Generative AI Prompting for Software Development Survey

CF1 **Building a Prompt Engineering Taxonomy for Generative AI Models Informed Consent Form**

RESEARCH PROCEDURES

The purpose of this study is to investigate issues, needs, and opportunities related to improving software development with generative AI tools. In particular, the study aims to build a comprehensive taxonomy of the many possible interactions between users and AI by investigating past research and gathering developer experiences with AI tools.

If you decide to participate, you will take a brief survey via the Qualtrics platform. The study will last about 15 minutes during which time you will be asked questions regarding your familiarity and experience with several topics related to AI tool use. There will also be a brief section which asks about your experience and background with software development.

You will be asked to identify and discuss tasks you or your organization engage with, the difficulty and challenges of such tasks, and the tools used in performing such tasks.

With your permission, we may contact you by email to invite you to participate in a follow-up interview. We will not share this email with anyone. The provided address will be linked with your responses so that we can ask follow-up questions regarding your answers in the survey.

RISKS

While unlikely, it is possible that survey responses could be accessed by an unauthorized user (e.g. a computer is lost, system compromised, etc.). We mitigate this risk by only storing non-anonymized data on machines necessary for initial data processing and by using best security practices (e.g. two-factor authentication) to protect data stored remotely.

BENEFITS

There are no benefits to you as a participant other than to further research in generative AI prompting and interaction.

PARTICIPATION

You must be at least 18 years old to participate. Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party. Your decision whether or not to participate will not prejudice your future relations with [NAME OF INSTITUTION].

USE OF YOUR INFORMATION

Identifiers about you will be removed from the identifiable private information and that, after such removal, the information could be used for future research studies or distributed to another investigator for future research studies without additional informed consent from you or your legally authorized representative.

COMPENSATION AND COST TO PARTICIPATE

There will be no compensation or costs to you for participating in this study.

RIGHT TO DECLINE OR WITHDRAW Your participation in this study is voluntary. You are free to participate in the study or withdraw your consent at any time during the study. You will not lose any benefits otherwise entitled if you decide not to participate or if you quit the study early.

CONFIDENTIALITY

The data collected by this study will be confidential, including your responses. Any information obtained in connection with this study that can be identified with you will remain confidential and disclosed only with your permission. You will be assigned a code number to protect your identity and all data will be kept secured. If you give us your permission by signing this document, we plan to disclose the results of the questionnaire in any publication resulting from this study. The disclosed results will not be personally identifiable (if needed, they will be anonymized). The de-identified data could be used for future research without additional consent from participants. The Institutional Review Board (IRB) that monitors research on human subjects may inspect study records during internal auditing procedures and are required to keep all information confidential.

CONTACT

This research is being conducted by [RESEARCHERS' NAMES AND CONTACT INFORMATION]. Questions regarding the rights of research subjects may be directed to [COMPLIANCE PERSONNEL]. The Institutional Review Board (IRB) at [NAME OF INSTITUTION] has reviewed and approved the present research (ProtocolID: [ID]).

CONSENT

You are welcome to print this page to keep a copy of this form.

JS

CF2 **YOU ARE MAKING A DECISION WHETHER OR NOT TO PARTICIPATE.   IF YOU WANT TO PARTICIPATE, PLEASE SELECT THE "AGREE" OPTION BELOW, AND START THE SURVEY.**

◯ I agree to participate in the described study. (4)

◯ I do not agree to participate in the described study. (5)

Skip To: End of Survey If YOU ARE MAKING A DECISION WHETHER OR NOT TO PARTICIPATE. IF YOU WANT TO PARTICIPATE, PLEASE SELEC... = I do not agree to participate in the described study.

End of Block: Consent

Start of Block: Demographics

X→

country In which country do you currently reside?

▼ Afghanistan (1) ... Zimbabwe (1357)

✱

D1 How many years of experience in software development do you have?

_____

D2 Please indicate which domains you have developed software for (e.g., banking or healthcare).

_____

D3 How would you describe your software engineering role(s)? (Select all that apply)

☐ Programmer (1)

☐ Tester (2)

☐ Software Architect (12)

☐ Project Technical Lead (3)

☐ Project Manager (4)

☐ IT Manager (5)

☐ Consultant (7)

☐ Educator (8)

☐ Researcher (9)

☐ Analyst (11)

☐ Other (please specify) (13)

---

*

D7 What types of systems do you have significant experience developing? (Select all that apply.)

