

# Bridging Guidelines and Implementation: A Quantitative Framework for Cross-Platform Mobile Accessibility Evaluation

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## Abstract

Despite widespread adoption of cross-platform mobile development frameworks, a significant gap persists between accessibility guidelines and practical implementation. This study addresses this challenge by introducing a comprehensive quantitative evaluation framework for mobile accessibility implementation across React Native and Flutter platforms. We develop six novel metrics—Component Accessibility Score (CAS), Implementation Overhead (IMO), Screen Reader Support Score (SRSS), WCAG Compliance Ratio (WCR), Development Time Estimate (DTE), and Complexity Impact Factor (CIF)—enabling systematic comparison of accessibility implementation approaches. Through empirical analysis of 30 common UI components and real-world testing with VoiceOver and TalkBack screen readers, we demonstrate that React Native achieves 45% reduction in implementation overhead compared to Flutter while maintaining superior screen reader compatibility (4.2 vs 3.8 average score). Our research contributes AccessibleHub, a React Native educational toolkit that serves as both an empirical research platform and practical learning resource, bridging the gap between theoretical accessibility guidelines and implementable solutions. The findings reveal that while both frameworks achieve equivalent WCAG 2.2 compliance (95.3%), React Native's property-based accessibility model offers significant efficiency advantages for rapid development, whereas Flutter's explicit semantic approach provides benefits for complex components and long-term maintenance in larger development teams.

## CCS Concepts

• **Human-centered computing** → **Accessibility**; **Mobile computing**; • **Software and its engineering** → *Software development techniques*.

## Keywords

mobile accessibility, cross-platform development, React Native, Flutter, accessibility metrics, WCAG compliance, screen reader support, quantitative evaluation

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## 1 Introduction

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### 1.1 Mobile accessibility as computing imperative

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### 1.2 Problem statement

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### 1.3 Research objectives and contributions

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## 2 Related Work

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### 2.1 Mobile accessibility frameworks and guidelines

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## 2.2 Cross-platform development accessibility

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## 2.3 Quantitative evaluation methodologies

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## 3 Methodology

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### 3.1 Novel quantitative metrics framework

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- **Component Accessibility Score (CAS):** Comprehensive scoring system for UI component accessibility
- **Implementation Overhead (IMO):** Systematic measurement of development time and complexity costs
- **Screen Reader Support Score (SRSS):** Evaluation framework for assistive technology compatibility
- **WCAG Compliance Ratio (WCR):** Automated compliance assessment methodology
- **Development Time Estimate (DTE):** Systematic timing and effort measurement
- **Complexity Impact Factor (CIF):** Framework for measuring implementation complexity

### 3.2 Experimental design and validation

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### 3.3 AccessibleHub implementation architecture

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## 4 Results and Analysis

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### 4.1 Quantitative comparison results

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## 4.2 Framework-specific advantages and trade-offs

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## 4.3 AccessibleHub validation and impact

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## 5 Discussion

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### 5.1 Implications for developers and organizations

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### 5.2 Methodology contributions to research community

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### 5.3 Limitations and future research directions

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## 6 Conclusion

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## Acknowledgments

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