

Preference is not Performance

Objective versus subjective measures of Berlin schematic map usability

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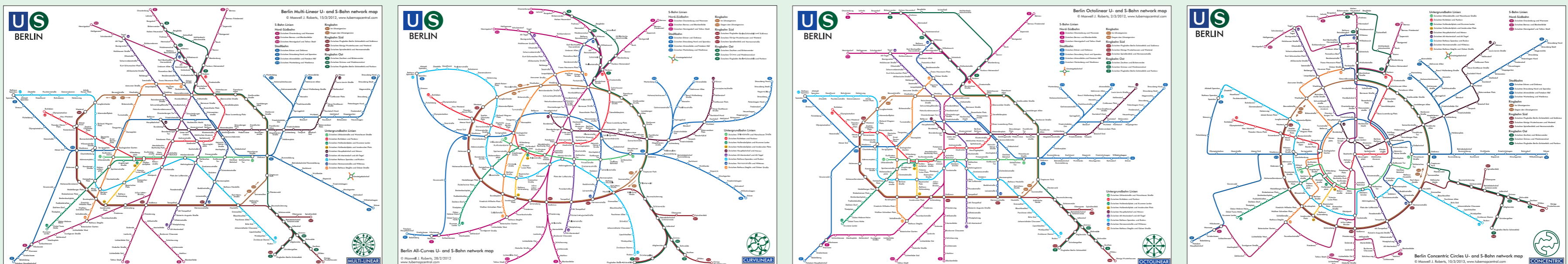
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Introduction

- Schematic rail maps are intended to simplify the complexities of reality, giving a clear overview of the trajectories of individual lines, their relatedness and their connectivity.
- Roberts *et al.* (2013) compared the official Paris Metro map (traditional octolinear) with a novel curvilinear design. The curvilinear design was 50% faster for journey planning, but preferred by only 50% of people.
- In general, objective measures and subjective evaluations are almost always uncorrelated: people can prefer designs that are hard to use and reject designs that are easy to use.
- People have expectations, prejudices, opinions and aesthetic preferences concerning design which bias their usability evaluations (Roberts, 2014).
- Two usability studies are reported here which compare objective versus subjective measures for four unofficial Berlin maps matched for size and design priorities – the simplest possible line trajectories.
- Octolinear:** traditional Henry Beck style; how people expect a good map to be formatted, but these design rules do not suit all cities well.
- Multilinear:** multiple angles permit the straightest line trajectories, but at the expense of the overall coherence of the design.
- Curvilinear:** the harsh disruptive corners of linear designs are smoothed away to form gentle curves that afford effortless flow.
- Concentric:** the line trajectories have poor simplicity, but this is the most coherent design of all. It generates massive interest on the internet.

Method

- Experiment 1: 72 people tested with multilinear, curvilinear, and octolinear designs, all people attempted to plan journeys using all three maps.
- Experiment 2: 40 people tested with concentric and octolinear designs, all people attempted to plan journeys using both.
- Journey planning task:
 - People attempted to plan a series of journeys for every map. Each journey was between two highlighted stations.
 - Six complex journeys planned per map, two interchanges required to complete each journey, or to avoid a roundabout journey.
 - Two measures of performance: mean time to plan each journey, and mean estimated time required to undertake each journey – based on a simple station and interchange count.
- Rating task (1):
 - A series of statements about various aspects of the designs were, rated on a 5-point scale (*strongly agree* to *strongly disagree*).
 - Total of ratings gave aggregate questionnaire scores, higher aggregates indicate a more favorable rating for each map.
- Rating task (2):
 - Each map was directly rated for perceived usability with three options (*easy to use, neutral, hard to use*).
 - Each map was directly rated for perceived attractiveness with three options (*attractive, neutral, unattractive*).



Results

	Multilinear	Curvilinear	Octolinear	Concentric
OBJECTIVE MEASURES				
Mean journey planning time (seconds, high scores = poor performance)				
Experiment 1	31.2 (12.0)	31.5 (15.2)	30.5 (14.6)	
Experiment 2			25.2 (7.6)	30.9 (9.6)
Estimated journey duration (minutes, high scores = poor performance)				
Experiment 1	64.5 (6.7)	62.9 (5.7)	64.5 (6.7)	
Experiment 2			62.5 (6.6)	62.4 (5.9)
SUBJECTIVE RATINGS				
Mean aggregate questionnaire rating (range 11 to 55; high scores = more favourable)				
Experiment 1	34.4 (9.3)	39.0 (9.7)	41.1 (8.6)	
Experiment 2			44.4 (7.2)	33.7 (10.4)
Mean direct usability rating (range 0 to 100; high scores = more favourable)				
Experiment 1	54.2 (38.2)	66.7 (40.2)	75.0 (30.3)	
Experiment 2			85.9 (25.5)	41.0 (39.5)
Mean direct attractiveness rating (range 0 to 100; high scores = more favourable)				
Experiment 1	36.1 (34.8)	73.6 (40.0)	66.7 (31.0)	
Experiment 2			65.4 (28.5)	64.1 (42.8)

- Objective measures:
 - No differences in estimated duration of journeys planned.
 - Multilinear, curvilinear, octolinear designs equal journey planning times, concentric map far slower than octolinear.
- Subjective measures:
 - Multilinear and concentric maps always received the worst usability ratings. The curvilinear map was rated more highly, the octolinear map was always rated the most usable design.
 - Curvilinear received a high attractiveness rating, concentric and octolinear equal, multilinear the least attractive by far.

Conclusions

- There is a clear dissociation between the objective measures and the subjective ratings of usability.
- The low ratings of the multilinear map are unjustified, the low ratings of the concentric map are completely justified:
 - People evaluate maps on the basis of salient features in relation to their expectations about good design.
 - Sometimes these salient features are by coincidence related to factors that determine usability, sometimes not.
- Aesthetic appreciation seems to be related to usability judgement, but is also independent of this:
 - The curvilinear map is rated as more attractive than usable, the octolinear map is rated as more usable than attractive.
 - The concentric map is rated as much more attractive than the multilinear, but seems to receive the lowest usability ratings.
- Both types of evaluation methodology are necessary:
 - Objective measures to ensure that usable designs are selected.
 - Subjective measures to ensure that acceptable designs are selected.

References

- Roberts, M.J. (2014). What's your theory of effective schematic map design? Schematic Mapping Workshop 2014, University of Essex, April.
- Roberts, M.J., Newton, E.J., Lagattolla, F.D., Hughes, S., & Hasler, M.C. (2013). Objective versus subjective measures of Paris Metro map usability: Investigating traditional octolinear versus all-curves schematic maps. *International Journal of Human Computer Studies*, 71, 363-386.