☐ Operating systems (1)

☐ Web applications (2)

☐ Mobile applications (3)

☐ Desktop applications (4)

☐ Middleware (5)

☐ AI-intensive systems (6)

☐ Development tools (compilers, programming languages, etc.) (7)

☐ Libraries/frameworks (8)

☐ Others (please specify) (9)

_____

Q59 Which of these languages do you regularly create code in? (Select all that apply)

☐   Python (1)

☐   C++ (4)

☐   C (5)

☐   Java (6)

☐   C# (7)

☐   JavaScript (8)

☐   Go (9)

☐   Basic (10)

☐   Pascal (11)

☐   SQL (12)

☐   Others (please specify) (13) _____

Q178 Have you used or do you use prompt-integrated generative AI tools to assist with software development? **(An AI Tool being "prompt-integrated" means that you, the user, can be actively involved in constructing a prompt to guide the tool's output, rather than the tool exclusively running in the background. For the rest of this survey, any mention of generative AI implies a prompt-integrated tool.)**

○ Yes (1)

○ No (2)

Skip To: End of Survey If Have you used or do you use prompt-integrated generative AI tools to assist with software develop... = No

C0 This section of questions asks about your experience with AI tools and how you use them to assist with software development.

Q179 How would you rate your personal skill level at using generative AI?

○ 0 - No skill (1)

○ 1 - Minimum proficiency: I can access and interact with generative AI tools (2)

○ 2 - Somewhat proficient: I find AI tools occasionally useful, but limited and unreliable (3)

○ 3 - Proficient: I can use AI to effectively assist in some way for most tasks (4)

○ 4 - Very proficient: With time, I can almost always get the desired output for most tasks (5)

○ 5 - Maximum proficiency: I can efficiently obtain desired output for any task (6)

Q180 Which of these software engineering tasks **do you regularly use** AI to assist with? (Select all that apply)

☐ Code Generation (1)

☐ Code Refactoring (2)

☐ Software Testing   (3)

☐ Code Debugging (4)

☐ Code Documentation (5)

☐ Code Review (6)

*

C3 Which of these prompt-integrated AI tools **do you regularly use** to assist with software engineering tasks? (Select all that apply)

☐ ChatGPT (1)

☐ Claude (4)

☐ Gemini (7)

☐ Grok (9)

☐ Deepseek-R1 (10)

☐ Llama (17)

☐ Copilot (18)

☐ AI-integrated IDE (e.g. Windsurf) (please specify) (16)

_____

☐ Others (please specify) (12)

_____

Q182 How, if at all, does your development workflow incorporate AI tools? (Select all that apply)

☐ Web interfaces (1)

☐ IDE plugins/extensions (2)

☐ Command line tools (3)

☐ API integration with development pipelines (4)

☐ Other (please specify): (23)

_____

☐ ⊗ My workflow does not incorporate AI tools (5)

Q181 Approximately how often do you use generative AI tools when working on software engineering tasks?

○ Multiple times daily (1)

○ Once daily (2)

○ A few times per week (3)

○ A few times per month (4)

○ Rarely (5)

Q184 How, if at all, has using AI tools affected your productivity as a developer?

○ Significantly decreased productivity (1)

○ Slightly decreased productivity (2)

○ No noticeable change (3)

○ Slightly increased productivity (4)

○ Significantly increased productivity (5)

Q57 Have AI tools changed your approach to software development, compared to developing software without AI tools?

○ Yes (1)

○ No (3)

○ Unsure (4)

C4 How has your use of AI tools changed your approach to software development? (Please respond as briefly or as fully as you'd like; any insights are appreciated.)

_____

_____

_____

_____

_____

End of Block: AI Experience, Tools, Development Workflow

Start of Block: Techniques for Prompting

Q174 This section of questions asks about the specific techniques and context you use when prompting generative AI tools.

Q58 Please rate your familiarity with the following prompting strategies:

	Never heard of it (1)	Heard of it but don't use (2)	Use occasionally (3)	Use regularly (4)
Few-Shot Learning - Providing examples to guide generation (10)	○	○	○	○
Output Automator - Generate scripts to implement the AI-suggested solutions (11)	○	○	○	○
Meta-prompting - Having AI suggest better prompts for specific tasks (12)	○	○	○	○
Meta Language Creation - Adjusts/Adds specific semantics to words, phrases, or symbols in the prompt (13)	○	○	○	○
Output Style - Make the AI's output follow a particular format or style (14)	○	○	○	○
Persona - Ask AI to complete a task while acting as a certain role or character (15)	○	○	○	○
Condition Check - Produce certain type(s) of output when specific condition(s) are met (16)	○	○	○	○

