

A Feasibility analysis : multicriteria model for evaluating confort in TGV coaches

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Problem definition

Step 1: Determining the components of confort

Step 2 : Model

Step 3: Decision tool(s)?

Step 4 : Some examples

Conclusion

Outline

- 1 Problem definition
- 2 Step 1: Determining the components of confort
- 3 Step 2 : Model
- 4 Step 3: Decision tool(s)?
- 5 Step 4 : Some examples
- 6 Conclusion

Confort Evaluation

- How to *evaluate*
- the *confort*
- from the *customer* point of view
- for *call for tenders* ?

Call for tenders

SNCF (French Railways) : call for tenders in order to

- rennovate a *TGV* (high speed train) coach or
- buy a new *TGV* coach

→The acquisitions department makes a global assesment of each supplier's offer.

Call for tenders

Confort department : evaluate the confort within each offer from the customers' point of view;

- is it possible?
- how?
- can we use some data from old studies (PhD thesis on psycholinguistic)?

What are we looking for?

We tried to analyse differents decision aiding steps:

- How can we determine the components of confort (dimensions)?
- How can we represent the complex structure of the problem situation?
- Which type of decision tool can we use?
- At what type of conclusions can we arrive?

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Data analysis

Data

Data from a PhD work on psycholinguistics (2007): Analysis of customers perception of confort through linguistic expressions (Analyse du ressenti des voyageurs a partir des expressions en langue)

Questionnaires with travelers (customers) : three different questionnaires

- General one
- Open ended
- Close ended

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Question on data?

Can we use directly the data from such questionnaires?

Data analysis

- Different aim, different methods, etc.
- Global confort
 - confort in the train but also outside the train
 - confort about the materials but also services, etc.
 - a lot of redondances

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Data analysis

How to restructure these data?

- Elimination of some data which are not interesting for our study (services, outside the train, etc)
- Verification of constraints of decomposability, non redundancy, independence, etc.

Hierarchical model

The choice of hierarchical model is justified by

- the nature of our data
- big number of confort components
- reading facility
- dependancies between different criteria

Confort dans le train

Sensoriel

- sonore
 - annonces sonores
 - porte
 - autres passagers
- mouvement du train
- visuel
 - vitres
 - design/décoration
 - lumière
- sentiment de sécurité
- climatique
- ambiance/relation
 - intimité
 - animaux
 - téléphones
 - déplacements des voyageurs
 - nombre de voyageurs

Confort Assis

- mouvement du train
- accoudoir
- appuie-tête
- confort de l'assise
- jambes
- filet
- poubelle
- repose-pieds
- sens de la marche
- tablette

Confort Debout

- mouvement du train
- couloir
- descente/montée du train
- poignées de maintien
- porte

