Preference is not Performance
Objective versus subjective measures of Berlin schematic map usability

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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 effortlessly 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

<table>
<thead>
<tr>
<th>Multiplanar</th>
<th>Curvilinear</th>
<th>Octolinear</th>
<th>Concentric</th>
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<tbody>
<tr>
<td><strong>OBJECTIVE MEASURES</strong></td>
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<td>Mean journey planning time (seconds, high access = poor performance)</td>
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<td>Experiment 1: 31.2 (12.0)</td>
<td>Experiment 2: 31.6 (12.0)</td>
<td>Experiment 1: 30.5 (14.6)</td>
<td>Experiment 2: 33.6 (19.3)</td>
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• 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.

Conclusions

• 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.

References