Q189 What specific information do you most often include when prompting AI to generate code? (Select all that apply)

☐ Example inputs and expected outputs (1)

☐ Specific libraries or frameworks to use (2)

☐ Performance or optimization requirements (3)

☐ Implementation alternatives to consider or avoid (4)

☐ Error handling expectations (5)

☐ Target environment or deployment constraints (6)

☐ Description of existing codebase architecture (7)

☐ Desired code style and naming conventions (8)

☐ Others (please specify): (9)

_____

Q191 Please elaborate on your prompting strategies for code generation (Optional)

_____

_____

_____

_____

_____

Q192 What specific information do you most often include when prompting AI to refactor code?
(Select all that apply)

☐   The original code with explanatory comments (1)

☐   Unit tests demonstrating expected behavior (2)

☐   Description of current issues and refactoring goals (3)

☐   Architectural constraints and style guidelines (4)

☐   Examples of similar code you consider well-structured (5)

☐   Code that should remain unchanged during refactoring (6)

☐   Performance requirements or benchmarks (10)

☐   Specific refactoring patterns to apply (7)

☐   Others (please specify): (9)

_____

Q195 Please elaborate on your prompting strategies for code refactoring (Optional)

_____

_____

_____

_____

_____

Q196 What specific information do you most often include when prompting AI to create or improve tests? (Select all that apply)

☐   Code to be tested with specifications (1)

☐   Edge cases and expected behaviors (2)

☐   Testing framework preferences and assertion styles (3)

☐   Test coverage goals and requirements (4)

☐   Examples of test cases (inputs-output mappings) (10)

☐   Existing test suite examples (5)

☐   Mocking or dependency handling instructions (6)

☐   Environment setup requirements (7)

☐   Performance or resource constraints for tests (8)

☐   Other (please specify): (9)

_____

Q198 Please elaborate on your prompting strategies for software testing (Optional)

_____

_____

_____

_____

_____

Q199 What specific information do you most often include when prompting AI to help with debugging or program repair? (Select all that apply)

☐ Full error messages and stack traces (1)

☐ Steps to reproduce the issue (2)

☐ Environment details and configurations (3)

☐ Previously attempted solutions (4)

☐ Related logs or console output (5)

☐ Version control history or recent changes (6)

☐ System architecture or component interactions (7)

☐ Screenshots or visual evidence of the issue (8)

☐ Other (please specify): (9)

_____

Q201 Please elaborate on your prompting strategies for code debugging (Optional)

_____

_____

_____

_____

_____

Q202 What specific information do you most often include when prompting AI to create or improve documentation? (Select all that apply)

- [ ] Code with functionality explanation (1)

- [ ] Target audience information and technical level (2)

- [ ] Examples of desired documentation style (3)

- [ ] Domain-specific terminology guidelines (4)

- [ ] Documentation format requirements (5)

- [ ] Existing documentation that needs updating (6)

- [ ] Usage examples and scenarios (7)

- [ ] Project standards and conventions (8)

- [ ] Other (please specify): (9) _____

Q204 Please elaborate on your prompting strategies for code documentation (Optional)

_____

_____

_____

_____

_____

Q205 What specific information do you most often include when prompting AI to help with code review? (Select all that apply)

- ☐ Code to be reviewed with context (1)

- ☐ Project coding standards and guidelines (2)

- ☐ Security or compliance requirements (3)

- ☐ Performance expectations (4)

- ☐ Previous review feedback (5)

- ☐ Description of feature or fix purpose (6)

- ☐ Related system components or dependencies (7)

- ☐ Common pitfalls in this domain or codebase (8)

- ☐ Other (please specify): (9)

Q207 Please elaborate on your prompting strategies for code review (Optional)

_____

_____

_____

_____

Q55 This section of questions asks about your conversation strategies with AI tools, including structure and adaptation to suboptimal outputs.

Q208 How often do you structure your conversations with AI tools for software engineering tasks in the following ways?

