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FINDING A BETTER WAY

Measuring acceptance - is it possible and how to do it?

Lena Nilsson, VTI

International seminar on acceptance organised by INRETS-GRETIA

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Point of departure

Measuring acceptance requires

- knowledge of what acceptance is
  - concept
  - definition
- delimitation of what to accept
  - application area
  - context

"Functioning" transport system – (road) traffic environment

- design of roads, vehicles
- support systems

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Why acceptance – purpose of investigating?

Understanding humans in complex environments

- views and values
- actions and behaviour
- human-system performance
- outcome, consequences

Establishing the contextual possibilities and limitations

- enable predictions and estimations (forecasted benefits, intentions, interest)
- make testable recommendations for improved design
- adoption of measures

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Quotations

"*While everyone seems to know what acceptability is, and all agree that acceptability is important, there is no consistency across studies as to what 'acceptability' is and how to measure it"* (Regan et al., 2002)

"User acceptance is one of the most important elements of success"

"The future challenge is to win drivers' acceptance while attaining the desired effects on the traffic system as whole"

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The problem

- There is no established definition of acceptance
- Definition and meaning taken for granted
- No consistent way of measuring – personal instruments
- Most researchers measure acceptance without defining it
- Large differences in definitions and measurements indicate a large discrepancy in the understanding of acceptance
- Comparisons between systems, settings and studies are almost impossible

Put on table – discuss – work to do – agree!!

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Project examples

ADVISORS 2000-2002

Develop an **integrated assessment methodology** and relevant criteria to reliably assess traffic safety, usability, interaction safety, **user acceptance**, road network efficiency and environmental impacts of **ADAS**.

Found an obvious lack of standardised and reliable instruments to evaluate, and procedures to measure, the acceptance of ADAS (in terms of usability, driver comfort and safety benefits).

Recommending questionnaire based on a three component model integrating **the three dimensions of acceptance** (usability, driver comfort and safety benefits), and suggesting to apply:

- Van der Laan scale (1997)
- Usability questionnaire (Brooke, 1996)
- Willingness to pay questionnaire
- Driving quality scale (Brookhuis, 1993)

No development!

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Project examples (2)

HASTE 2002-2005

Develop **methodologies and guidelines** for the assessment of **IVIS**.

Driving performance focus.

Studying behavioural, vehicle, psycho-physiological, and self-report measures.

FESTA (Field Operational Test Support Action) **2007-2008**
Methodology description for FOT
Scanning & reviewing
No special work/development on acceptance

EuroFOT ongoing
???

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Acceptance definitions from literature

Literature review (Adell, 2009) => 5 categories

1. Using the word "accept"
   "Acceptance is the degree to which a law, measure or device is accepted" (Risser et al. 1999)
2. Satisfying user needs and requirements – rational usefulness evaluation
   "Whether the system is good enough to satisfy all the needs and requirements of the users and other potential stakeholders" *(Nielsen, 1993)*
3. Sum of attitudes – including more emotionally formed
   "Acceptance is often defined as the sum of all attitudes to a law, measure or device" (Risser et al.1999)
4. Willingness to use – aims for behavioural change
   "The intention to adopt an application." (Chismar & Wiley-Patton, 2003)
5. Actual use
   "The system's capacity to earn the co-operation of the driver" (Fairclough, 1997)

Describes a progression – later categories including earlier ones

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Acceptance types from literature

Literature review (Adell, 2009)

Attitudinal (emotion & experience) ⇔ **Behavioural** (observable behaviour)

Social (anti-fiddle system) ⇔ **Practical** (cost, reliability)

Conditional (if everybody) ⇔ **Contextual** (camera roads, not rush hours)

Acceptance (willingness to be subjected) ⇔ **Support** (liking for doing so)

Acceptability (no experience) ⇔ **Acceptance** (attitudes including behavioural reactions)

Priori acceptability (no experience) ⇔ **Posteriori** (experience, not necessarily behavioural reactions)

Problem awareness (speed) = acceptance ⇔ otherwise positive attitude

Three level chain: Expectation (attitude) => acquisition/purchase (action) => voluntary use (utilization)

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Proposed definition of acceptance

Acceptance is the degree to which
an individual
intends to use a system
and, when available,
to incorporate the system in his/her driving

Adell, 2009

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Acceptance measurement from literature

Literature review (Adell, 2009) => 9 groups

1. Using the word “accept/acceptable” — def 1
2. Usefulness and/or satisfaction — def 3 (part def 2 & 3)
3. Willingness to submit to something — partly def 4
4. Use — def 5
5. General assessment — partly def 3 & 2
6. Importance of the system — partly def 3 & 2
7. Reliability of the system — partly def 3 & 2
8. Human-Machine-Interaction assessments — -
9. Physiological reactions — -

