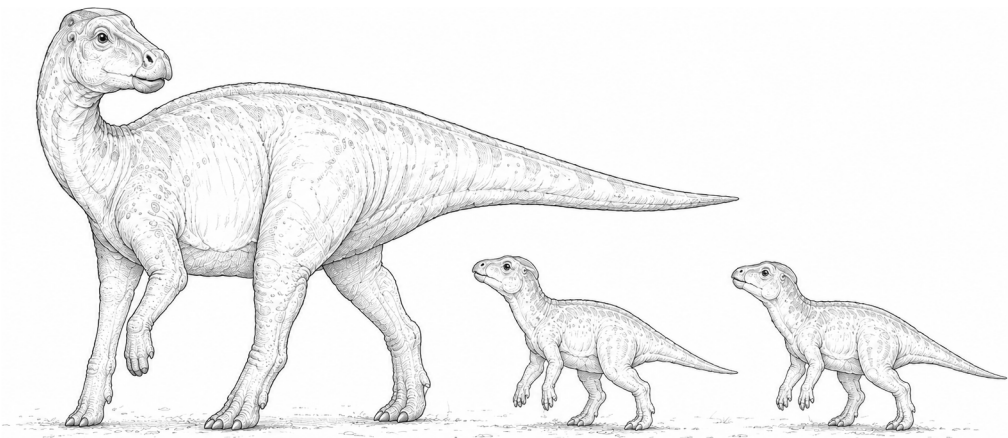


FIX THE LADDER

**GROWING JUNIOR ENGINEERS
IN THE AGE OF AI**



GIORDANO SCALZO

Fix the Ladder

Growing Junior Engineers in the Age of AI

Giordano Scalzo

This book is available at <https://leanpub.com/fixtheladder>

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The author generated this text in part with AI. Upon generating draft language, the author reviewed, edited, and revised the language to their own liking and takes ultimate responsibility for the content of this publication.

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Part I: The Confidence Gap

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The Quiet



It was a Tuesday.

The newest engineer on my team put up a pull request that morning, and it stopped me. Usually the ones that stop me are big, because big pull requests worry me. This one was *sophisticated*: it delivered in a day a feature I'd have budgeted two weeks for. A clever algorithm sat at the centre, wired cleanly through several parts of the app. The surrounding design was better after the change than before. It was the kind of work I'd expect from someone ten years in.

They'd been writing production code for less than a year.

I've been at this so long that I might have shipped my first production bug around the time some of my youngest colleagues were shipping their first teeth. I know what good work looks like, and this was better than good.

So I did the thing I always do. I asked them to walk me through a few of their decisions.

And things got quiet.

They could tell me what the code did. That part was easy: they read it back to me, line by line. But when I asked *why* it was built that way, or how they'd debug it if it fell over in production at two in the morning, the answers thinned out. They weren't wrong, just thin. Reasons that would fit almost any code. Reasons a microwave manual could have given.

This isn't a story about a weak engineer. They're sharp, and that is why it stayed with me. I was looking at sophisticated code, and for the first time I could remember, I couldn't tell what it said about the person who had written it.

The pull request had everything. Except an author who could explain it.

I didn't have a name for it that afternoon. I do now. I call it the Confidence Gap: the distance between what AI-assisted code appears to show and what the engineer behind it actually understands. And it hides in plain sight, because every signal we use to judge an engineer still reads green. Clean pull request. Passing tests. Fast delivery. A PR description better written than most of my emails. The code looked senior. The understanding hadn't caught up yet, and nothing on the dashboard was going to tell me that.

I wanted to build a spaceship

Let me back up to the beginning, because you need to know which side I'm on.

When I was a kid, I wanted to make a video game. Not play one. Make one. And I had a specific one in mind: a lone spaceship, a swarm of aliens closing in to kill it. I could see it perfectly. So I sat down at the computer and typed, in the most serious voice a ten-year-old can summon: *make a spaceship in space, put a lot of aliens trying to kill it, and make it beautiful.*

Nothing happened. Of course nothing happened. The computer wanted a programming language, and loops, and sprites, and a hundred things I didn't have. The gap between what I could imagine and what I could build was enormous, and it stayed like that for years. So I did the only thing on offer: I learned. I copied listings out of magazines before I could properly read them. I studied. I went to university. I became an engineer. And then, like a lot of

us, I spent my most productive years on important, deeply boring software. I traded spaceships for a large financial institution.

