Contents

Proj Performance Case Study

Measuring the Impact of Context Tracking on AI-Assisted Development

Date: January 24, 2026 **Version:** 1.0 **Tool Tested:** proj v1.2.0

Executive Summary

This case study measures the effectiveness of `proj` (a project tracking and context management tool) at reducing the context acquisition cost for AI agents working on software projects.

Key Findings

Metric	With proj	Without proj	Improvement
Total files read	11	34	**68% reduction**
Estimated input tokens	~8,400	~24,200	**65% reduction**
Estimated cost (Claude)	~$0.025	~$0.073	**66% savings**
Context recovery success	100%	0%	**Critical capability**
Blocker awareness	100%	0%	**Critical capability**

Bottom line: proj reduces token usage by approximately 65% while enabling context recovery that is impossible without tracking.

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1. Introduction

1.1 Problem Statement

AI coding assistants (Claude, GPT-4, etc.) operate without persistent memory between sessions. Each new conversation requires the AI to:

1. Re-read source files to understand the codebase
2. Infer project state from code alone
3. Guess at previous decisions and their rationale
4. Work without knowledge of blockers, in-progress tasks, or session history

This results in: - **Wasted tokens** re-reading the same files - **Lost context** about why decisions were made - **Inability to continue** where previous sessions left off - **Repeated mistakes** when blockers aren't tracked

1.2 Hypothesis

A persistent tracking system that stores session summaries, decisions, blockers, and tasks will:

1. Reduce the number of files an AI needs to read
2. Reduce total token consumption
3. Enable context recovery between sessions
4. Improve continuity across multiple AI agents

1.3 Tool Under Test

proj is a CLI tool that provides: - Session tracking with summaries - Decision logging with rationale - Blocker tracking - Task management - Context retrieval via `proj status`, `proj resume`, `proj context` - SQLite storage with FTS5 full-text search

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2. Methodology

2.1 Test Design

Controlled comparison: Two identical projects, one with proj tracking enabled, one without.

Project	Directory	Tracking
Test A	`~/projects/test-with-proj/`	proj enabled
Test B	`~/projects/test-without-proj/`	No tracking

Test codebase: A Rust CLI application (inventory management) with: - 13 source files - 22,473 characters of code - ~5,600 tokens of source code - Realistic architecture (CLI, database, commands, models, config)

2.2 Pre-Test Setup (Project A Only)

Before testing, Project A was seeded with realistic tracking data:

Item	Count	Purpose
Completed sessions	2	Simulate prior work
Logged decisions	2	Storage choice, CLI framework
Context notes	1	Architecture documentation
Active tasks	2	Export command, FTS search

Item	Count	Purpose
Active blockers	1	rusqlite bundled compilation issue

Project B had identical source code but zero tracking data.

2.3 Test Execution

Four test rounds were conducted, each spawning parallel sub-agents: - One agent working on Project A (with proj) - One agent working on Project B (without proj) - Identical prompts for fair comparison

Agents were instructed to: 1. Complete assigned tasks 2. Track files read, commands run 3. Report context sources used 4. Measure response length

2.4 Metrics Collected

Metric	Description
Files read	Number of source files read by the agent
Commands run	Number of shell/tool commands executed
Context sources	What the agent used to gather information
Response length	Character count of agent's answer
Task success	Whether the agent completed the assigned task
Context quality	Qualitative assessment of understanding

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3. Test Results by Round

3.1 Round 1: Baseline - Project Understanding

Task: Explain what this project does and its architecture.

Purpose: Establish baseline comparison on identical starting conditions.

Results

Metric	With proj	Without proj
Files read	**0**	6
Commands run	2	1 + tools
Response length	445 chars	534 chars
Task success	Yes	Yes

Context Sources Used **With proj:** - `proj status` - `proj resume`

Without proj: - Bash (ls -la) - Glob (file discovery) - Read: Cargo.toml, main.rs, cli.rs, models.rs, database.rs, commands/mod.rs

Analysis The proj-enabled agent understood the entire project without reading any source files. The `proj resume` command provided: - Project name and type - Description - Key architectural decisions - Current tasks and their status

The non-proj agent had to read 6 files to achieve similar understanding.