Usually **questionnaires** – but also interviews, focus groups, logged data

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Acceptance measurement sub-groups

Category	Subjective measures	Observed behaviour	Physiological measures
Assessment by using the word "accept/acceptable"			
Considered acceptability of the system	X		
General assessment			
Judgement of the concept/idea	X		
Being in favour of the system	X		
Ranking by popularity	X		
Recommend others to use	X		
Importance of the system			
Expressed necessity	X		
Supporting implementation	X		
Ranking by importance	X		
Usefulness and satisfaction			
Usefulness/Satisfaction scale (Van der Laan et al, 1997)	X		
Perceived Usefulness/Perceived Comfort	X		
Usefulness	X		
Satisfaction	X		
Reliability			
Credibility of the system	X		
HMI assessments			
Opinions about the HMI	X		
Willingness to...			
Willingness to pay	X		
Willingness to buy	X		
Willingness to accept	X		
Willingness to have	X		
Willingness to keep	X		
Willingness to use	X		
Willingness to install in own car	X		
Wish to shut down the system	X		
Use			
Voluntary use	X	X	
Frequency of use	X	X	
Action to shut down the system	X	X	
Physiological reactions			
Physiological reactions (stress)			X

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User Acceptance Scale - Van der Laan et al., 1997

Usefulness/Satisfaction scale

1 Useful	|_|_|_|_|_|	Useless
2 Pleasant	|_|_|_|_|_|	Unpleasant
3 Bad	|_|_|_|_|_|	Good
4 Nice	|_|_|_|_|_|	Annoying
5 Effective	|_|_|_|_|_|	Superfluous
6 Irritating	|_|_|_|_|_|	Likeable
7 Assisting	|_|_|_|_|_|	Worthless
8 Undesirable	|_|_|_|_|_|	Desirable
9 Raising alertness	|_|_|_|_|_|	Sleep-inducing

Bipolar scales combined to one U score (odd) and one S score (even)

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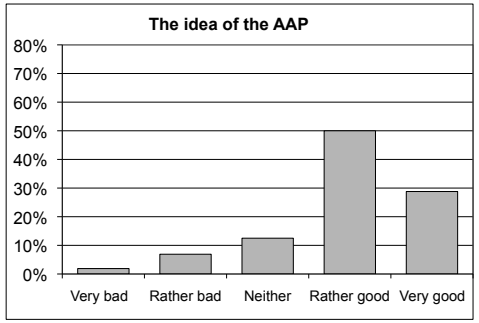
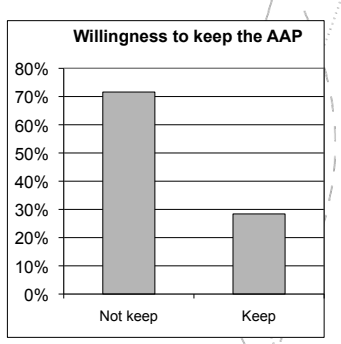
Interpretations of acceptance measures

Positive to the concept of ISA

Low willingness to keep the system





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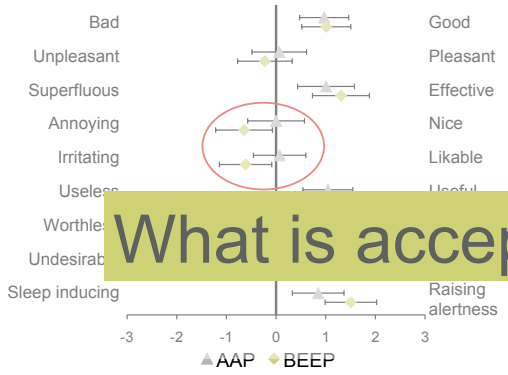
Interpretations of acceptance measures

Usefulness/satisfaction acceptance scale
(Van der Laan et al., 1997)



Nevertheless…

More positive to have the BEEP system compared to the AAP

13 drivers chose the AAP
24 drivers the BEEP

What is acceptance?

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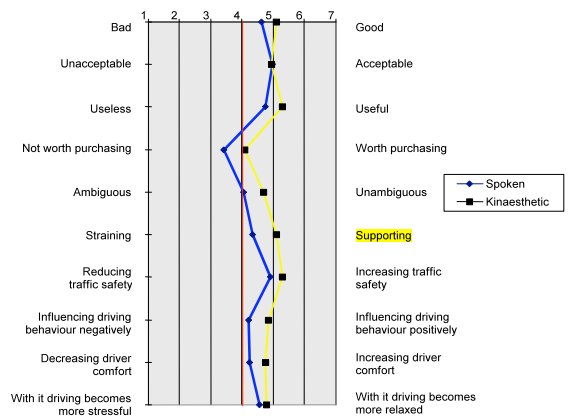
I think the system is….



