

A comparison of methods for evaluating cartographic interfaces

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Track 13: Use and User Issues

Keywords: Geovisualization, Interactive maps, User Interface

BACKGROUND: Custom interactive maps, web map mashups, and advanced geovisualization/geovisual analytics software applications are growing in their importance and ubiquity. As the deployment of such tools increases to solve scientific and practical problems, so too must the time and resources allocated for ensuring these tools work. Cartographic interface evaluation describes any approach to identifying and explicating usability or utility issues of a map-based application, to the end of improving it. The work described here extends prior work presented at ICC 2009.

OBJECTIVES: This research unifies work in the domains of human-computer interaction (HCI), usability engineering, and GIScience to develop an initial framework for conceptualizing cartographic interface evaluation. The objectives of this research are threefold: (1) classify interface evaluation methods according to similarity, (2) enumerate the benefits and limitations of each method or class of methods, and (3) describe how each method or class of methods should be modified to evaluate cartographic interfaces specifically. The framework presented here serves as both a pragmatic guide for selecting appropriate evaluation methods when developing map-based applications and as a classroom teaching tool about the usability and utility of cartographic interfaces.

METHODS: An informal, two-stage content analysis was conducted on secondary sources (academic manuscripts and popular websites) about interface evaluation found in the domains of HCI, usability engineering, and GIScience, particularly those including a classification of interface evaluation methods. First, comparison was made across the recommended classification principles and the resulting category sets; the result of this step was a revised classification of methods (Objective #1). Second, HCI and usability engineering literature was analyzed to identify the benefits and limitations for each method (#2) and the GIScience literature was analyzed to identify any modifications to the method that were recommended for application to cartographic interfaces (#3); this descriptive content was summarized to produce initial guidelines for administering each method in the framework.

RESULTS: Although many scholars organize interface evaluation methods by the project stage, the analysis revealed a potentially more logical classification by 'information source', with sources of feedback including experts, theory, or users. A preliminary summary of the revised classification is presented in Table 1. Analysis of identified benefits/limitations from HCI and usability engineering literature revealed several common attributes that could be compared across methods: #/complexity of application features, diversity in user experience and

motivation, interface novelty, available resources (time/money/participant access), and comprehensiveness of collected feedback. Finally, review of GIScience literature identified several, method-specific modifications for evaluation of cartographic interfaces, although few general recommendations.

CONCLUSION: The work presented here is an initial attempt to structure cartographic interface evaluation to the end of ensuring that such tools meet their intended purpose and properly integrate into the workflows of their intended users. Continued theoretical and applied work on cartographic interface evaluation is necessary to improve the usability and utility of such tools.

	<i>Method</i>	<i>Related Methods</i>
<i>Expert-based</i>	heuristic evaluation	
	conformity inspection	feature inspection, consistency inspection, standards inspection, guideline checklist
	cognitive walkthroughs	pluralistic walkthroughs, prototyping, storyboarding, Wizard of Oz
<i>Theory-based</i>	scenario-based design	personas, scenarios of use, use case, context of use, theatre
	secondary sources	content analysis, competitive analysis
	automated evaluation	unmoderated user-based methods
<i>User-based methods</i>	participant observation	ethnographies, field observation, MILCs, journal/diary sessions, screenshot captures, automated interaction logs
	surveys	questionnaires, entry/exit surveys, blind voting, cognitive workload assessment
	interviews	structured interviews, semi-structured interviews, unstructured interviews, contextual inquiry
	focus groups	supportive evaluation
	Delphi	
	card sorting	concept mapping, affinity diagramming, brainstorming
	talk aloud/think aloud studies	verbal protocol analysis, co-discovery study
	interaction studies	performance measurement, controlled experiments

Table 1: Classifying Interface Evaluation Methods by Information Source