Then one afternoon, years later, a text box appeared on my screen. I typed almost exactly what I'd typed as a child (*a spaceship, aliens trying to kill it, make it beautiful*), and this time the machine just did it. A small, playable game. A ship, a swarm of aliens, and yes, it was beautiful. The thing I'd wanted at ten, handed to me in the time it takes to make a coffee.

It felt like magic, and that feeling colours everything that comes next. The science fiction I grew up reading had quietly arrived while I was in meetings. I am the kid who wished for these tools.

And that is why the quiet Tuesday landed the way it did.

I know what the tools gave me. I skipped the whole climb and got my spaceship. And standing in front of that pull request, I realised the engineer had skipped the same climb, and got their spaceship too. What they hadn't got was the part I'd been lucky enough to be forced through: the slow, painful years that turn you into someone who actually understands what they've built.

That is the problem, and it isn't an argument against the tools. Taking them away would be like telling that ten-year-old to forget the whole thing and go outside. The tools did exactly what we asked. What we do with the time they give us is the open question.

Two problems, not one

For about a month after that Tuesday, I thought I had a mentoring problem. One engineer, one gap. I was wrong. I had two problems, and if you lead engineers right now, so do you.

The first is the one I've been describing: the ladder is broken. The way juniors used to become seniors, slowly, through friction, through the boring tickets and the bad merges and the reviews that stung, barely exists anymore. AI removed the friction, and the friction was doing more than we gave it credit for.

And AI is only half of what's pulling at the ladder. The apprenticeship always ran on proximity: the junior who overhears a senior swearing at a stack trace, the question you only ask because you're sitting close enough to see that someone is stuck. Remote and hybrid work made those encounters less

automatic. They're good for a hundred real reasons, and I'd defend them. But a junior is easy to forget on a call, a tile on a screen, not the person beside you.

And the seniors who might teach them are the busiest people in the building, heads-down shipping or trapped in the endless meetings we invented to patch the very communication gaps that remote opened. So the friction went, and the proximity went with it. The ladder didn't lose a rung. It lost two.

Which means the fix comes in two parts as well. One part is a method for rebuilding judgement: the course I ran with real engineers, the exercises that teach a junior to challenge the AI instead of trusting it. That's the part I can describe in the most detail. But judgement was only ever half of what the ladder built. The other half is everything that isn't the code: getting a junior seen and heard again. The friction taught them to think, and the proximity taught them they belonged to something. We have to rebuild both.

The second problem is quieter, and in the long run worse. The door is closed. Across the industry, junior hiring has contracted. One argument for cutting it is that AI now does the work juniors used to do. Why train a junior for two years, the reasoning goes, when a senior with an agent can ship the tickets today?

The two are really one. Fixing how juniors learn is worthless if nobody hires juniors in the first place. And hiring juniors is reckless if you have no way to actually grow them. Solve one, ignore the other, and you've solved nothing. Most companies are busy solving neither, very thoughtfully, and at great length.

