MEng Innovation by Design
2024/2025 Ideate-Prototype-Realize

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Sentinel: A Code Review Tool for Software Engineers

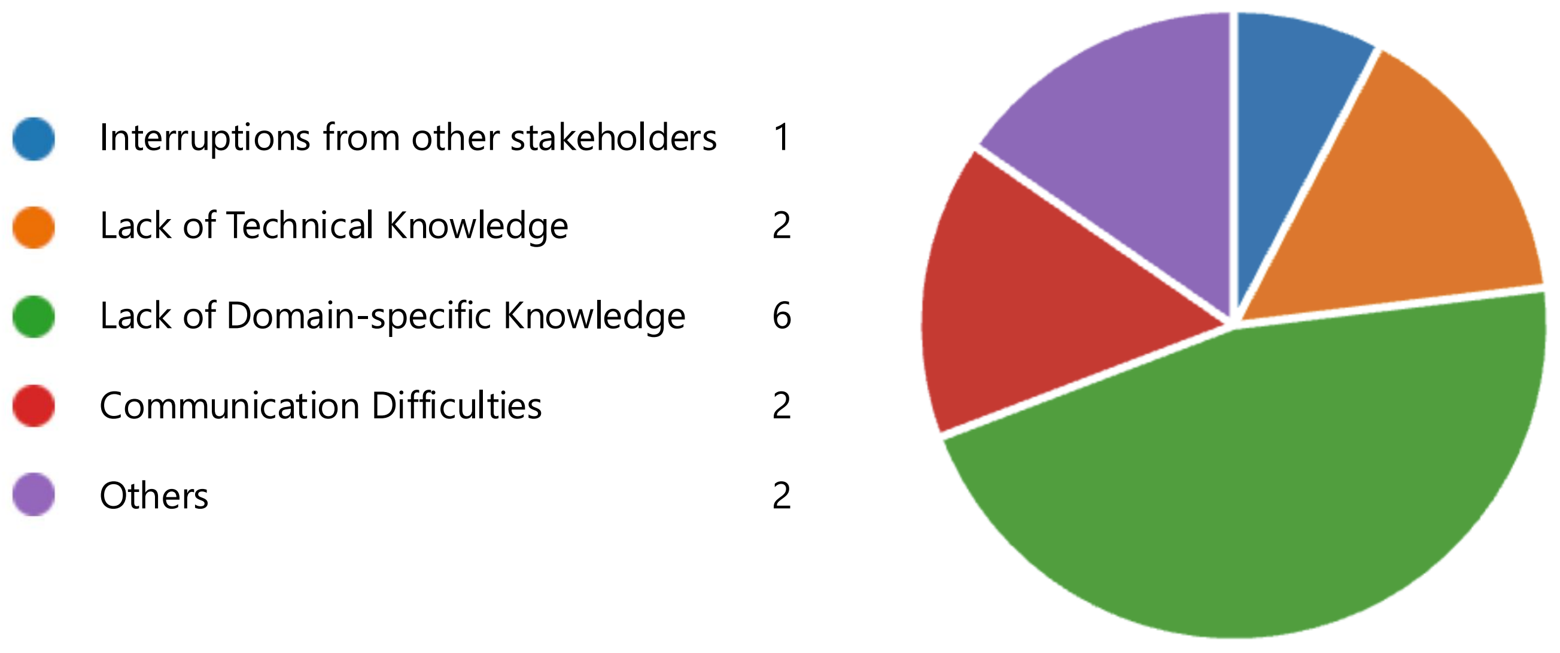
Background

Effective code review is a cornerstone of software reliability, yet conventional practices, primarily based on static analysis, can make it difficult for reviewers to grasp code structure and runtime behaviour[1]. This research examines how software visualization and proxemics can enhance collaborative code review.

How Might We Improve Collaboration Amongst Software Engineers during Code Reviews?