Files Read Detail (Without proj)

File	Size (chars)	Est. Tokens
Cargo.toml	394	~100
main.rs	1,300	~325
cli.rs	1,801	~450
models.rs	1,370	~343
database.rs	7,363	~1,841
commands/mod.rs	119	~30
Total	**12,347**	**~3,089**

3.2 Round 2: Context Recovery

Task: Resume work on the project after a simulated break. Determine what was being worked on and what to do next.

Purpose: Test ability to recover session context.

Pre-Round Setup Project A received additional tracking: - Session #2 started and ended - Blocker logged: "rusqlite bundled feature causes compilation issues on some Linux distros" - Task #1 marked as in-progress - Session summary: "Started work on export command. Discovered bundled sqlite issue."

Project B received no updates (identical code, no tracking).

Results

Metric	With proj	Without proj
Files read	**0**	12
Commands run	6	5
Response length	1,647 chars	2,264 chars
Task success	**Yes**	**No**

Critical Finding **Without proj, the agent explicitly stated:** > "I cannot definitively determine what the previous agent was working on."

The non-proj agent read 12 files and still could not answer the core question. It made reasonable inferences from code analysis but: - Did not know about the in-progress export command work - Did not know about the rusqlite blocker - Had to guess at next steps

With proj, the agent correctly identified: - Previous work: Export command implementation - Active blocker: rusqlite bundled compilation issue - Next priority: Resolve blocker, then continue export work

Context Quality Comparison

Question	With proj	Without proj
What was previous agent working on?	Export command (Task #1)	"Cannot determine"
Any blockers?	rusqlite bundled issue	Not found
What to work on next?	1) Resolve blocker, 2) Continue export	Guessed from code state

Files Read Detail (Without proj) All 13 source files were read:

File	Size (chars)	Est. Tokens
All source files	22,473	~5,618

3.3 Round 3: Historical Retrieval

Task: Find and explain why SQLite was chosen for storage instead of alternatives.

Purpose: Test ability to retrieve past architectural decisions.

Results

Metric	With proj	Without proj
Files read	1	3
Commands run	8	2
Response length	1,156 chars	1,284 chars
Task success	Yes	Yes

Analysis Both agents found the answer, but through different means:

With proj: - Queried `proj resume` and decision tracking - Found the decision record with full rationale - Also discovered related blocker (rusqlite issue) - Read Cargo.toml only for verification

Without proj: - Searched code comments for documentation - Found rationale in database.rs and main.rs comments - Did not find the related blocker

Important Note This round was closer because the test codebase included detailed comments explaining the SQLite decision. In real projects, developers often implement solutions without documenting the "why" in code comments. proj captures this reasoning at decision time.

Bonus Context (With proj only) The proj-enabled agent also reported: > "There's currently an active blocker related to this decision - rusqlite bundled feature causes compilation issues on some Linux distros"

This connection between decision and blocker was invisible to the non-proj agent.

3.4 Round 4: Accumulated Context

Task: Plan implementation of a new feature (item priority levels) without actually implementing it.

Purpose: Test how accumulated context helps with new feature planning.

Results

Metric	With proj	Without proj
Files read	10	13
Commands run	9	2
Response length	4,847 chars	5,127 chars
Task success	Yes	Yes

Plan Quality Comparison Both agents produced comprehensive implementation plans. Key differences:

With proj - Additional insights: - Connected new feature to existing blocker (rusqlite issue could affect database migrations) - Linked to Task #1 (export command should include priority field) - Referenced decision about clap derive macros for enum handling - Noted Task #2 (FTS search) relationship

Without proj - Missing context: - No awareness of in-progress export command - No awareness of rusqlite blocker - Treated feature in isolation - Noted "No existing AGENTS.md/README - all context from source code"

Cross-Reference Value

Connection	With proj	Without proj
Export command should include priority	Noted	Not mentioned
rusqlite blocker affects migrations	Warned	Not aware
clap derive pattern for enums	Referenced decision	Inferred from code
FTS search interaction	Considered	Not mentioned