TWO PROBLEMS, NOT ONE

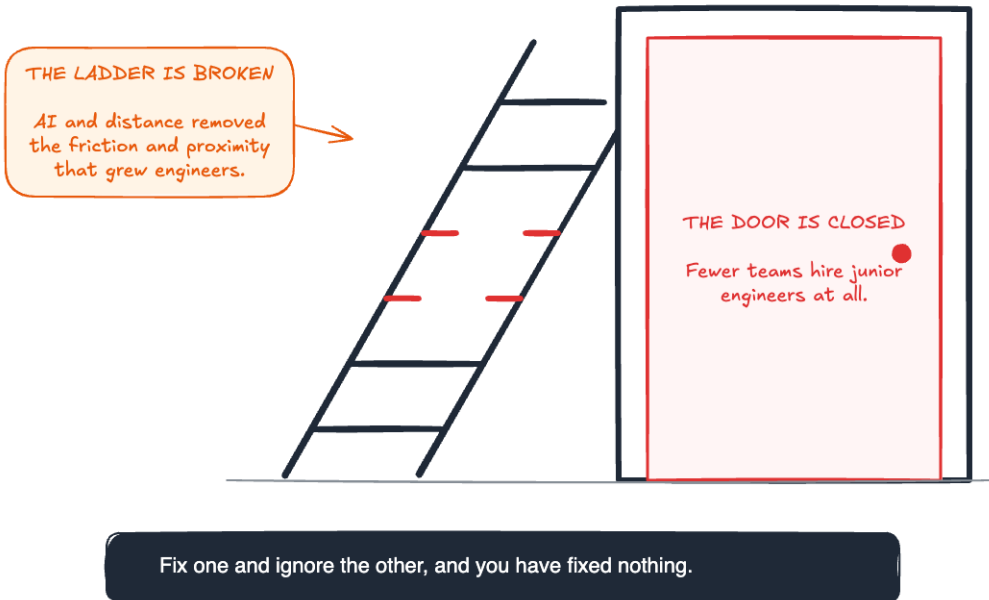


Figure 1-1: Two problems, not one

I'll make the case for both. But I have to warn you early about something I found out the embarrassing way.

The course I said I'd hand you: when I finally ran it, the engineers in the room were not juniors. They were mid-level, and they were good. The gap was there anyway.

That stopped me. If the gap shows up in engineers with years behind them, then this was never really a junior problem. The juniors are just the ones standing where the floor used to be. They feel it first because they have nothing beneath them to cushion the fall. The rest of us have experience to lean on, for now.

There's a line I'll earn as we go: with AI, we are all juniors again. The tools reset everyone. The engineer who's been shipping for twenty years and the one who started last spring are, for the first time, learning the same new thing at the same time.

Which brings me back to the pull request, and to the question I couldn't shake that Tuesday. I'd spent a whole career learning to read code and judge the engineer behind it. That afternoon, the signal broke. The output looked senior. The understanding didn't. And underneath sat an older question, one

I'd never had to ask: how did anyone ever build the understanding in the first place?

But the question I actually needed to answer was bigger than one engineer:

Are we growing engineers? Or are we just getting better at producing engineer-shaped output?

Friction Was the Teacher

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The Loop



The first time I tried to mentor someone through AI, I gave the worst advice of my career. A junior on my team showed me a function the AI had written, and I said the thing everyone says. “Looks good. Just review it carefully and make sure it’s solid before you merge.”

They nodded, and they meant it, and nothing happened, because I had asked them for the one thing they couldn’t yet do. “Review it carefully” assumes you already know what careful looks like. “Make sure it’s solid” assumes you can tell solid from shaky. If they had that eye already, they would have used it. My advice required the very skill it was supposed to build.

The part I got wrong, and for longer than I’d like to admit, is that I thought this was a junior problem. It is not, or not only. When you write code yourself, you make a thousand small decisions along the way, and you know why you

made each one, because you were there. When you review code, you inherit all of those decisions without having made any of them.

AI takes that to its extreme: it hands you something long, fluent, and apparently sophisticated, built from a thousand choices you never saw. Judging that is a different skill from writing it, and almost nobody has been trained in it, at any level of seniority.

Judgement is a habit, and habits are built by doing, not by being told. Charity Majors says it flatly: software is an apprenticeship industry, and you can only learn it by doing, and doing, and doing some more.¹ That matches what expertise researchers have found for decades: skill comes from deliberate practice, effortful and repeated, rather than from exposure or instruction alone.² You can't hand someone taste in a sentence over their shoulder. They have to build it, rep by rep.

So after that afternoon of useless advice, I did something more concrete than talk. I put together a short course, six one-hour sessions, whose only job was to grow judgement and taste in engineers who had never been given the room to build either. I've run versions of it several times now, with a handful of engineers, and reshaped it after every round. The parts that survived each round are the parts I trust.

To tell the story cleanly, rather than as a blur of names, I have folded those engineers into two composites I will call C. and P., on the terms set out at the front. I'm not writing this as someone who has solved it. Nobody has. I'm a few steps into the same fog as you, holding up what has worked so far.

Two ideas guide the sessions. Judgement has a shape you can practise: a loop. And a mentor's job is now to make thinking visible.