	Often (1)	Sometimes (2)	Rarely (3)	Never (4)
Single comprehensive prompt - Providing all requirements, context, and constraints in one detailed prompt (1)	○	○	○	○
Incremental refinement - Starting with a basic request and iteratively refining based on AI responses (2)	○	○	○	○
Step-by-step guidance - Breaking down complex problems into sequential steps for the AI to solve (3)	○	○	○	○
Exploratory dialogue - Asking the AI to explore multiple solutions or approaches before implementation (4)	○	○	○	○
Context building - Progressively adding more context and background information as the conversation develops (5)	○	○	○	○

Feedback loop - Providing explicit feedback on AI responses to guide subsequent outputs (6)	○	○	○	○
Template-based approach - Using consistent prompt templates adapted for specific task types (7)	○	○	○	○
Multi-part problem solving - Dividing the task into sub-problems addressed in sequence (8)	○	○	○	○
Comparative analysis - Having the AI generate multiple solutions for comparison (9)	○	○	○	○

Q56 When an AI response doesn't meet your needs, how often do you use each of the following strategies to guide it?

	Often (1)	Sometimes (2)	Rarely (3)	Never (4)
Point out specific issues - Identify exact problems or errors in the AI's response (1)	○	○	○	○
Provide additional context - Add more background information or project details (2)	○	○	○	○
Include example solutions - Share examples of the type of output you're looking for (3)	○	○	○	○
Request explanations first - Ask the AI to explain its approach before making changes (4)	○	○	○	○
Reformulate the original request - Restate your request using different wording or structure (5)	○	○	○	○
Break down complex problems - Simplify the task into more manageable components (6)	○	○	○	○
Add constraints or requirements - Specify	○	○	○	○

additional limitations or criteria (7)				
Request alternative approaches - Ask for different solutions to the same problem (8)	○	○	○	○
Provide feedback on partial solutions - Give feedback on specific parts that work while requesting improvements to others (9)	○	○	○	○

Q210 In your estimation, how many exchanges on average with the AI tool do you need to accomplish your immediate software engineering goal?

○ 1 (1)

○ 2-3 (2)

○ 4-6 (3)

○ 7-10 (4)

○ 10+ (5)

○ Unsure (6)

P0 This section of questions asks about the challenges and effectiveness of using AI tools for various software engineering tasks. The answers in this section represent broad categories and

contain examples for explanation, but these are not meant to be comprehensive. You may need to consider similar possibilities based on your own personal experience.

Q185 For which specific types of software engineering tasks do you regularly use AI tools? (Select all that apply)

☐ Designing software and code architectures (e.g. software design, architectural patterns) (1)

☐ Setting up structural code (e.g. boilerplate, function headers, imports) (4)

☐ Implementing new code components (e.g. includes creating data structures, writing functions) (2)

☐ Optimizing existing code (e.g. performance improvements, reducing complexity) (5)

☐ Standardizing and cleaning code (e.g. style improvements, naming conventions, removing duplication) (6)

☐ Test creation and implementation (e.g. unit, integration, end-to-end test code) (8)

☐   Test strategy and planning (e.g. test case design, edge case identification) (9)

☐   Issue diagnosis (e.g. understanding errors, identifying root causes) (11)

☐   Bug fixing (e.g. resolving exceptions, fixing logical errors) (12)

☐   Code-level documentation (e.g. functions, classes, inline comments) (14)

☐   Project-level documentation (e.g. READMEs, architecture docs, API docs) (15)

☐   Code quality evaluation (e.g. style, maintainability, complexity) (18)

☐   Functional / performance assessment (e.g. efficiency, potential bugs, security vulnerabilities) (19)

☐   Others (please specify) (21)

_____

C2 How reliable do you find AI tools for each of these software engineering scenarios?

Display this choice:

> *If Which of these software engineering tasks do you regularly use AI to assist with? (Select all tha... = Code Generation*

Display this choice:

> *If Which of these software engineering tasks do you regularly use AI to assist with? (Select all tha... = Code Generation*

Display this choice:

> *If Which of these software engineering tasks do you regularly use AI to assist with? (Select all tha... = Code Refactoring*

Display this choice:

> *If Which of these software engineering tasks do you regularly use AI to assist with? (Select all tha... = Code Refactoring*

Display this choice:

> *If Which of these software engineering tasks do you regularly use AI to assist with? (Select all tha... = Software Testing*

Display this choice:

> *If Which of these software engineering tasks do you regularly use AI to assist with? (Select all tha... = Software Testing*

Display this choice:

> *If Which of these software engineering tasks do you regularly use AI to assist with? (Select all tha... = Code Debugging*

Display this choice:

> *If Which of these software engineering tasks do you regularly use AI to assist with? (Select all tha... = Code Debugging*

Display this choice:

> *If Which of these software engineering tasks do you regularly use AI to assist with? (Select all tha... = Code Documentation*