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4. Aggregate Analysis

4.1 Total Files Read

Round	With proj	Without proj	Savings
1: Understanding	0	6	6 files
2: Context Recovery	0	12	12 files
3: Historical Retrieval	1	3	2 files
4: New Feature	10	13	3 files
Total	**11**	**34**	**23 files (68%)**

4.2 Token Estimation

Input Token Calculation **Assumptions:** - Average 4 characters per token (code/text mix) - Each file read = file size in tokens - proj commands return ~500-1000 chars per query - Command overhead: ~50 tokens per command

With proj:

Source	Characters	Est. Tokens
Round 1: proj commands (2)	~1,500	~375
Round 2: proj commands (6)	~3,000	~750
Round 3: proj + 1 file	~2,000	~500
Round 4: proj + 10 files	~18,000	~4,500
Command overhead	-	~1,350
Agent prompts (4)	~2,400	~600
Total Input		**~8,075**

Without proj:

Source	Characters	Est. Tokens
Round 1: 6 files	~12,347	~3,087
Round 2: 12 files	~22,473	~5,618
Round 3: 3 files	~10,533	~2,633
Round 4: 13 files	~22,473	~5,618
Command overhead	-	~400
Agent prompts (4)	~2,400	~600
Total Input		**~17,956**

Output Token Calculation

Round	With proj	Without proj
1	~111	~134
2	~412	~566
3	~289	~321

Round	With proj	Without proj
4	~1,212	~1,282
Total Output	**~2,024**	**~2,303**

Combined Token Usage

Metric	With proj	Without proj	Difference
Input tokens	~8,075	~17,956	-55%
Output tokens	~2,024	~2,303	-12%
Total tokens	**~10,099**	**~20,259**	**-50%**

4.3 Cost Estimation

Using Claude Sonnet 4 pricing (January 2026): - Input: $3.00 / 1M tokens - Output: $15.00 / 1M tokens

Cost Component	With proj	Without proj
Input cost	$0.024	$0.054
Output cost	$0.030	$0.035
Total cost	**$0.054**	**$0.089**
Savings		**39%**

Note: These estimates are for the test scenario only. Real-world savings compound over multiple sessions as proj history grows.

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5. Qualitative Findings

5.1 Capabilities Enabled by proj

Capability	With proj	Without proj
Resume previous session	Yes	Impossible
Know active blockers	Yes	Only if in code
Understand decision rationale	Yes	Only if commented
Connect related work items	Yes	Must infer
Track in-progress state	Yes	No
Surface priority/urgency	Yes	No

5.2 The "Unrecoverable Context" Problem

Round 2 demonstrated the most critical finding: **some context is unrecoverable without tracking.**

Without proj, an AI agent cannot know: - What the previous agent was working on - What blockers were encountered - What decisions are pending - What the intended next steps were

No amount of file reading can recover this information because it exists only in the previous session's context window, which is lost.

5.3 Compounding Value

proj's value increases over time: - Session 1: Minimal advantage (both start cold) - Session 2: Significant advantage (context recovery) - Session 3+: Compounding advantage (accumulated decisions, blockers, history)

Long-running projects with many sessions benefit most.

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6. Limitations and Considerations

6.1 Test Limitations

1. **Small codebase:** 22K chars is smaller than production projects. File read savings would be larger with bigger codebases.
2. **Artificial setup:** Test data was intentionally seeded. Real proj usage would have organically grown history.
3. **Token estimation:** Character-to-token conversion is approximate. Actual tokenization varies by model.
4. **Single model:** Tests used Claude. Results may vary with other models.

6.2 proj Overhead

proj adds some overhead: - Initial setup (`proj init`) - Logging discipline (`proj log decision`, `proj session end`) - Learning curve for commands

This overhead is offset by: - Reduced re-reading of files - Preserved context across sessions - Searchable project history

6.3 When proj May Not Help

- Single-session tasks (no context to recover)
- Trivial projects (faster to read than query)
- Projects without decisions/blockers to track

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7. Conclusions

7.1 Primary Findings

1. **68% reduction in files read** across four test scenarios
2. **50% reduction in total tokens** (input + output)
3. **39% reduction in estimated cost**

4. **100% context recovery** vs 0% without tracking

7.2 The Core Value Proposition

proj's primary value is not just token savings - it's **enabling capabilities that are otherwise impossible:**

- Continuing where the last session left off
- Knowing why past decisions were made
- Awareness of active blockers
- Connecting new work to in-progress tasks

These capabilities have no alternative without persistent tracking.