¹Charity Majors, "Generative AI is not going to build your engineering team for you," Stack Overflow blog, 31 December 2024 (first published at charity.wtf, 10 June 2024): "Software is an apprenticeship industry. You can't learn to be a software engineer by reading books. You can only learn by doing... and doing, and doing, and doing some more." She also notes that writing code is the easiest part of the job; the hard parts are operating, understanding, extending, and governing it. A practitioner essay. <https://charity.wtf/p/generative-ai-is-not-going-to-build-your-engineering-team-for-you> and <https://stackoverflow.blog/2024/12/31/generative-ai-is-not-going-to-build-your-engineering-team-for-you/>

²The deliberate-practice research: K. Anders Ericsson, Ralf Th. Krampe, and Clemens Tesch-Römer, "The Role of Deliberate Practice in the Acquisition of Expert Performance," *Psychological Review*, 1993; and Ericsson and Robert Pool, *Peak: Secrets from the New Science of Expertise*, 2016. Expert performance is built by structured, effortful, feedback-driven practice, not by experience or exposure alone.

The loop

The loop is five moves, and the first one happens before you touch the keyboard.

Think first. Before you ask the AI for anything, form a view. Not a full design, just an opinion: here is roughly what I think this should look like, here is the part I'm unsure about, here is what would make it hard. Thirty seconds of opinion is enough. The point is to walk into the exchange with something of your own, because you can't challenge an answer you have no alternative to. Skip this step and everything after it collapses, because you have nothing to compare the AI's output against except the AI's own confidence.

Ask. Now ask, and ask well. A vague prompt gets a vague, average answer, the code equivalent of "it depends." A good ask carries your thinking into the request: the constraints, the platform, the thing you're worried about. You will see, again and again, that the quality of what comes back is mostly a reflection of the quality of what went in.

Challenge. This is one of the two moves people skip, and it is where the teaching happens. The AI has handed you something confident and plausible. Now attack it. Where does it hide complexity? What did it assume that you never told it? What breaks if the input is empty, or the network drops, or the user does the thing users always do? The attack should end in an opinion you can defend. Sometimes that opinion is "this is actually right," and recognising when the machine is right is its own hard skill. The attack is not only rhetorical: run the code, feed it the ugly input, watch what happens. Verify is challenge with evidence, and a whole session ahead is given to it.

Improve. Take what the challenge surfaced and do something with it. Reject the parts that fail. Change the parts that are close. Ask again with what you have learned. The output that ends up in the codebase should have passed through a human who checked it and made a decision. Sometimes that means keeping it as it is, with reasons.

Explain. Last, and least optional of all: say why. Out loud, to another person, explain what this code does, how it works, and why it is built this way rather than the three other ways it could have been. If you can do that calmly, in your own words, the judgement is yours now. If you can't, you've found the exact edge of your understanding, which is the most useful thing a mentoring session can produce.

That is the whole loop. Think, ask, challenge, improve, explain. None of the moves is clever. The power is in the order and the repetition. Do it once and it feels like overhead. Do it fifty times and it stops being a checklist and becomes the way you look at code, which is another word for judgement.

THE LOOP

Five moves. Repeat.

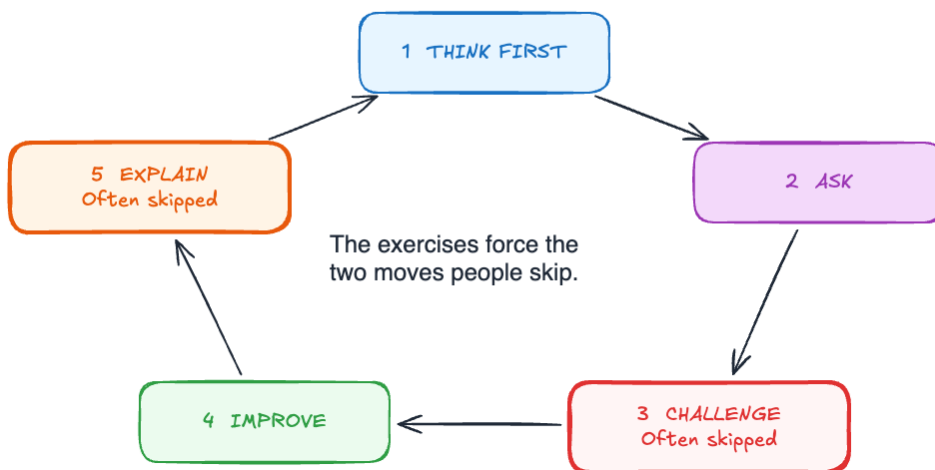


Figure 3-1: The loop

Everything ahead is a way of forcing one of these moves to happen when it otherwise wouldn't. The exercises exist because, left alone, a tired engineer under deadline will skip straight from "ask" to "paste." The loop is how you put the missing moves back.

