Qualitative Codebook

Impact of AI on Software Development: A Qualitative Analysis

1. Methodology

Research Design: This codebook documents the coding scheme used in a qualitative analysis examining the impact of artificial intelligence on software development practices, workflows, and the broader job market.

Coding Process: Data were analyzed using an iterative coding approach across three rounds of analysis. Two independent coders reviewed and coded the responses of software managers to five free response questions. Codes were refined and consolidated across rounds to establish the final coding scheme.

Inter-rater Reliability: Codes were compared across rounds and discrepancies were resolved through discussion to reach consensus on the final code structure.

2. Free Response Questions

- Q1: In what areas do you see the software development process evolving with the rise of AI?
- Q2: How do you use AI in your own personal work, if at all?
- Q3: What ethical concerns do you have about AI in software development?
- Q4: What other concerns (besides ethical issues) do you have about AI?
- Q5: What other effects do you anticipate on the software development job market?

3. Code Definitions by Free Response Question

Q1: Evolution of Software Development Processes with AI

Free Response Question: In what areas do you see the software development process evolving with the rise of AI?

Code	Definition	Frequency	Example
Code Generation	Use of AI tools to automatically generate source code, functions, or code snippets based on natural language descriptions or requirements.	10	Using GitHub Copilot to generate boilerplate code or function implementations
Testing/Prototyping /MVP/POC/Verification	Application of AI in testing activities, including creating prototypes, minimum viable products (MVPs), proof of concepts (POCs), test case generation, and verification processes.	23	Using AI to generate unit tests or create quick prototypes for stakeholder feedback

Documentation	AI-assisted creation, maintenance, or generation of technical documentation, code comments, API documentation, and user guides.	5	Automatically generating README files or API documentation from code
Configuration Management	Use of AI in managing software configurations, dependencies, build processes, and deployment pipelines.	1	AI-assisted configuration of CI/CD pipelines
Bug Fixing/Ticket Investigation	Application of AI to identify, diagnose, and fix software bugs, or to investigate and triage support tickets.	3	Using AI to analyze error logs and suggest fixes for common bugs
Integration	AI tools facilitating the integration of different software components, APIs, or third-party services.	1	AI-assisted API integration and compatibility checking
Project Management	Use of AI in sprint planning, workload forecasting, productivity tracking, and other project management activities.	1	AI-powered sprint velocity prediction and resource allocation
Requirement Gathering	Application of AI to elicit, analyze, and document software requirements from stakeholders.	1	Using AI to synthesize user stories from stakeholder interviews
User Experience Design	AI assistance in designing user interfaces, user flows, or improving user experience.	1	AI-generated UI mockups or UX pattern recommendations
Onboarding	Use of AI to facilitate the onboarding process for new team members or users.	1	AI-powered interactive tutorials for new developers joining the codebase

Q2: Personal Use of AI in Work

Free Response Question: How do you use AI in your own personal work, if at all? For example: Using AI to improve performance docs, proof check emails, etc.

Code	Definition	Frequency	Example
Information Synthesis	Using AI to analyze, combine, and synthesize information from multiple sources into coherent summaries or insights.	16	Summarizing multiple research papers or consolidating meeting notes

Communication Refinement	AI assistance in improving written communication, including grammar checking, tone adjustment, and message clarity.	9	Proofreading emails or adjusting tone for different audiences
Document/Email/Report/Ticket Creation	AI-assisted creation of various written materials including documents, emails, reports, and support tickets.	23	Drafting performance reviews, project reports, or customer support responses
Testing/Prototype	Personal use of AI for creating test cases or prototypes in individual work.	6	Quickly prototyping a feature idea before formal development
Research	Using AI to conduct research, find relevant information, or explore new topics.	6	Researching best practices for implementing a new technology
Coding/Refactoring	Personal use of AI for writing code, refactoring existing code, or solving coding problems.	12	Refactoring legacy code or getting help with algorithm implementation

Q3: Ethical Concerns about AI

Free Response Question: What ethical concerns do you have about AI in software development?