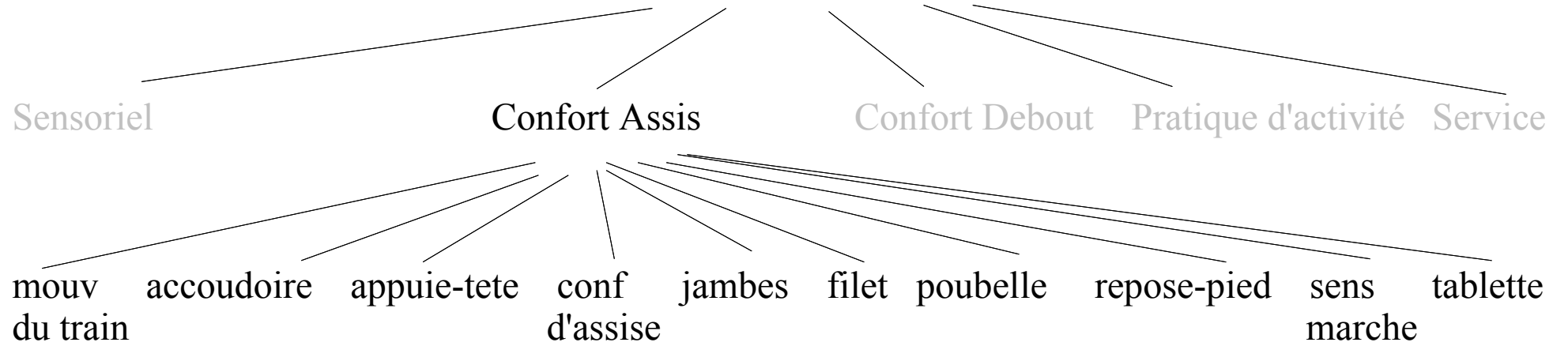
Pratique d'activité

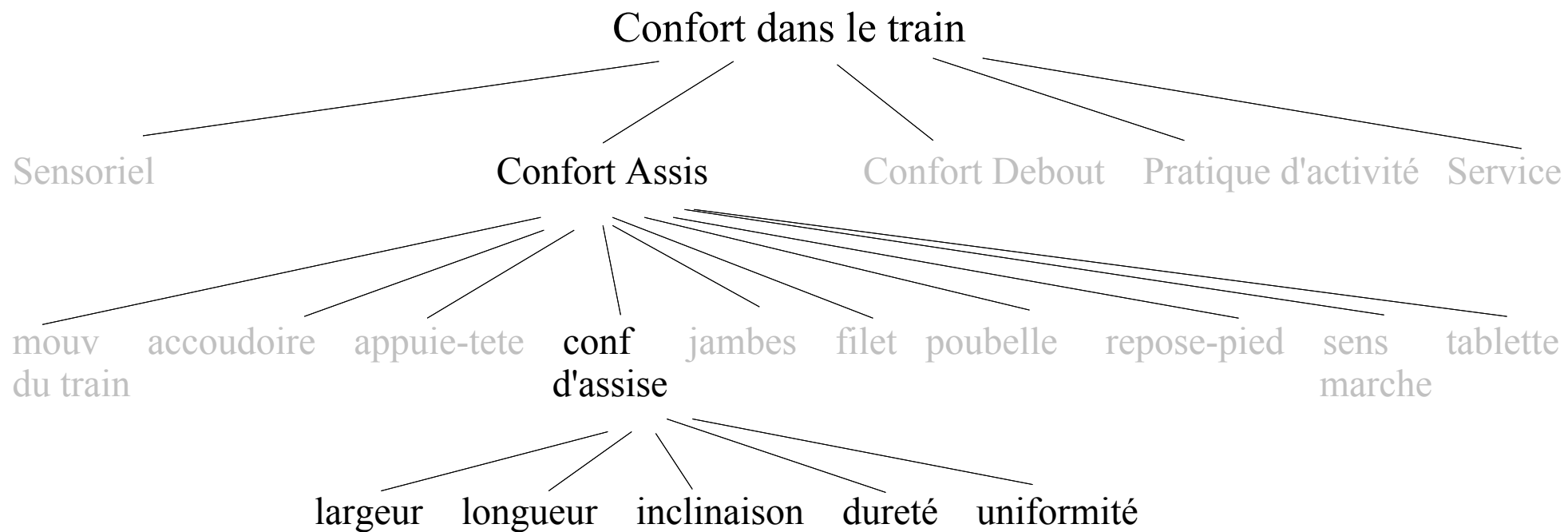
- confort assis
- tablette pour activité
- multimédia
- prise
- connexion
- lumière
- vitres/visibilité
- ambiance
- confort debout

Service

- bar/restaurant
- systemes d'information
- langerie
- toilettes
- téléphones
- bagages
- UFR
- PMR
- animaux

Confort dans le train





Which type of decision problem?

Sorting problem :

Classify suppliers' offers in five categories:

terrible	not bad	acceptable	comfortable	very comfortable
Offer 1 Offer 4		Offer 7 Offer 2 Offer 5 Offer 6		Offer 3

Choice of tool(s)?

The choice of the tool(s) depends on

- the problem (choice, ranking, sorting, etc.)
- type of the informations (uncertainty, etc)
- type of domains (scales : ordinal, ratio, interval, etc.)
- desired properties (monotonicity, independence, transitivity, etc.)