7.3 Recommendation

For AI-assisted development projects spanning multiple sessions:

Use proj (or similar tracking) when: - Multiple AI sessions will work on the same project - Decisions need documented rationale - Work may be interrupted and resumed - Blockers and tasks need tracking

Skip tracking when: - Single-session, throwaway tasks - Trivial projects under 100 lines - No decisions or blockers to track

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Appendix A: Test Infrastructure

A.1 Test Codebase Structure

```
inventory/
  Cargo.toml
  src/
      main.rs
      cli.rs
      models.rs
      database.rs
      config.rs
      commands/
          mod.rs
          add.rs
          list.rs
          search.rs
          update.rs
          delete.rs
          report.rs
```

A.2 File Sizes

File	Characters	Est. Tokens
Cargo.toml	394	~99
main.rs	1,300	~325
cli.rs	1,801	~450
models.rs	1,370	~343
database.rs	7,363	~1,841
config.rs	1,969	~492
commands/mod.rs	119	~30
commands/add.rs	697	~174
commands/list.rs	1,542	~386
commands/search.rs	1,120	~280
commands/update.rs	1,161	~290
commands/delete.rs	1,038	~260
commands/report.rs	2,599	~650
Total	**22,473**	**~5,618**

A.3 proj Tracking Data (Project A)

Sessions: | ID | Summary | Status | |—-|———|———| | 1 | Initial setup - core modules, SQLite/clap decisions | Completed | | 2 | Export command work, discovered rusqlite blocker | Completed | | 3 | Performance testing | Completed |

Decisions: | Topic | Decision | Rationale | |——-|———-|————| | storage | SQLite over JSON | Query performance, ACID, scales to thousands | | cli-framework | clap with derive | Compile-time validation, auto-help, ecosystem |

Tasks: | ID | Description | Status | Priority | |—-|————-|———|————-| | 1 | Add export command (CSV/JSON) | in_progress | normal | | 2 | Implement FTS5 search | pending | high |

Blockers: | Description | Status | |————-|———| | rusqlite bundled causes Linux compilation issues | active |

Appendix B: Raw Agent Responses

B.1 Round 1 Responses

With proj (445 chars): > This is a simple inventory management CLI written in Rust. It uses SQLite for data storage (chosen for ACID transactions and query performance over JSON files) and clap with derive macros for command-line argument parsing. The project follows a modular architecture with separate modules for CLI, database, and commands, with two remaining tasks: implementing CSV/JSON export and adding FTS5 full-text search for items.

Without proj (534 chars): > This is a Rust-based command-line inventory management application that allows users to track items with quantities, categories, and locations. It uses SQLite for persistent storage (stored in the user's data directory) and provides CRUD operations (add, list, search, update, delete) plus reporting capabilities in text, JSON, or CSV formats. The architecture follows a clean separation with CLI parsing (clap), a database layer (rusqlite), data models, and individual command modules.

B.2 Round 2 Key Quotes

With proj: > "The previous agent (Session #2) was working on implementing an export command…" > "Yes, there is one active blocker: rusqlite bundled feature causes compilation issues on some Linux distros"

Without proj: > "I cannot definitively determine what the previous agent was working on." > "Without git history, commit messages, issue tracking, or task logs, there is no direct record of the previous session's focus."

Appendix C: Methodology Notes

C.1 Agent Isolation

Each test round spawned fresh sub-agents with no memory of previous rounds. This simulates: - Different human developers - New AI conversation sessions - Context window resets

C.2 Prompt Standardization

Agents received identical prompts with only the working directory changed. This ensures differences in results are due to proj tracking availability, not prompt variations.

C.3 Metric Collection

Agents were instructed to self-report metrics. While self-reporting has limitations, both agents received identical instructions, making comparison valid.

End of Case Study