

Updating values of time and reliability in The Netherlands

October 2009

Significance, Vrije Universiteit, John Bates, TNO, NEA,
TNS-NIPO/Veldkamp en PanelClix

Background

- In The Netherlands, transport projects and policies are evaluated ex ante using cost-benefit analysis (OEI framework)
- **Time** benefits in passenger and freight transport are usually the **largest** benefit
- Value of times from stated preference (SP) research are used to convert time into money:
 - National passenger VoT studies in 1988-1990 and 1997-1998
 - National freight VoT studies in 1990-1992 and 2003-2004

Background

- Survey design for new study (passengers and freight) done in 2007
- Main study: 2009-2010
- Same design used in Norway
- Focus now on Value of Reliability (VoR) of travel time
 - for which we now only have **preliminary** values
 - need VoR in terms of Reliability Ratio:

Coefficient for standard deviation of travel time / coefficient of travel time

The new Stated Preference survey

Objective:

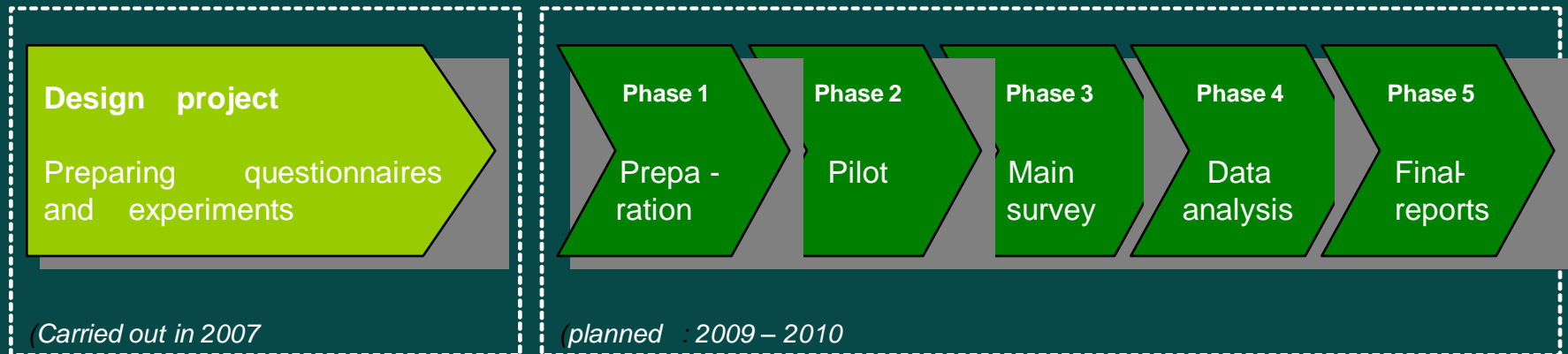
Measuring the value to society of travel time benefits and travel time reliability benefits

Four SP surveys

- Car
- Bus, tram, metro, high-speed train, air travel
- **Freight** transport by road, rail, inland waterways, sea, air
- Recreational navigation

Values meant to be used in official Dutch guidelines for CBA

Set-up of the project



SP structure

Two alternatives

- | | | |
|---------------|---|-------------|
| ■ Trip A | - | Trip B |
| ■ Transport A | - | Transport B |

Up to four attributes

- Travel time
- Reliability
- Departure/ arrival times
- Travel costs

Presentation reliability attribute

Eight formats tested

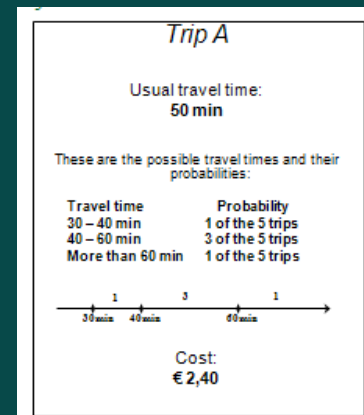
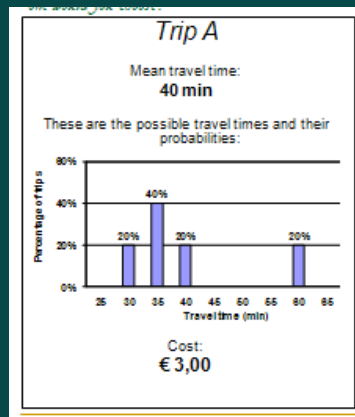
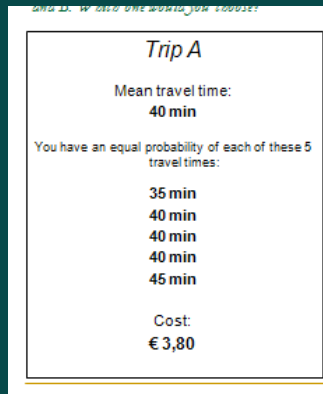
Through 30 face-to-face interviews (passengers)

Which format was understood best?