Make thinking visible

For as long as software has existed, output has been a reliable signal of growth. If a junior shipped a working feature, you knew something true about them: they could hold the problem in their head, translate it into code, and make it run. The artefact proved the ability, because producing the artefact required the ability. That is the unwritten contract every review, every promotion, every "looks good, ship it" was built on.

AI broke the contract. The feature still ships, still passes its tests, still looks clean, still arrives fast. But it no longer proves anything about the person

who submitted it, because producing it no longer required the thing it used to require. Output has come loose from understanding. And every management instinct we have is still pointed at the output.

THE BROKEN CONTRACT

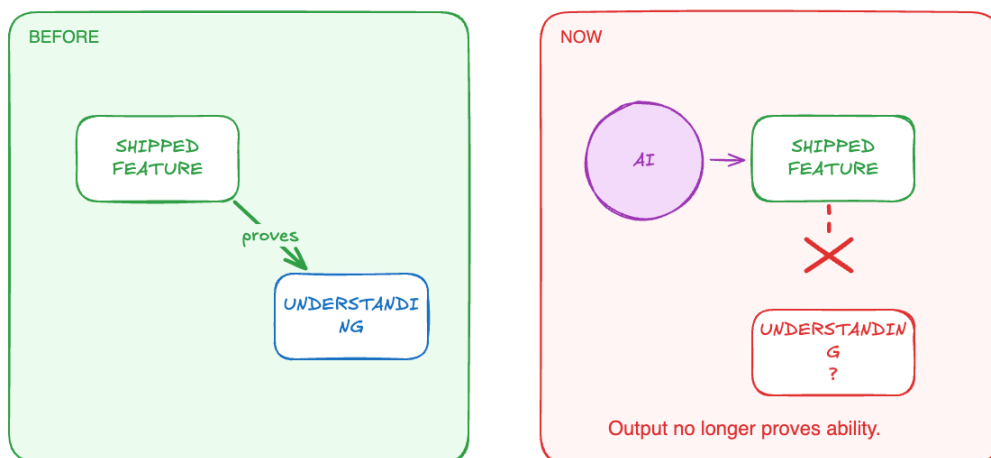


Figure 3-2: The broken contract

And the signal is not the only thing that broke. Judged purely on what they can deliver, an engineer hand-producing a screen loses, fair and square, every time, to a senior running a fleet of agents. So we have to be clear about what we're growing, because it is not a faster deliverer. We are growing the next generation of seniors, whose job will be to direct those agents. That job runs on everything output never measured: the taste to tell whether the agents are building the right thing, the judgement to catch them when they're confidently wrong, and the understanding to know what to ask for in the first place.

Producing is the skill the machine just made cheap. Judging and directing are the skills going up in value, and the ones we now have to teach on purpose. The channel that used to teach them, years spent next to other seniors, absorbing taste from their reviews and their disasters, is closing at the same time.

If you can't read growth off the code any more, you have to make the

thinking visible some other way,³ deliberately, because it won't surface on its own. That is the second idea underneath every exercise ahead: drag the reasoning out of the engineer's head and onto a surface where two people can look at it together. The evidence has moved from the code to the thinking, and thinking stays invisible until you force it into the open.

Part of making thinking visible is giving it words. An engineer staring at AI output usually feels that something is off long before they can say what, and a feeling can't be coached any more than invisible reasoning can. The sessions ahead lean on the vocabulary of John Ousterhout's *A Philosophy of Software Design* (change amplification, cognitive load, deep and shallow modules), because names turn unease into findings.⁴ You cannot look for what you cannot name; once you can name it, you see it everywhere. The book stays on the shelf, referenced and not recited. What transfers are the words.

Which gives you the one question that replaces all the old ones. For years the test was some version of "did they ship it?" The test now is different: can they explain it, defend it, debug it, and change it? The old test asked whether the AI helped you get the thing done. The new one asks whether you can stand behind the result as if you had written every line, because as far as production is concerned, you did. All the loop does is create a moment where that question has to be answered out loud.

This means one hard rule: every session ends with an artefact. A written design note, a refactor diff, a decision log, a list of the ways the code could break. Something on a page, never "let's discuss this for an hour."