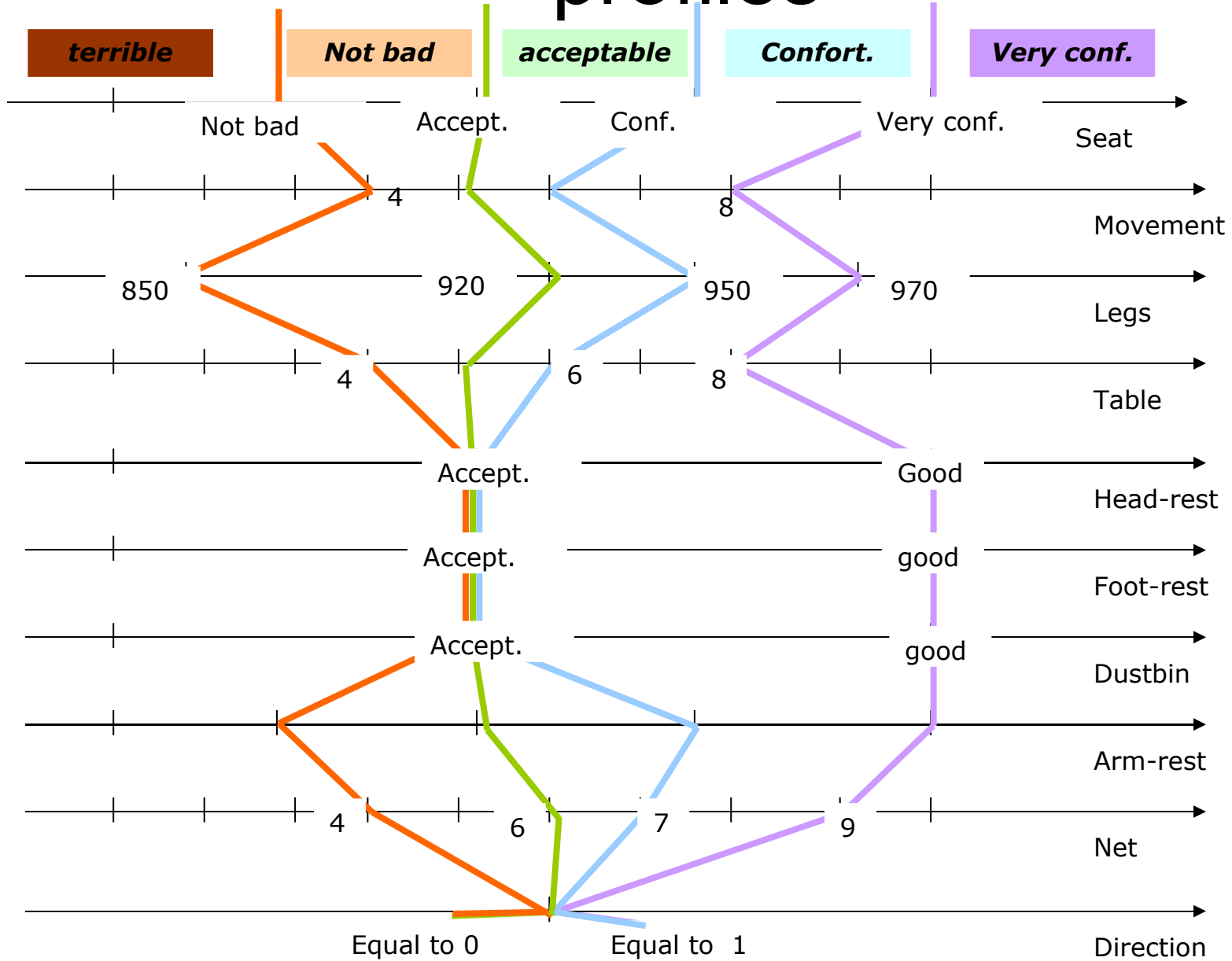
Example of study depending on the tool

Electre Tri for the aggregation of the first level components of confort :

