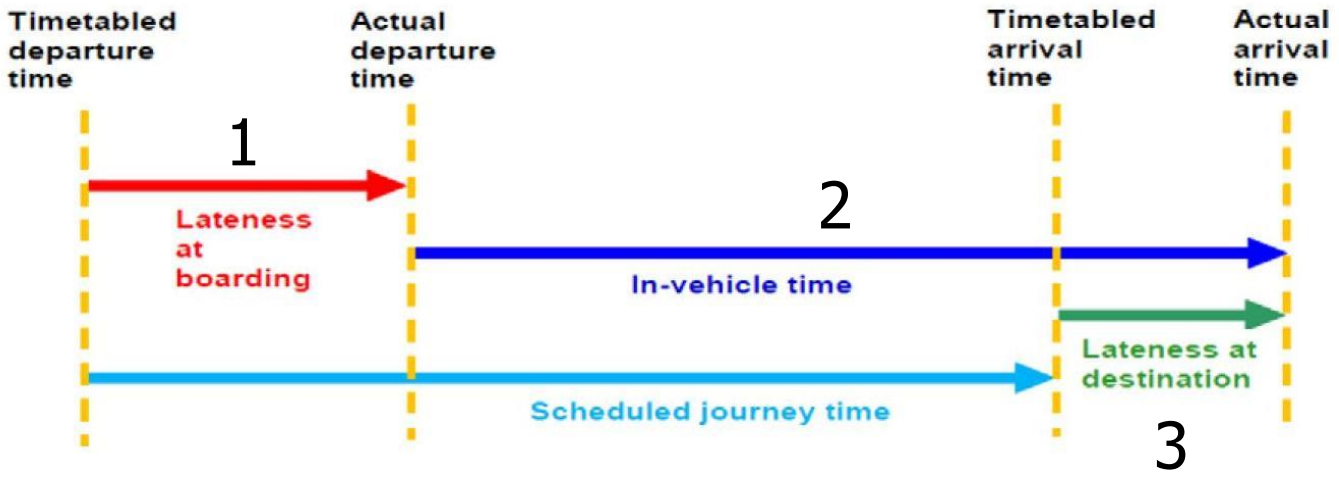


Fig. 3. The time components of a rail journey.

1. Schedule adherence at boarding stop (extra wait time)
2. Impact of congestion (extra IVT)
3. Combined lateness at destination versus planned arrival time (similar to auto)

Conclusions

- ABM is a better platform for testing a variety of transit attributes
- ABM required little modification
- Lots of data development
- Final Tasks
  - Finalize measurable transit service attributes
  - Estimate individual path choice preferences
  - Incorporate in operational ABM & transit network procedures

Questions?

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