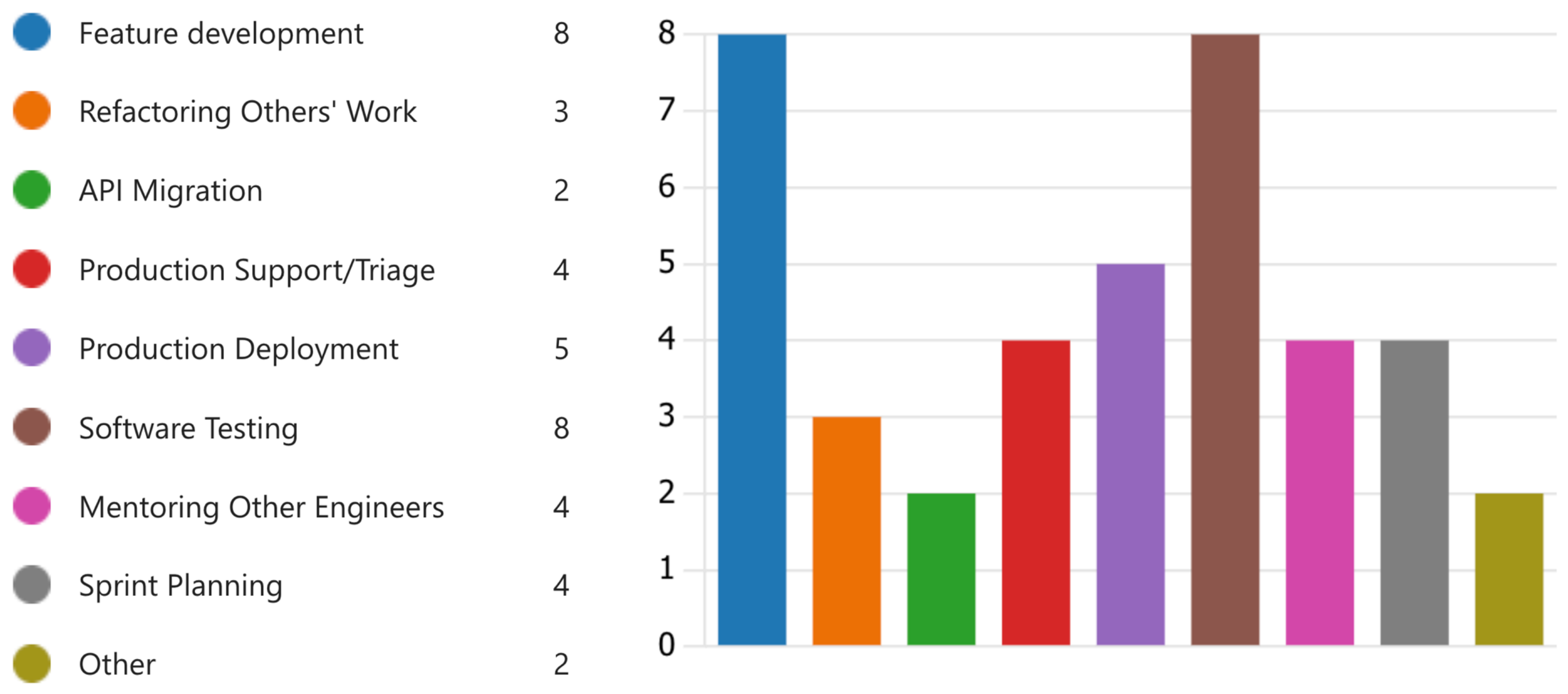
Ideate

Pain Points Faced By Software Engineers During Code Reviews



●	Interruptions from other stakeholders	1
●	Lack of Technical Knowledge	2
●	Lack of Domain-specific Knowledge	6
●	Communication Difficulties	2
●	Others	2