Special attention to the effect of education level

See Tseng et al. (2009) in Journal of Choice Modelling, 2(1), pp. 8-28

HOW do people perceive reliability?



Presentation of reliability attribute

Test eight formats that are presented by a distribution of 5 possible travel times

Assess presentation formats in face-to-face interviews

- clarity,
- ease of handling,
- visual attractiveness, and
- which ones were preferred

In this version we show you the 5 possible travel times *below each other.*
Imagine that you want to travel by car to a shopping centre. You can choose from two trips A and B. Which one would you choose?

Trip A

Mean travel time:

40 min

You have an equal probability of each of these 5 travel times:

35 min

40 min

40 min

40 min

45 min

Cost:

€ 3,80

Trip B

Mean travel time:

41 min

You have an equal probability of each of these 5 travel times:

30 min

35 min

45 min

45 min

50 min

Cost:

€ 2,80

A

In this version we show you the 5 possible travel times as *points on a circle*.

Trip A

Mean travel time:
44 min

You have an equal probability of each of these 5 travel times:



Trip B

Mean travel time:
41 min

You have an equal probability of each of these 5 travel times:



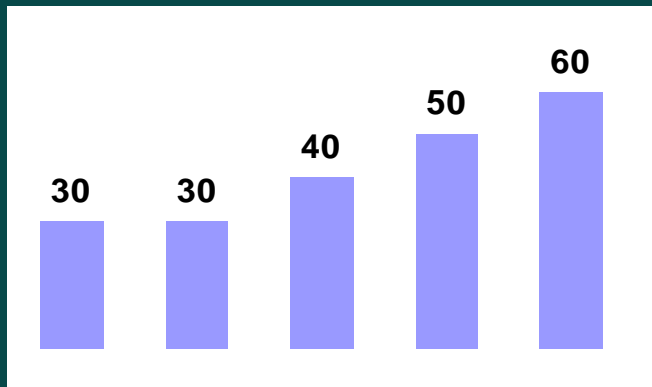
B

In this version the 5 possible travel times are illustrated by *the height of the bars*.

Trip A

Mean travel time:
42 min

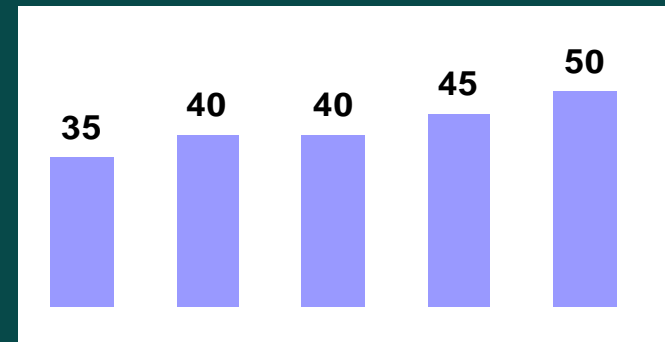
You have an equal probability of each of these 5 travel times:



Trip B

Mean travel time:
42 min

You have an equal probability of each of these 5 travel times:



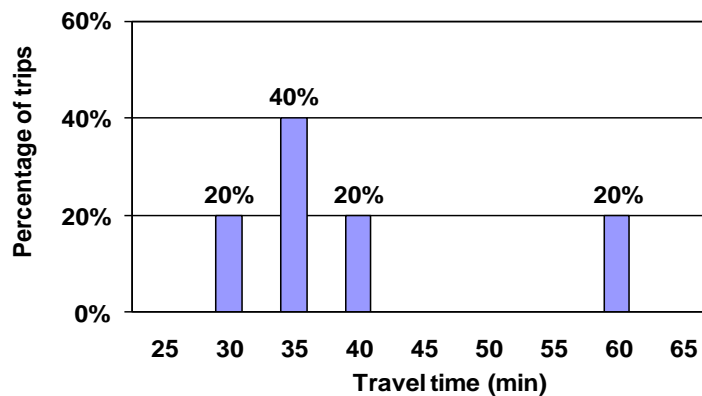
C

In this version the 5 possible travel times are illustrated by the *height of the bars*.
(probabilities as percentage).

