

ABSTRACT

The use of various web applications within the Early Childhood Education (PAUD) environment in Semarang City presents challenges in fragmented and decentralized authentication management. To address this, the initial phase of this research focused on designing and developing a Single Sign-On (SSO) system as a centralized authentication solution. The system was developed using the Express.js and React.js frameworks with a Waterfall methodology, featuring user management, authentication, authorization, and service integration. Its functionality was validated through 30 black-box testing scenarios. The research then continued with a comparative analysis of automation testing tools for web-based software. This analysis utilizes the Semarang City PAUD SSO as the primary case study, with the Universitas Diponegoro SSO as a comparative case. The evaluation was conducted based on two main parameters: technical efficiency (script execution time, test stability, CPU utility, and RAM consumption) and ease of use (script creation time, cross-browser support, programming language, and cost). The testing process followed the Software Testing Life Cycle (STLC) framework using functional black-box testing at the system level. Performance data were collected through direct experiments and analyzed using the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method with Analytic Hierarchy Process (AHP) based weighting. The results indicate that Selenium WebDriver achieved the highest overall preference score (1,0000), outperforming Playwright (0,8317 & 0,6740) and WebDriverIO (0,0000). Selenium WebDriver led in both technical efficiency (0,6925) and ease of use (0,8554), making it the most optimal automation testing tool in this research context. This study is expected to serve as a reference for developers, QA engineers, and the software industry in selecting the most suitable automation testing tool for their needs and implementation context.

Keywords : Single Sign-On, PAUD, Waterfall, Automation testing tools, Comparative analysis, Selenium WebDriver, Playwright, WebDriverIO, Software Testing Life Cycle, TOPSIS, AHP