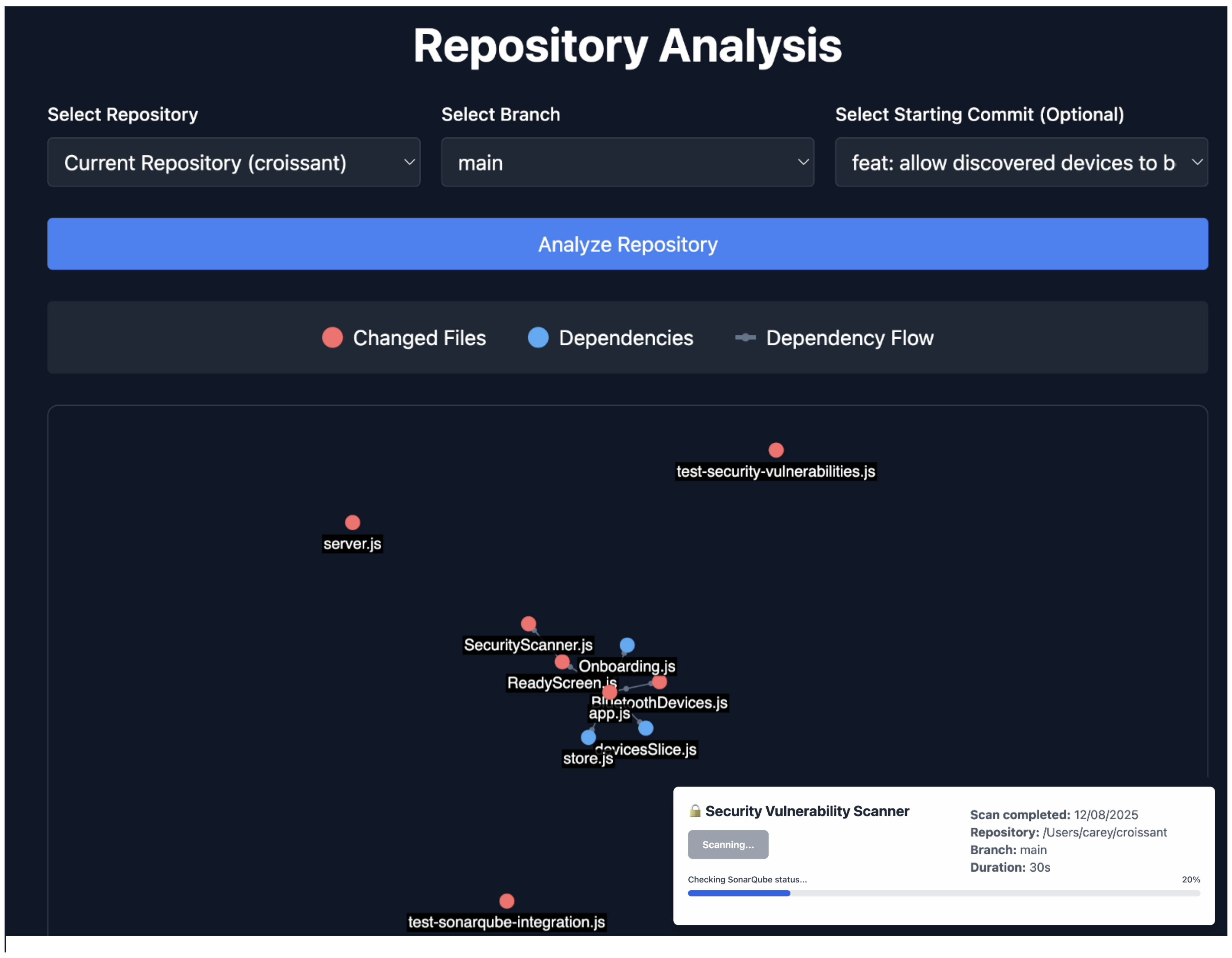
Figure 1: Pain points faced by software engineers



●	Feature development	8
●	Refactoring Others' Work	3
●	API Migration	2
●	Production Support/Triage	4
●	Production Deployment	5
●	Software Testing	8
●	Mentoring Other Engineers	4
●	Sprint Planning	4
●	Other	2

Figure 2: Day-to-day responsibilities of software engineers

Prototype



Repository Analysis

Select Repository: Current Repository (croissant)

Select Branch: main

Select Starting Commit (Optional): feat: allow discovered devices to b

Security Vulnerability Scanner

Scan completed: 12/08/2025
Repository: /Users/carey/croissant
Branch: main
Duration: 30s

Checking SonarQube status... 20%

Figure 3: Final Web-based Code Review Tool

RQ1: How do engineers at different organisations perceive the value of code visualization during code reviews?

