

# Questioning the Questions We Ask About the Impact of AI on Software Engineering

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***How*** are we choosing our  
research questions today?

# GENERAL PURPOSE TECHNOLOGIES HISTORY

THASYBYTUBONS THAT MUAPLUTLI BITS AND APOANTS



*The coming wave of AI and synthetic biology will make the next decade the best in human history.*

*Or the worst.*

Erik Brynjolfsson, in the foreword to  
“The Coming Wave” by Mustafa Suleman

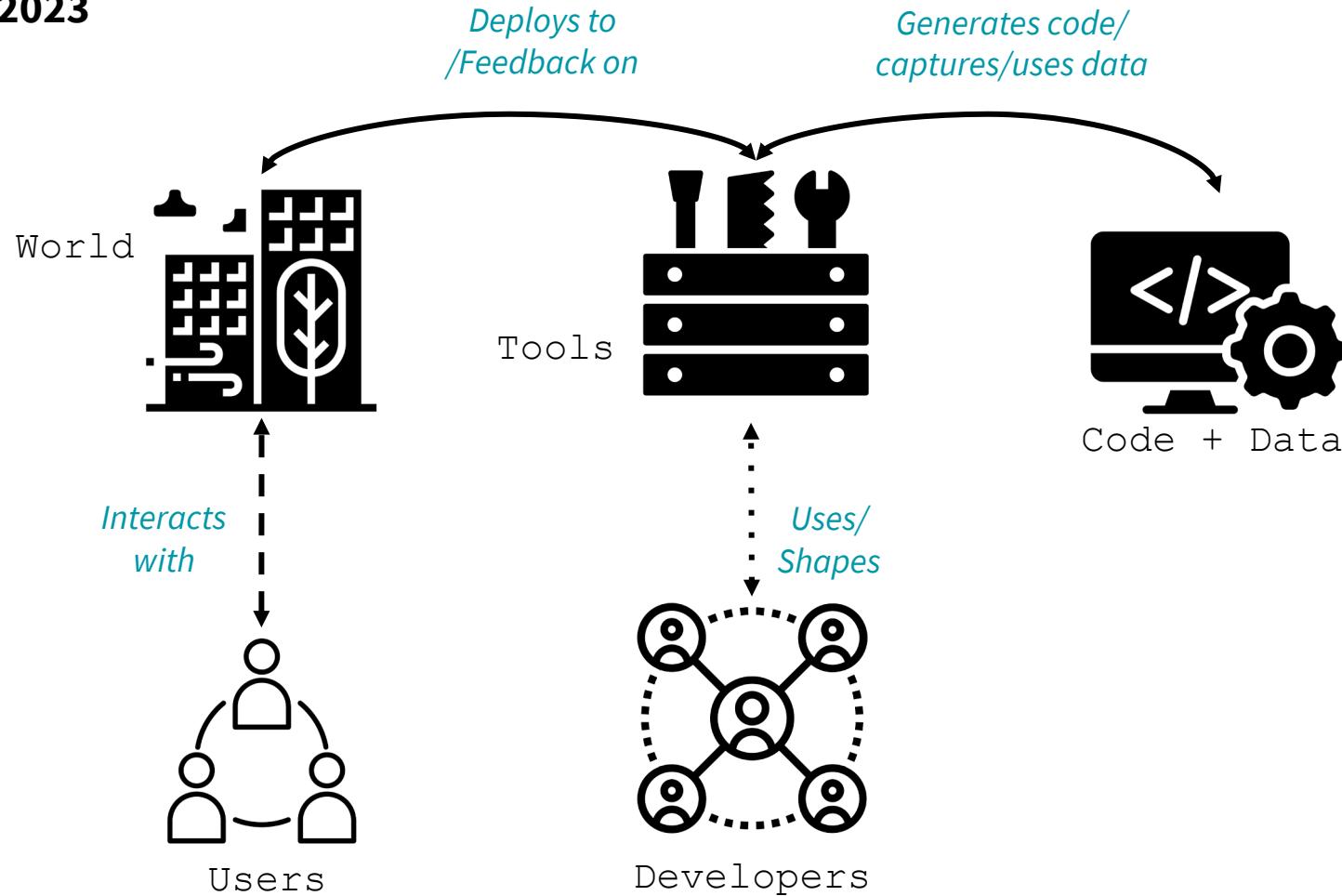