Trip A

Mean travel time:
40 min

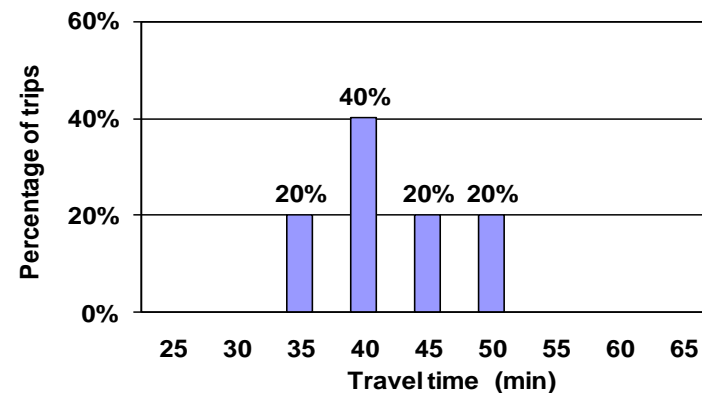
These are the possible travel times and their probabilities:



Trip B

Mean travel time:
42 min

These are the possible travel times and their probabilities:



E

In this version we show in words and along a time axis how large the probabilities of certain travel times are (as number of trips of the five). The travel times are, thus, not precise, but within certain limits

Trip A

Usual travel time:
50 min

These are the possible travel times and their probabilities:

Travel time	Probability
30 – 40 min	1 of the 5 trips
40 – 60 min	3 of the 5 trips
More than 60 min	1 of the 5 trips

Cost:
€ 2,40



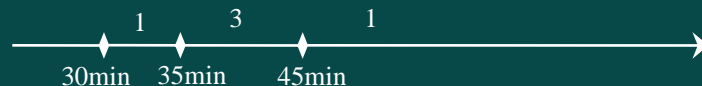
Trip B

Usual travel time:
40 min

These are the possible travel times and their probabilities:

Travel time	Probability
30 – 35 min	1 of the 5 trips
35 – 45 min	3 of the 5 trips
More than 45 min	1 of the 5 trips

Cost:
€ 3,60



G

Results

Format A is favoured by a majority of respondents in every aspect

Also Format C performs well

Score rates in general are reasonably good

Results are consistent between low and high educated people

Presentation reliability attribute

Best format (better than “bars” or “clockface” presentation):
Most favoured and best understood in test questions.

Transport A

Usual transport time:
40 min

**You have an equal chance of
the following five transport times:**

35 min
40 min
40 min
40 min
45 min

Transport costs:
€ 380

Transport B

Usual transport time:
41 min

**You have an equal chance of
the following five transport times:**

30 min
35 min
45 min
45 min
50 min

Transport Costs:
€ 280

Three SP experiments

The experiments

Attribute	Experiment 1	Experiment 2	Experiment 3
Transport time	X	X	X
Transport cost	X	X	X
Reliability		X	X
Departure/arrival time		X	X

Experiment 1 is the same as the “VoT studies” in 1988 and 1997

Complexity increases from experiment 1 to 2/3

SP experiment 1

Transport time and costs

Which situation do you prefer?

Transport A

Usual transport time:
65 min

Transport costs:
€ 280

Transport B

Usual transport time:
60 min

Transport costs:
€ 480

SP experiment 2 and 3

Transport time, costs, reliability and arrival time

Transport A

Departure time:
08:05 h

You have an equal chance of the following five transport times and therefore of arriving at any of the following times:

Transport time		Arrival time
55 min	→	09:00
65 min	→	09:10
65 min	→	09:10
95 min	→	09:40
145 min	→	10:30

Usual transport time: 65 min

Costs: € 230

Transport B

Departure time:
08:05 h

You have an equal chance of the following five transport times and therefore of arriving at any of the following times:

Transport time		Arrival time
50 min	→	08:55
60 min	→	09:05
60 min	→	09:05
90 min	→	09:35
140 min	→	10:25

Usual transport time: 60 min

Costs: € 380

Objectives for freight transport SP survey

Obtain monetary values for travel time and travel time reliability for:

- Road transport
- Rail transport
- Sea transport
- Inland waterways transport
- Air transport

Distinguish, where possible and relevant, between:

- VoT related to cargo and VoT related to transport services (vehicles, staff)
- container/non-container
- distance class
- type of product (e.g. final product)
- and type of logistic chain (e.g. to distributor).