RQ2: Can proxemic triggers improve synchronous code reviews compared to existing workflows?

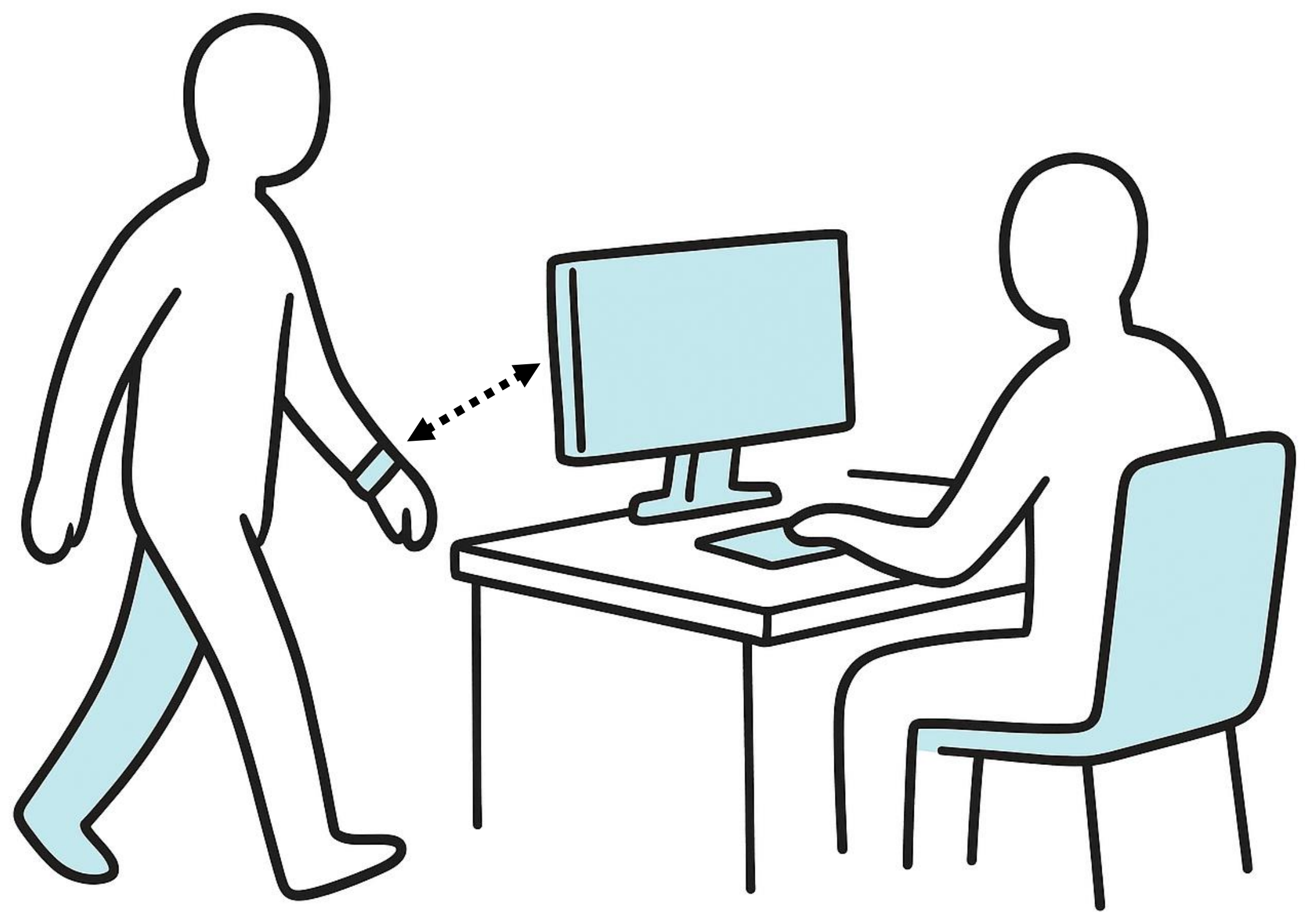


Figure 4: Proxemic triggering of screen changes using Bluetooth

Realize

Feature 1: Web-based Function Call Graphs (FCG)