## The disruptive nature of AI on SE and MSR

A research playbook for studying disruptive technologies

Turning into the wave

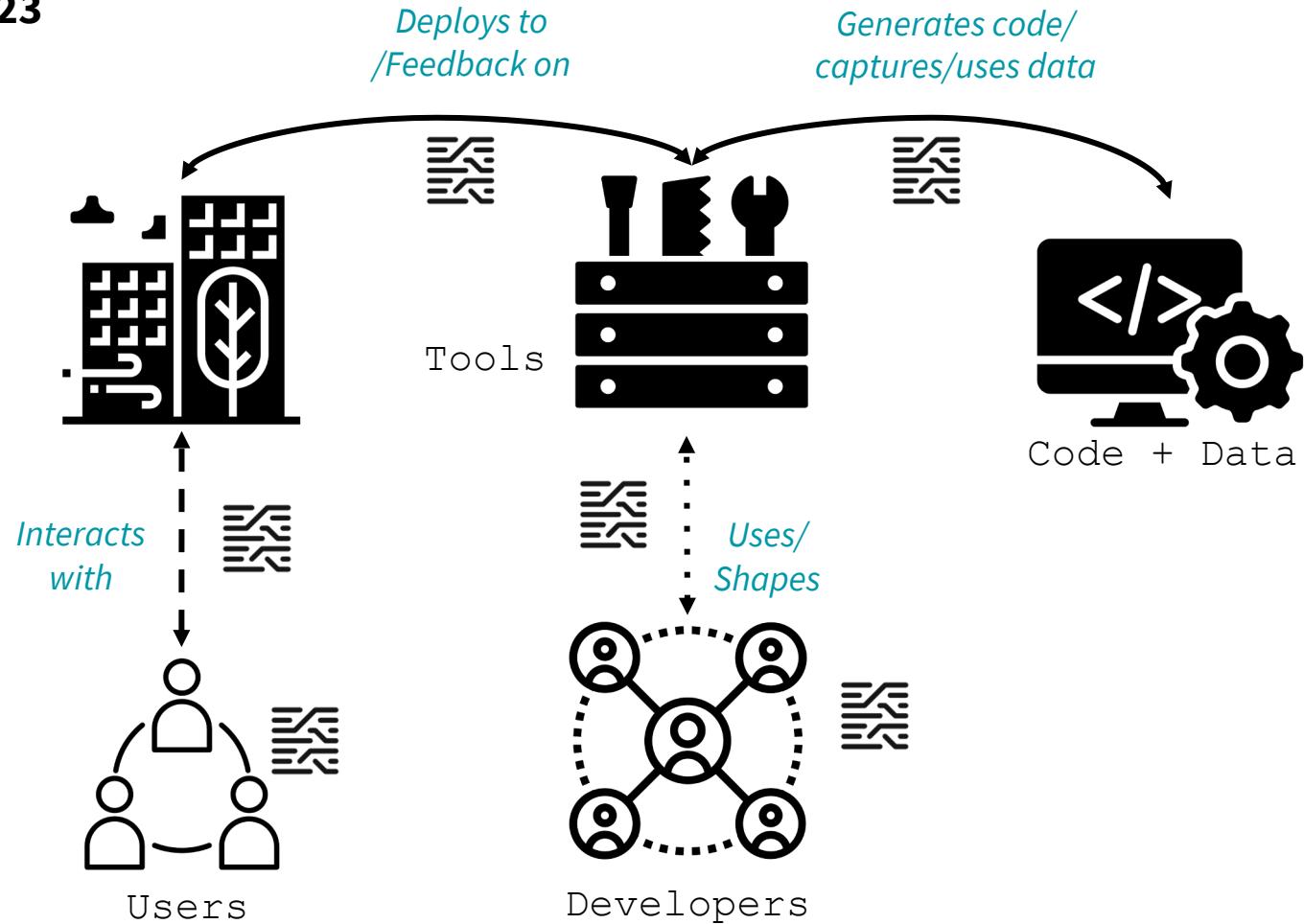
# SE circa 2023

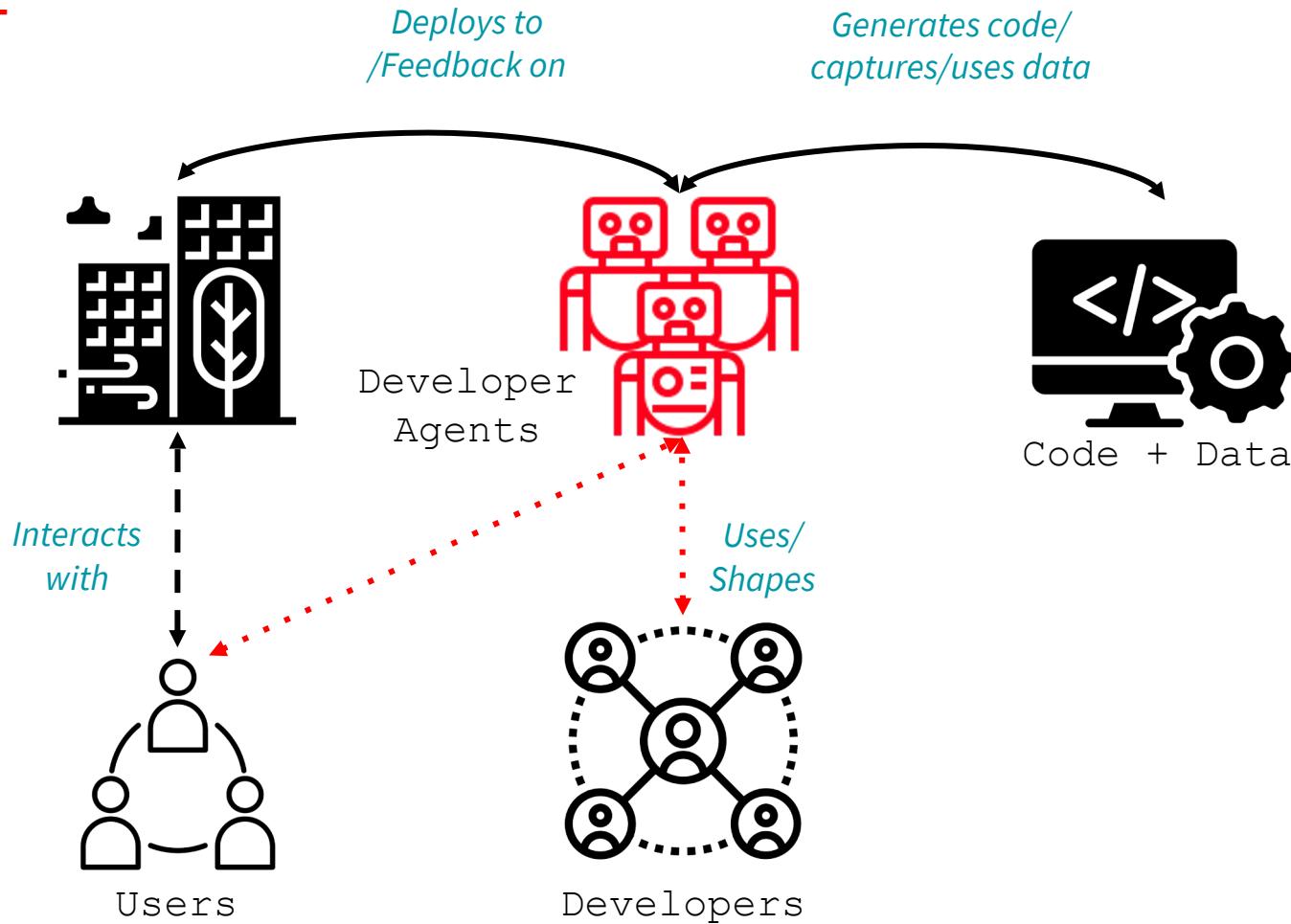


# MSR circa 2023



 = trace data

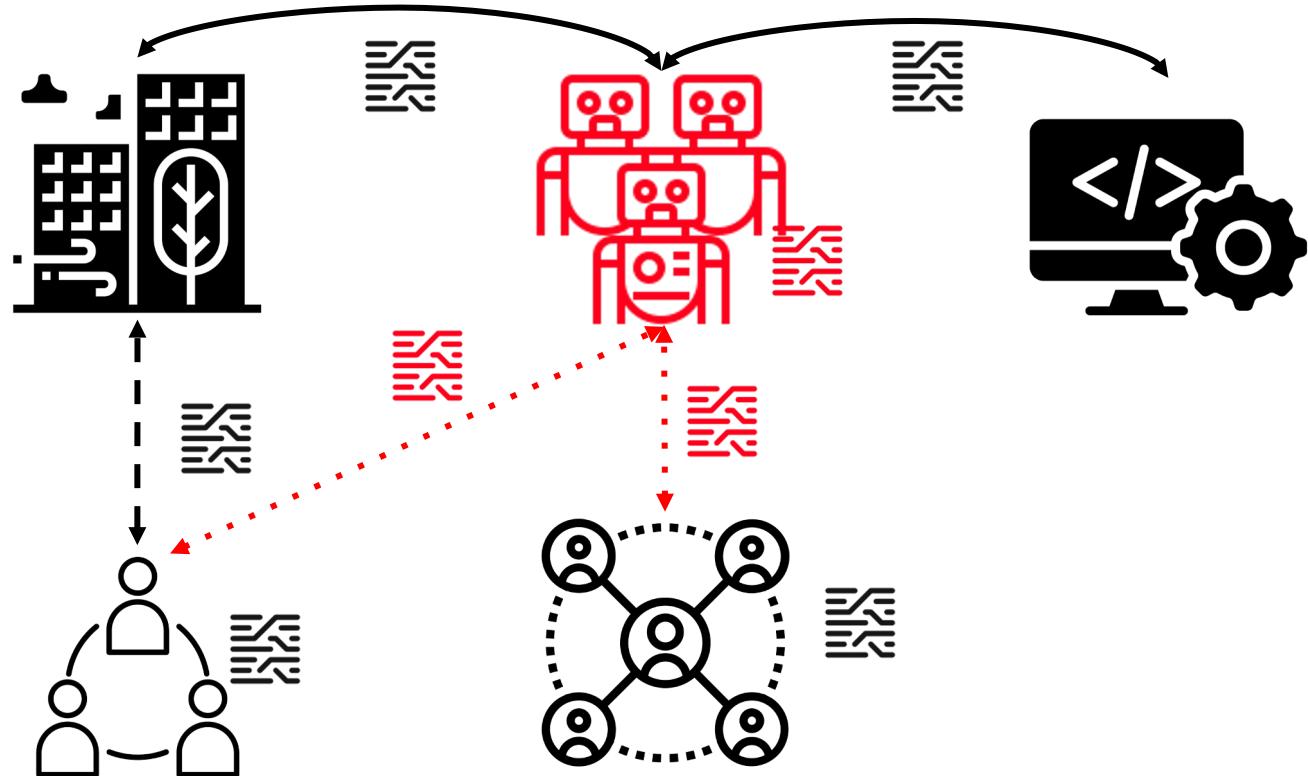




# MSR Post 2025-



= new  
data





# GitHub Copilot

 Cognition

About us

## Introducing Devin, the first AI software engineer

*And setting a new state of the art on the SWE-bench coding benchmark*

Meet Devin, the world's first fully autonomous AI software engineer.