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Closing points

Measuring acceptance

- possible? Yes
- how? Not established, not straightforward, not obvious, …

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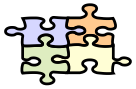
Closing points (2)

Issues to consider - ???

- One general acceptance definition & instrument – set for various types, purposes, contexts, ….
- One index – combination of indicators (weighed)
- Focus on individual (decision-makers)
- Goal(s) – whose, relevance
- Acceptance – manifestation in intention / behaviour / use
- Liking necessary
- Functionality, interface/interaction
- Yes/no (nominal) scale - continuum
- Development phases - development over time
- Influencing factors
- Relation to SA, WL, trust, compliance, ….
- ……..



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Thank you for listening

lena.nilsson@vti.se
www.vti.se
www.vipsimulation.se

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ADVISORS proposal

Measurement area	*Option*	*Measure*
Usability scale questions	Mandatory	Usability questionnaire
	Free	Driving quality
		Other usability
User Acceptance scales/questions	Mandatory	User Acceptance Scale
	Free	Other acceptance
Willingness to pay questionnaire	Mandatory	Willingness to pay
scales	Free	Additional questions /

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Procedural guidance for Van der Laan scale users

1. Describe the system to be evaluated in terms of 'what is your judgement about a system that would…(short & clear explanation of the system functioning)' and present the nine items (before-measurement).
2. After experience with the system under evaluation present the nine items again: 'what is your judgement about the system …(name), you just finished driving with' (after-measurement).
3. Individual items should be coded from -2 to +2 from left to right, scores on items 3, 6, and 8 should be coded ranging from +2 to -2 (N.B. these items are mirrored).
4. Perform reliability analysis on the before-measurement (use of Cronbach's α is strongly suggested). If reliability is sufficiently high (above 0.65), compute per subject the end-scores for the two scales by averaging the scores on items 1, 3, 5, 7, and 9 for the ***usefulness*** score, and averaging scores on items 2, 4, 6, and 8 for the ***satisfying*** score.
5. The usefulness scores can now be averaged over subjects to obtain an overall system practical evaluation. The same can be done with the satisfying scores.
6. Compute difference-scores per subject by subtracting the before-measurement score from the after-measurement score per scale. The difference scores show whether and in which direction subjects' opinion was altered as a result of experience with the system.

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The System Usability Scale (SUS) – Brooke, 1996

Tick one box in each line	*Strongly Disagree*				*Strongly agree*
I think that I would like to use this system frequently	☐	☐	☐	☐	☐
I found the system unnecessarily complex	☐	☐	☐	☐	☐
I thought the system was easy to use in this trial	☐	☐	☐	☐	☐
I think that I would need support of a technician to be able to use this system	☐	☐	☐	☐	☐
I found the various functions in this system were well integrated	☐	☐	☐	☐	☐
I thought there was too much inconsistency in this system	☐	☐	☐	☐	☐
I would imagine that most people would learn to use this system very quickly	☐	☐	☐	☐	☐
I found the system very cumbersome to use	☐	☐	☐	☐	☐
I felt very confident using the system in this trial	☐	☐	☐	☐	☐
I needed to learn a lot of things before I could get going with this system	☐	☐	☐	☐	☐

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Questionnaire Willingness to pay

You just experienced a new electronic system in the trial.
We would like to know how much you value this system.

1. What amount of money would you be ready to spend buying this system now?
   - ☐ Less than 100 Euros
   - ☐ Between 100 and 200 Euros
   - ☐ Between 200 and 500 Euros
   - ☐ Between 500 and 1000 Euros
   - ☐ More than 1000 Euros

2. Suppose the system is included in your next, new car of 20.000 Euro.
   What amount of money would you be prepared to pay extra for this system?
   - ☐ Less than 100 Euros
   - ☐ Between 100 and 200 Euros
   - ☐ Between 200 and 500 Euros
   - ☐ Between 500 and 1000 Euros
   - ☐ More than 1000 Euros

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Driving quality scale Brookhuis, 1993

Participants are requested to put a cross on the line, to indicate:

How well did you drive during the trial, compared to normal

| ⇐ I drove extremely well
|
|
|
|
|
| ⇐ I drove as usual (normal)
|
|
|
|
|
| ⇐ I drove extremely bad

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