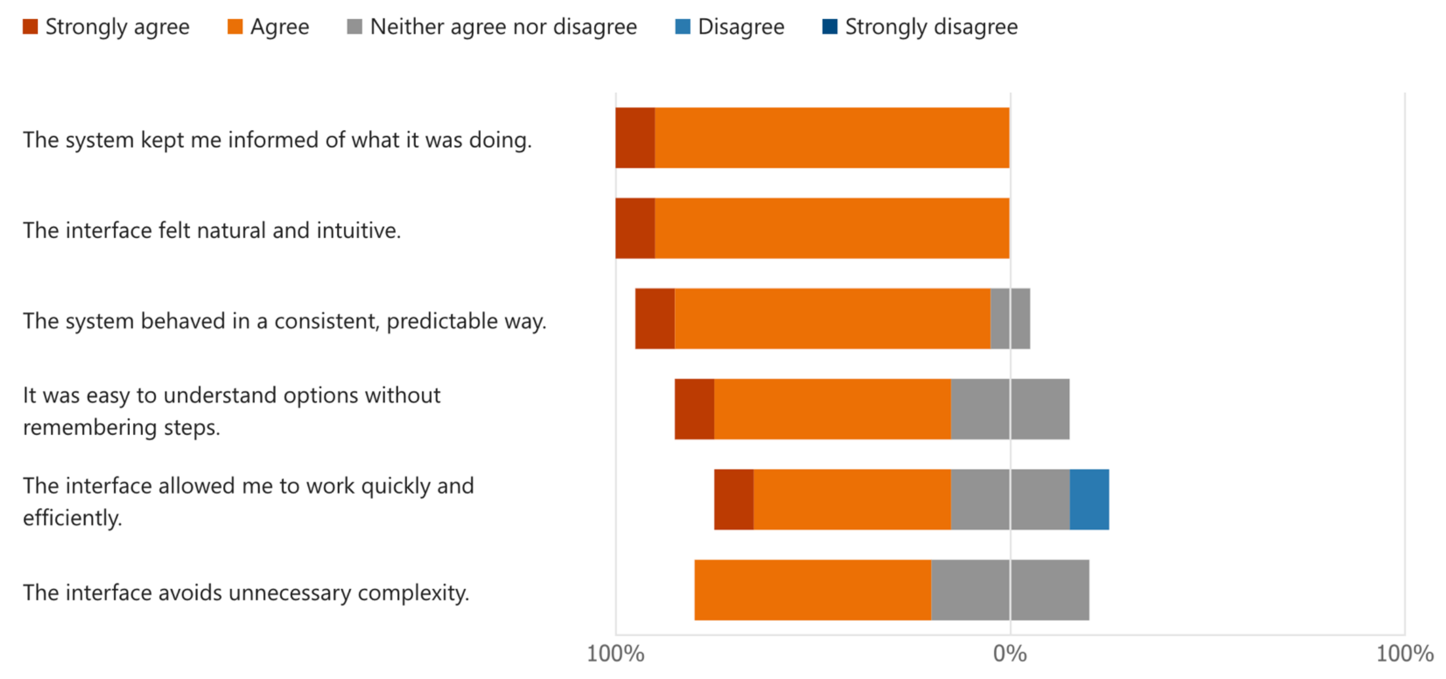


Figure 5: Likert scale validation for code review using FCG

Feature 2: Using Proxemics to Invoke FCGs

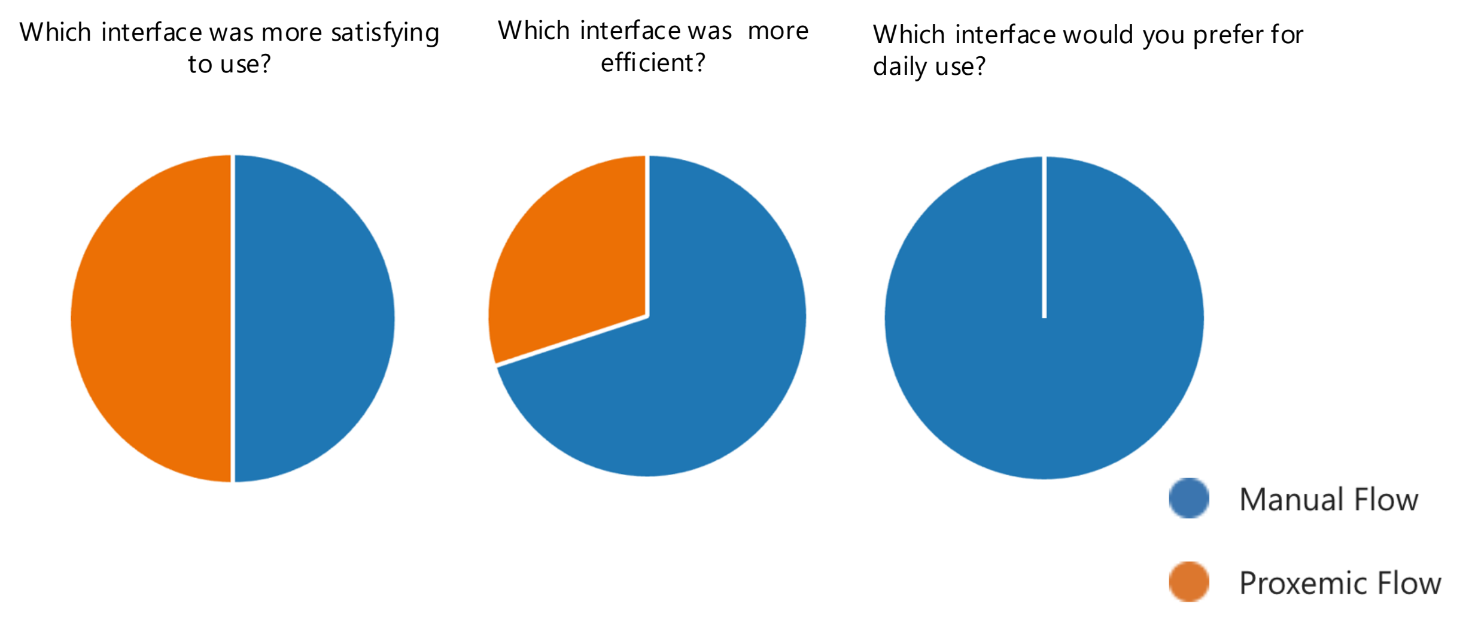


Figure 6: Proxemics Heuristic Evaluation Results

Proxemics could be more satisfactory and may not fit into existing workflows.

Feature 3: Simplified Security Vulnerability Scanner

1. Visualization is good for exploring unknown codebases.
2. Feature must integrate within IDE and execute within 5 seconds.
3. Security scanning perceptions vary by experience.

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[1] A. Krause-Glau, L. Damerau, M. Hansen and W. Hasselbring, "Visual Integration of Static and Dynamic Software Analysis in Code Reviews via Software City Visualization," in 2024 IEEE Working Conference on Software Visualization (VISSOFT), Flagstaff, AZ, USA, 2024, pp. 144-149, doi: 10.1109/VISSOFT64034.2024.00028.