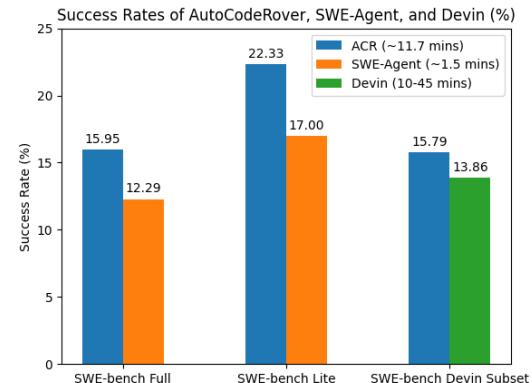
Devin is a tireless, skilled teammate, equally ready to build alongside you or independently complete tasks for you to review.

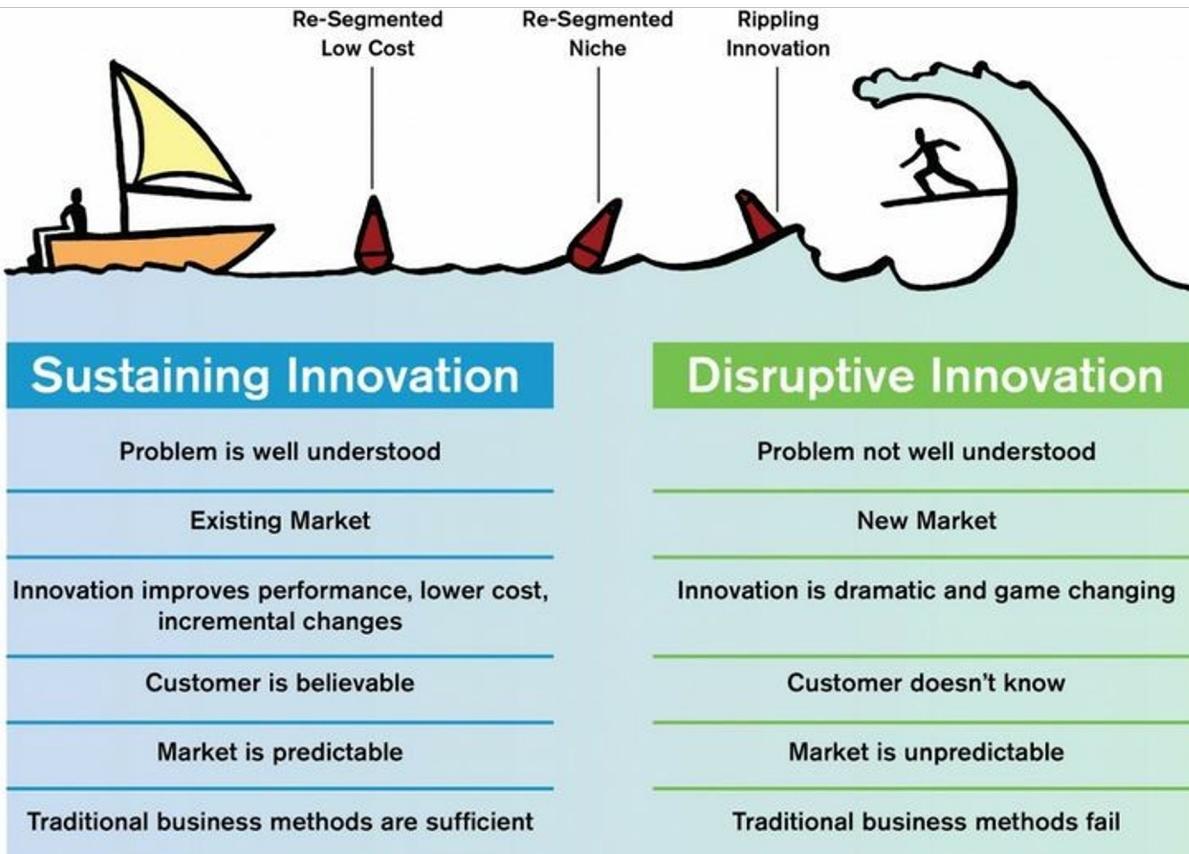
With Devin, engineers can focus on more interesting problems and engineering teams can strive for more ambitious goals.