A priori hypotheses

	VoT related to cargo	VoT related to vehicles and staff
Carrier	0	~factor cost
Shipper that contracts out	Interest, deterioration, disruption of production, out of stock	0

Proposed segmentation and interview method

Stratified random sample with target number of interviews by mode, (non)-container and carrier/shipper

- Can estimate separate choice models per stratum

Other distinctions: include question in survey and test as interaction variable in modelling

Interview shippers on door-to-door chain, carriers can be interviewed on part of a chain (e.g. from port of Rotterdam to Eindhoven by road)

Heterogeneity-> customisation -> We selected computer-assisted personal interviews (CAPI) for main survey

The questionnaire 1: the firm

Number of employees

Main product (transported)

Vehicles owned/leased

Modes used

The questionnaire 2: a typical transport

Product, mode, origin, destination, distance, transport time, cost/price and departure time

Weight, value, packaging

Agreed delivery time or time window

Buffer time

Percentage not delivered on time, average delay

Other mode/route; attributes (RP)

Lateness penalties, inventories, fixed shipping rates?

The questionnaire 3: time & cost SP

6 x 2 choice alternatives, each with 2 attributes: usual travel time and cost/price.

Instructions:

- Everything else stays the same
- Travel time might vary because there are routes with different distances, delays
- Cost/price varies because of differences in fuel costs
- The changes in time and costs are for all users of the same infrastructure.

Part 3 and 4: specific instructions

Transporters: in case of a shorter transport time the staff and vehicles/vessels might be released for other productive activities. Do not take into account what would happen to the goods

Shippers that contract out: only have to take into account what would happen (less deterioration, disruption of production process, running out of stock, etc) to the goods if the transport time would be shorter

Shippers with own account transport: have to take all of this (=cargo and vehicle) into account

The questionnaire 4: VoT and VoR SP

Introduction to variability, uncertainty and probability (dice)

Questions to check understanding of presentation of the choice alternatives.

6 + 7 (one dominant choice) binary choices with 4 attributes per alternative

How did you make your choice (all 4 attributes, or 1, 2, 3 attributes)?

The questionnaire 5: evaluation

Time required to complete interview

Choices difficult, clear and realistic?

Remarks?

Test survey

All 4 SP surveys tested: car, public transport, freight, recreational navigation:

Small pilot in design project

- For each of the 4 SP surveys: 20 paper mailback questionnaires and 4 face-to-face interviews
- Recruitment for freight difficult
- Improvements needed for inland waterways and sea
- Results used to estimate discrete choice models: VoTs and VoRs in plausible ranges

Tests in survey project

- Involve sector organisations
- Test interviews: 5 passenger transport, 5 freight
- Main pilot: passenger transport 275 interviews, freight 25 interviews

Main survey

Passenger transport

- Target 5,200 interviews
- Internet survey
- On-line panel: sample population 240,000

Freight transport

- Target 520 interviews
- CAPI

Results available in June 2010

- VoTs and VoRs to be used in official Dutch CBAs

Phase 3: main survey – passengers

Targets (also by purpose, time-of-day, interchanges):

- 2500 car drivers
- 1000 train, metro, light rail
- 1000 bus, tram
- 250 airplane
- 250 high speed train
- 200 recreational navigation

Phase 3: main survey freight

Targets:

- 200 road (shipper/carrier, container/non-container)
- 120 inland waterways (shipper/carrier, container/non-container)
- 100 sea (shipper/carrier, container/non-container)
- 50 rail (container/non-container)
- 50 air (shipper/carrier)

Also needed: reliability volumes

- **Predicting travel time variability by mean travel times?**
- **Traffic management measures can have effects on travel time variability and mean travel time that differ considerably in direction and size → miscalculations of costs of variability**
- **Traffic forecasting tools need to be improved to provide estimates of changes in standard deviations and numbers of trips on links**