Code	Definition	Frequency	Example
Dehumanize Operations	Concerns about AI reducing human elements in software development, treating developers as interchangeable resources, or diminishing the human aspects of work.	5	Worry that AI-driven management treats developers like replaceable code generators
AI-Generated Material Ownership and Responsibility	Ethical questions about who owns AI-generated code and who is responsible when AI-generated content causes problems or contains errors.	7	Uncertainty about liability when AI-generated code causes a production failure
Privacy and Security	Concerns about data privacy, security vulnerabilities, and the exposure of sensitive information when using AI tools.	8	Risk of proprietary code being leaked to AI training data
Workforce (Job Displacement/Loss)	Concerns about AI causing unemployment, job elimination, or significant workforce reduction in software development.	8	Fear that junior developer positions will be eliminated due to AI automation
Theft of Intellectual Property	Concerns about AI models being trained on copyrighted code without permission or AI facilitating IP theft.	4	Worry about AI models trained on open-source code without proper attribution

Bias	Concerns about AI systems perpetuating or amplifying biases in code, hiring, or decision-making processes.	4	AI code generators reflecting biases from their training data
Over-reliance	Concerns about developers becoming too dependent on AI tools, potentially losing fundamental skills or critical thinking abilities.	8	Developers accepting AI suggestions without understanding the underlying logic
Transparency/Explainability	Concerns about the lack of transparency in how AI systems make decisions or generate outputs, making it difficult to understand or trust results.	3	Inability to explain why an AI model recommended a particular architectural decision
AI Hallucination	Concerns about AI generating plausible but incorrect information, code, or solutions.	1	AI confidently suggesting code that appears correct but contains subtle bugs

Q4: Other Concerns Beyond Ethical Issues

Free Response Question: What other concerns (besides ethical issues) do you have about AI?

Code	Definition	Frequency	Example
Loss of Higher Order Skills	Concerns about deterioration of critical thinking, communication, problem-solving, and meta-cognitive skills due to AI reliance.	3	Developers losing ability to think through complex problems independently
Loss of Technical Skills	Concerns about decline in fundamental programming skills, understanding of underlying systems, or technical expertise.	3	New developers never learning to write algorithms from scratch
Increasing Reliance	Growing dependency on AI tools in daily work processes, distinct from over-reliance as an ethical concern.	1	Teams becoming unable to function without AI assistance
Security	Technical security concerns related to AI implementation and use, distinct from privacy concerns.	1	AI tools introducing new attack vectors or vulnerabilities
Recruitment	Concerns about how AI affects hiring processes, candidate evaluation, or onboarding.	1	Difficulty assessing candidates who relied heavily on AI in their portfolios
Accuracy of AI	Concerns about the correctness, reliability, and quality of AI-generated outputs.	1	AI providing incorrect solutions that seem plausible

Q5: Effects on Software Development Job Market

Free Response Question: What other effects do you anticipate on the software development job market?

Code	Definition	Frequency	Example
Technical Skillset Shifting	Changes in the types of technical skills valued in the job market, with emphasis shifting from coding to higher-level skills like system design, AI tool management, or domain expertise.	8	Greater demand for architects and system designers over code writers
Compensation Change	Anticipated changes in salary levels, compensation structures, or pay scales for software developers.	3	Potential decrease in junior developer salaries due to increased supply
Increase Job Expectations	Rising expectations for developer productivity, scope of responsibilities, or required capabilities per role.	3	Companies expecting single developers to handle full-stack work previously done by teams
Eliminate Jobs/Roles	Specific job roles or positions being eliminated or significantly reduced due to AI automation.	13	Entry-level QA tester positions being largely automated
Hiring Process	Changes to how companies recruit, interview, or evaluate candidates for software development positions.	2	More emphasis on problem-solving in interviews vs. coding syntax
AI Bubble	Concerns about unsustainable hype around AI leading to market correction or disillusionment.	1	Current AI investment levels may not be sustainable long-term
New Roles	Emergence of new job positions or specializations created by AI adoption.	1	AI prompt engineers or AI-human interface specialists
Reduced Barrier to Entry	AI making it easier for people to enter software development with less formal training or experience.	1	Non-programmers able to build functional applications using AI tools

4. Coding Guidelines and Procedures

Inclusion Criteria

A response segment was coded if it:

- Directly answered or addressed the free response question
- Provided a distinct perspective, concern, or observation
- Could be assigned to an existing code or required creation of a new code
- Represented a complete thought or concept, even if brief

Exclusion Criteria

A response segment was not coded if it:

- Was purely transitional or conversational filler
- Repeated previously coded information without adding new insight
- Was unclear or ambiguous without additional context
- Fell outside the scope of the free question