International Conference on Social Sciences

3 - 5 October 2025 Milan , Italy

Cognitive Dilemmas in Technical Tests: a Case Study of the Space Shuttle Program

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Abstract

Technical test is a central point in the construction of technical facts. It is generally expected to provide a solid foundation for solving technical controversies. However, the processes of technical test are influenced by various social and psychological factors and may lay themselves open to suspicion, thus leading to a series of cognitive dilemmas. Through the case study of technical tests in America's space shuttle program, 3 kinds of dilemmas were identified. The first dilemma was caused by the dual function of exploring and persuading assumed by technical tests. For exploratory purposes, test conditions should be harsh to test the performance of the object in extreme environments; for persuasive purposes, mature systems might be used in tests to minimize uncertainties, thus sacrificing explorability. This dilemma was particularly acute in technical demonstration tests. The second dilemma was caused by the complexity of similarity judgments between test and application context. It was difficult to conclude whether the properties exhibited by a component during testing were representative of those in actual operating conditions, and whether extrapolations from technical test results to real-world applications were empirically and logically reliable. The third dilemma was caused by the uncertainties in test standards and procedures. Technical tests could be governed by test conditions and auxiliary hypotheses, and the competence and qualifications of technical testers might influence beliefs about the results of technical tests, leading to "experimenter's regress". An appropriate use of these dilemmas may provide a path towards technological democracy.

Keywords: Epistemology; Experimenters'S Regress; Similarity Judgments; Technical Controversy; Technical Fact