Display this choice:

> *If Which of these software engineering tasks do you regularly use AI to assist with? (Select all tha... = Code Documentation*

Display this choice:

> *If Which of these software engineering tasks do you regularly use AI to assist with? (Select all tha... = Code Review*

Display this choice:

> *If Which of these software engineering tasks do you regularly use AI to assist with? (Select all tha... = Code Review*

	Very reliable (7)	Somewhat reliable (8)	Somewhat unreliable (10)	Very unreliable (11)	Unsure / Haven't tried (12)

Implementing complex algorithms (e.g. multiple edge cases, intricate logic flows, mathematical computations) (1)

○   ○   ○   ○   ○

Creating code for system integration (e.g. connecting with external APIs, third-party libraries, services) (2)

○   ○   ○   ○   ○

○   ○   ○   ○   ○

Modernizing outdated code patterns (e.g. updating to current language features, migrating between frameworks) (6)

Refactoring for performance gains (e.g. optimizing algorithms, reducing resource consumption) (7)

○   ○   ○   ○   ○

Test case design and coverage (e.g.

○   ○   ○   ○   ○

identifying edge cases, appropriate test coverage, requirements validation) (9)

Test code maintainability (e.g. generating maintainable tests, appropriate assertions, handling test dependencies) (10)

○   ○   ○   ○   ○

Root cause analysis (e.g. diagnosing complex interactions, identifying underlying issues vs. symptoms)

○   ○   ○   ○   ○

(13)

Context-dependent bugs (e.g. environment-specific issues, legacy code problems) (16)

○   ○   ○   ○   ○

Documenting implementation rationale (e.g. explaining the "why" behind decisions, architectural considerations) (18)

○   ○   ○   ○   ○

○   ○   ○   ○   ○

(Select all tha... = Code Documentation					
Maintaining documentation accuracy (e.g. consistency with code changes, technical accuracy) (19)					
Display this choice: *If Which of these software engineering tasks do you regularly use AI to assist with? (Select all tha... = Code Review*	○	○	○	○	○
Contextual code understanding (e.g. comprehending business logic, project-specific patterns) (21)					
Display this choice: *If Which of these software engineering tasks do you regularly use AI to assist with? (Select all tha... = Code Review*	○	○	○	○	○
Non-functional requirements assessment (e.g. security vulnerabilities, performance implications) (23)					

Q60 Please list any other software engineering scenarios not represented above which you have used generative AI tools for, and indicate their reliability.

_____

_____

_____

_____

_____

Q186 How often do you encounter the following issues when using AI tools for software engineering tasks?

	Always (1)	Often (2)	Sometimes (3)	Rarely (4)	Never (5)

Code correctness and compatibility issues (e.g. hallucinated functions/APIs, incorrect syntax, compilation errors) (1)

○　　　○　　　○　　　○　　　○

Codebase consistency issues (e.g. misalignment with existing code styles, violation of project architecture) (3)

○　　　○　　　○　　　○　　　○

○　　　○　　　○　　　○　　　○

Unintended behavior changes (e.g. altering code functionality, introducing subtle bugs, breaking existing tests) (5)

Incomplete code transformations (e.g. partial refactorings, inconsistent application of patterns) (6)

○   ○   ○   ○   ○

Tests that miss actual requirements (e.g. tests don't verify intended behavior, miss important edge cases) (8)

○   ○   ○   ○   ○

Low-value tests with inadequate coverage (e.g. superficial tests, insufficient test depth, overly implementation-specific) (11)

○   ○   ○   ○   ○

Suggested bug fixes miss root causes (e.g. addressing symptoms instead of underlying issues, failure to diagnose complex issues) (12)

○   ○   ○   ○   ○

○   ○   ○   ○   ○

○   ○   ○   ○   ○

○   ○   ○   ○   ○

(17)

Superficial code analysis (e.g. overlooking critical bugs, missing non-functional requirements) (19)

○　　　○　　　○　　　○　　　○

False positives and hallucinations (e.g. flagging non-issues, hallucinating non-existent problems) (20)

○　　　○　　　○　　　○　　　○

Q61 Please list any other issues you have encountered with generative AI not represented above, and indicate their frequency.

_____

_____

_____

_____

_____

✱

CI Thank you so much for taking the time to complete this survey! Your response will help to increase the reliability and usefulness of generative AI tools. If you would be willing to be contacted for an interview to further explore prompting strategies and your responses to this survey, please enter your e-mail address below.

_____