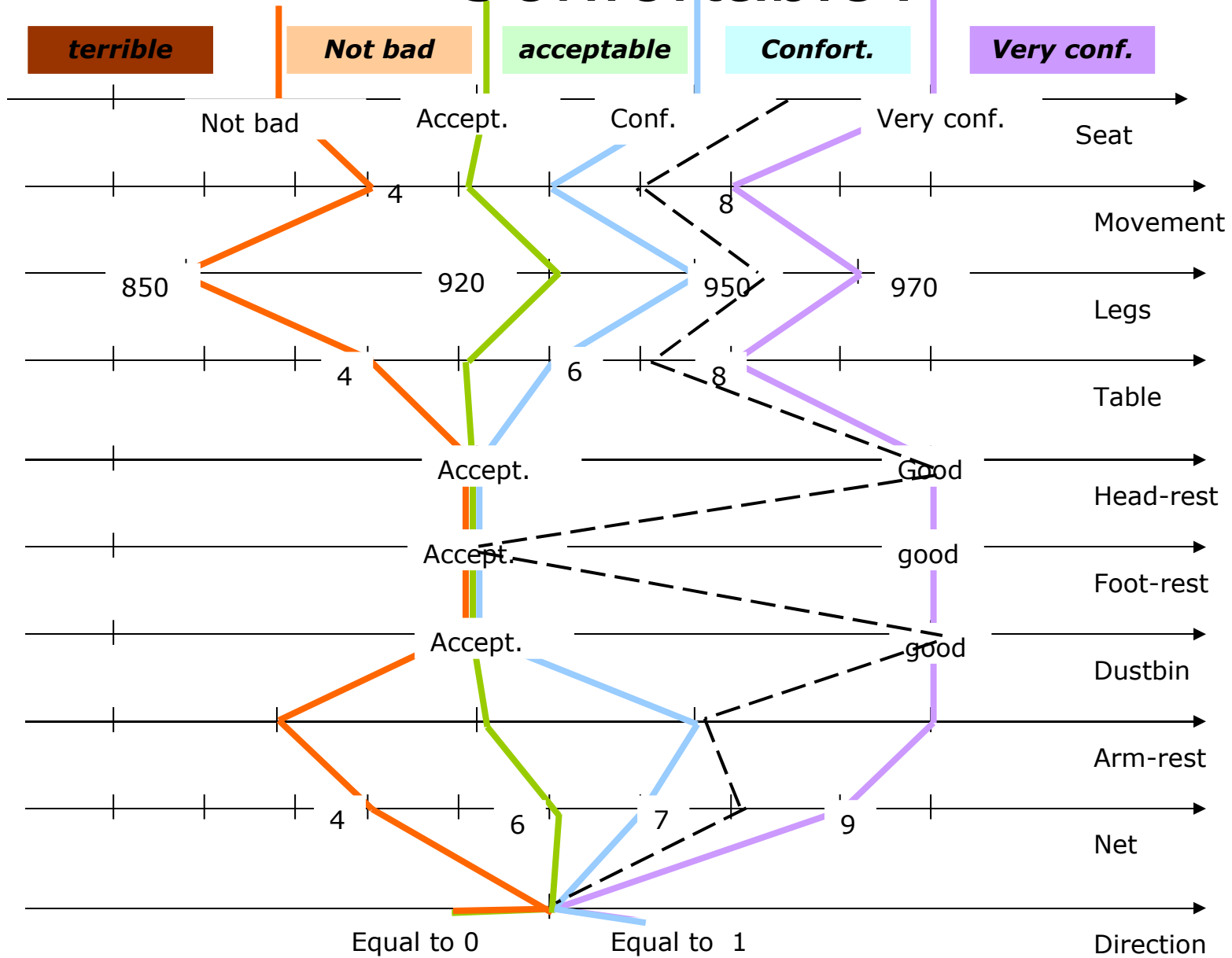
- define the scales of components
- define the categories (profiles)
- other parameters (thresholds, weights, etc.)