The page matters only because thinking that stays in someone's head can't be coached or argued with. The moment an engineer has to write down why they accepted the AI's design, the reasoning becomes real, and its gaps become visible to both of you. An artefact is thinking that has been forced to hold still long enough to look at.

The first decision logs were rough. C. filled his straight down the page; P's was half-finished, and he offered to complete it that evening, which told me

³The phrase comes from the cognitive-apprenticeship literature: Allan Collins, John Seely Brown, and Ann Holum, "Cognitive Apprenticeship: Making Thinking Visible," *American Educator*, 1991 (building on Collins, Brown, and Newman, 1989). Where a traditional apprenticeship makes physical craft observable, knowledge work hides the thinking, so the teacher's job is to externalise it through modelling, articulation, and reflection. For the practitioner's version of the same idea, see Dave Hoover and Adewale Oshineye, *Apprenticeship Patterns* (O'Reilly, 2009).

⁴John Ousterhout, *A Philosophy of Software Design* (2018), chapters 2 and 4: change amplification, cognitive load, unknown unknowns, and deep versus shallow modules. Design vocabulary used here as a lens for reviewing code.

more about how the two of them think than the logs themselves did.

And it changes what you watch for. The old signals, clean pull requests, green tests, fast delivery, are the ones AI now fakes for free, so they tell you less than they used to. The signals that still mean something are the ones AI can't produce on the engineer's behalf: how deep their explanation goes before it runs out, whether they reach for the debugger with a hypothesis or with a prayer, whether they see the empty-input case before it bites, how they behave in someone else's review. Those are the things that grow. Learn to watch those, and you can see growth again, even in a world where the output all looks the same.

Running it

The format is deliberately boring. A method a leader won't run is worth nothing, so the shape has to be cheap to repeat. The one below is the shape I settled on, then adjusted, and you should adjust it further.

A session is roughly an hour, once a week, with a small number of engineers. Ten minutes of you introducing one idea. Forty minutes of them working, hands on, with you facilitating. Ten minutes at the end pulling apart what happened. That last ten minutes is where the artefact gets named and the lesson gets said out loud, so guard it. When a session runs long, and it will, protect the debrief before you protect the exercise.

A few rules under that shape matter more than they look.

Use real code, from your own apps. Toy examples produce toy engagement. The moment the snippet on the screen is something the team actually ships, the room leans in. The AI's suggestions get judged against a real product instead of an imaginary one. This one change did more for the energy in my sessions than any other.

When an exercise calls for working "AI-off," that means close the AI tools, not the laptop. The engineer still types, still thinks in the editor, still writes prose about what they intend. They just do it without the model in the loop, so a view forms in their own head before the answer is available to borrow. AI-off is the "think first" move from the loop, given room to happen: the thirty seconds of opinion, stretched into a page. It is not a punishment or a nostalgia trip, whatever it feels like the first time.

Call them engineers, not juniors, even in your own head. The word you use sets the frame, and the frame should be growth. Nobody does their best thinking while being reminded they are the junior in the room.

Three more decisions I learned the hard way. Digital artefacts only: no pen and paper, because a file can be shared, compared, and kept, and paper is easy to lose. One working doc per session, everything in it, so nobody ends the hour with their thinking scattered across four windows. And one shared screen with the code's owner explaining, rather than everyone reading alone; silent parallel reading was where the energy went to die.

And plan for everything to take twice as long as you expect. Two real activities in a forty-minute block is ambitious, not conservative. The first time I ran this I had five things planned and got through one. That was fine, but it tells you something about the pace: the good conversations are slow, and you don't want to cut them off. Plan light. Let the room fill the time.

A handful of questions do most of my facilitating. What complexity is this adding? Who pays the cost later? Is this AI output good, or just plausible? What did AI decide for you, and what did you accept, reject, change? Ask them until the engineers start asking them without you. That is my exit condition.

All of it (the prompts, the templates, the session-by-session plan) is gathered in the Facilitator's Pack at the back, for when you want to run this for real. Here, the shape is enough: a cheap, repeatable hour, built around real code, that ends with something written down. Everything else is a variation played inside that hour.

The sessions ahead are those variations. Each one takes the loop and bends the whole session around a single move, the one that is hardest to make happen on its own. We start where the loop starts, before the AI has said a word. What do you actually think the code should look like, before you ask it anything at all?

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