<i>Catégorie</i>	<i>Echelle (catégorie)</i>	<i>Sous-catégories</i>	<i>Echelle (Sous-catégories)</i>
Appuie-tête (head rest)	mauvais-moyen- bon	inclinable	0-1
		sensoriel	[0,10]
Confort de l'assise (seat)	mauvais-passable- moyen-bon-très bon	largeur	De 400mm à 650mm
		longueur	De 500mm à 700mm
		dureté	[0,10]
		uniformité	[0,10]
		inclinable	0-1
Jambes (leg)	de 850mm à 980mm	-	
Filet (net)	[0,10]	-	
Poubelle(dustbin)	mauvais-moyen- bon	taille	mauvais-moyen-bon
		ergonomie	[0,10]
Repose-pieds (foot-rest)	mauvais-moyen- bon	largeur	De 200mm à 600mm
		glissance	mauvais-moyen-bon
		distance entre appuie et dessous	De 80 mm à 200mm
Sens marche	0-1	-	
Test du siège % mouvement	[0,10]

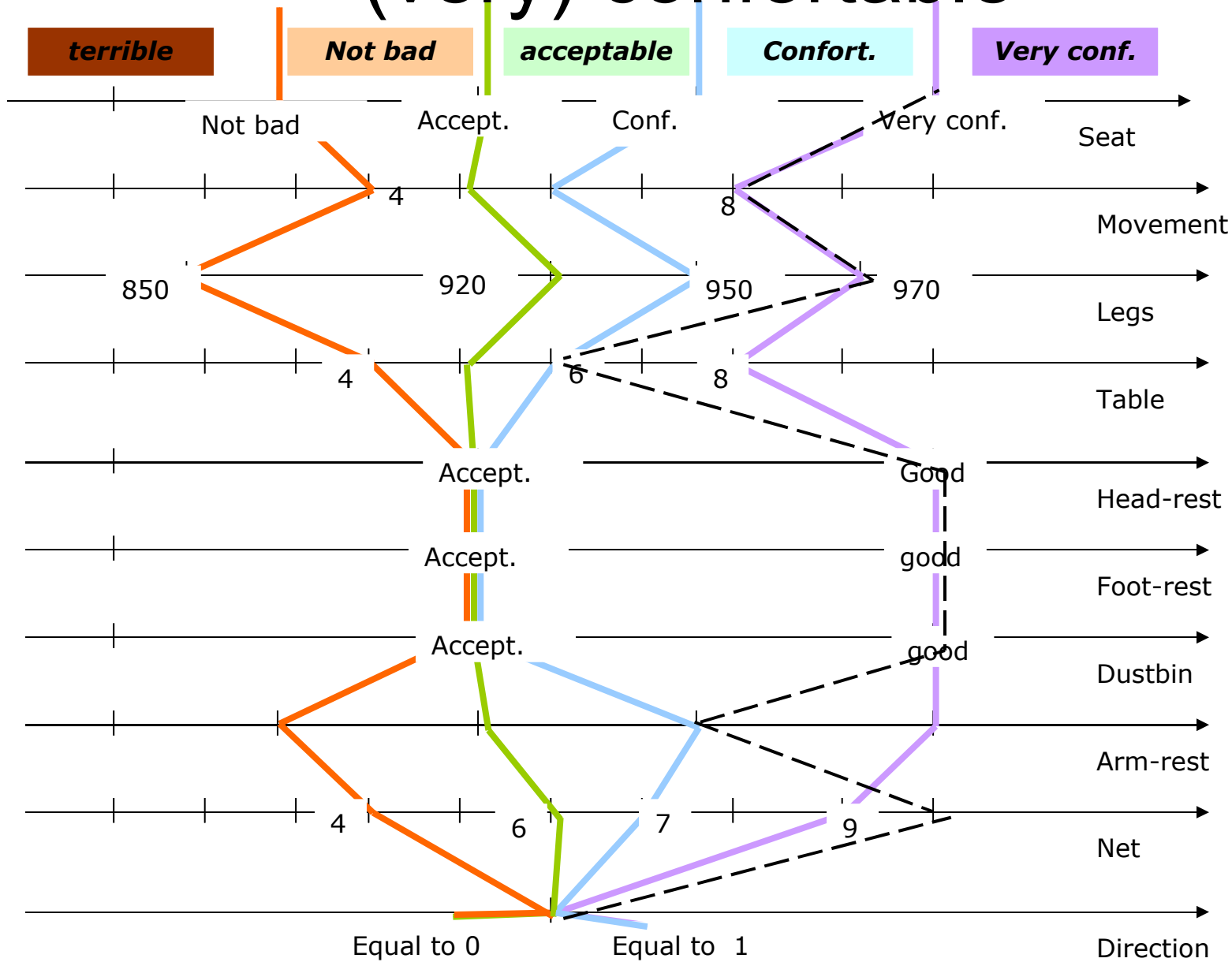
profiles



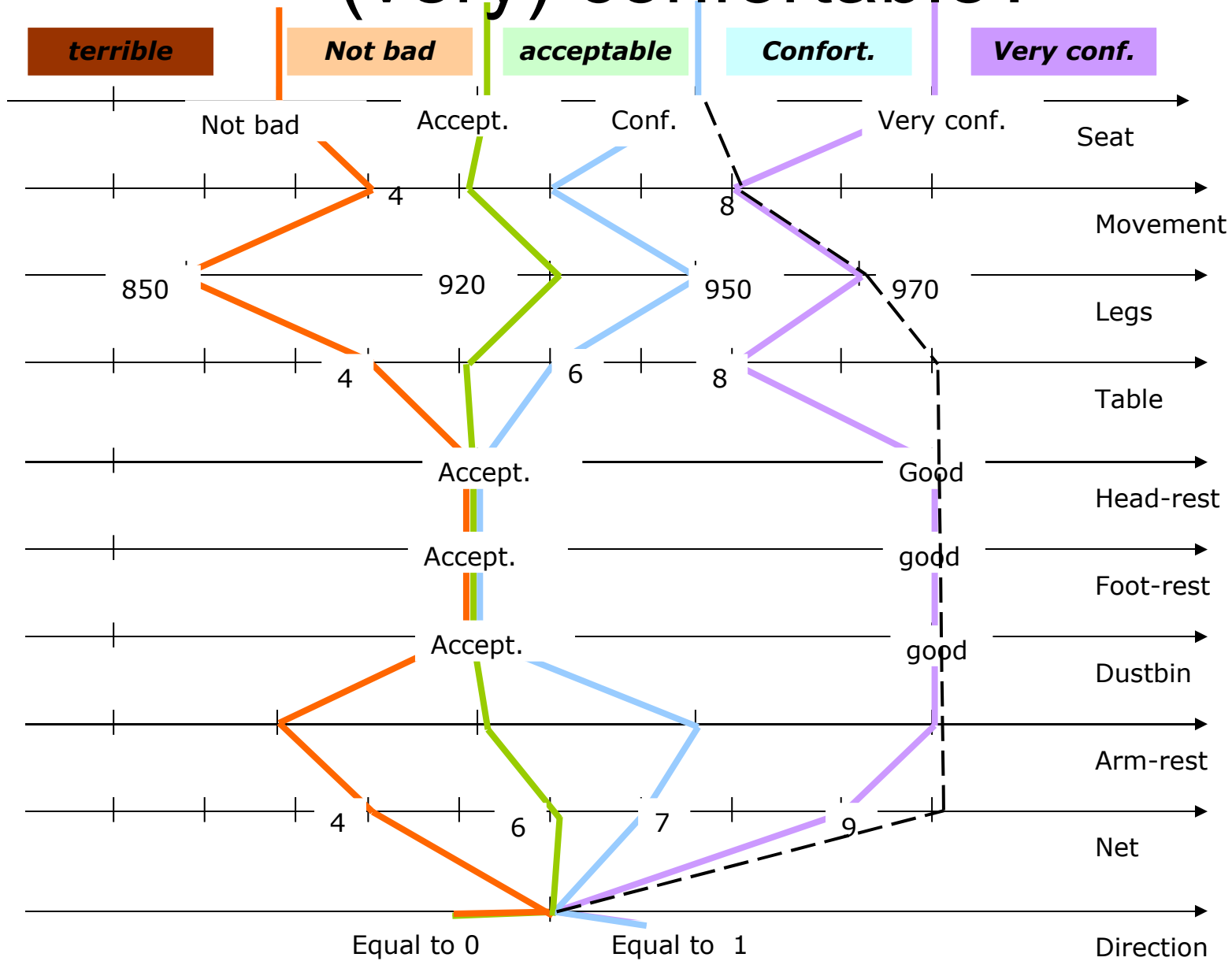
Comfortable?



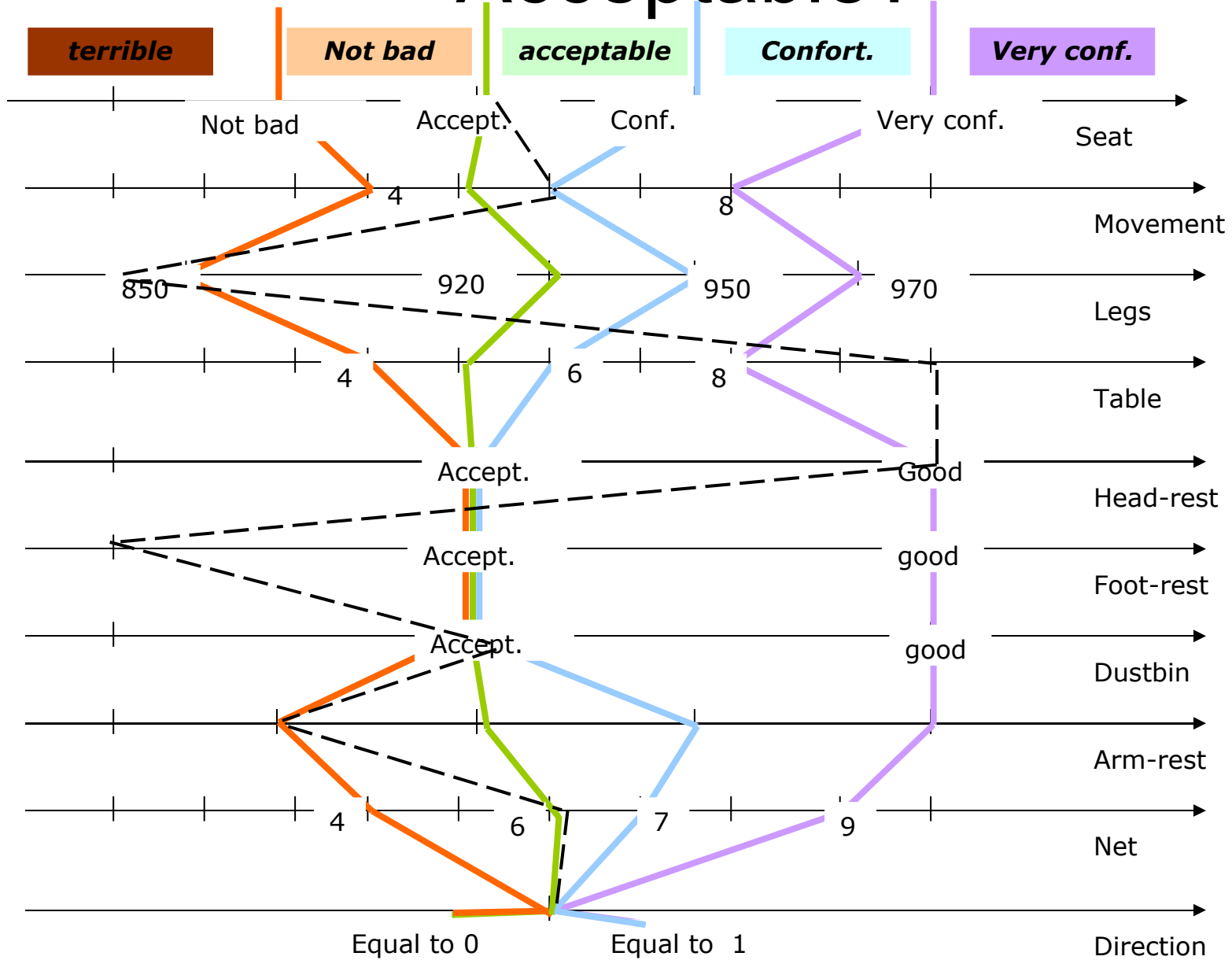
(very) comfortable



(very) comfortable?



Acceptable?



Conclusion

- feasibility study of the confort evaluation
 - complex problem
 - big number of components, different scales
 - difficulties for the elicitation of decision parameters
 - different participants (experts, customers, researchers, SNCF personnels, etc.)
 - different decision tools in the same problem