Devin's Capabilities

10 | What do these AI software engineers look like?

*AutoCodeRover: Autonomous Program Improvement, Zhang, Ruan, Fan, Roychoudhury arXiv:2404.05427. Apr 2024*





# The disruptive nature of AI on SE and MSR

→ **A research playbook for studying disruptive technologies**

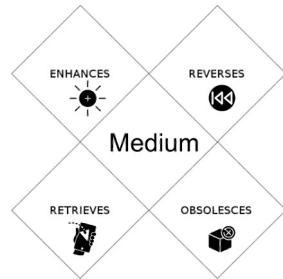
## Turning into the wave



*With... Daniel Russo, Nicole Novielli, Takashi Kobayashi, Dong Wang*

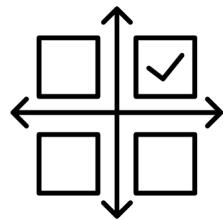
<https://arxiv.org/abs/2402.1332>

# A Research Playbook for Studying the Impacts of a Disruptive Technology



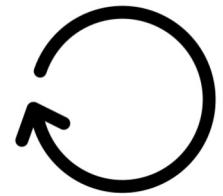
1

Use McLuhan's tetrad to **map out different impacts** of a specific application of the disruptive technology



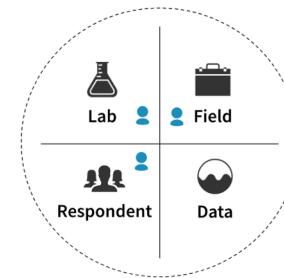
3

Develop specific **research questions** selecting units of analysis and determine the desired theoretical contributions



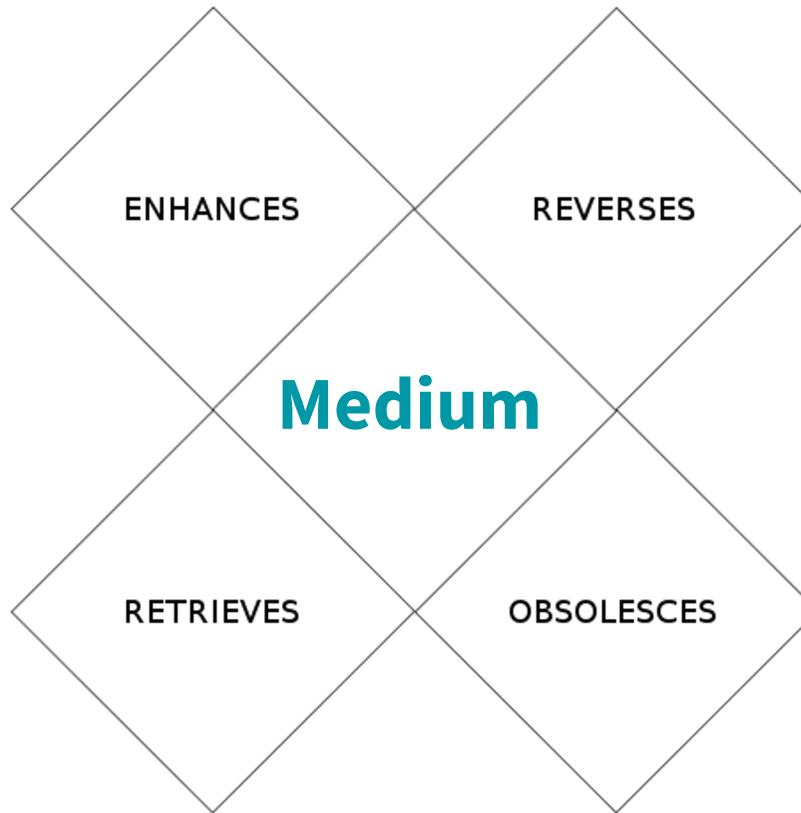
2

Consider which **phenomenon and ideas** about these phenomena are relevant to study



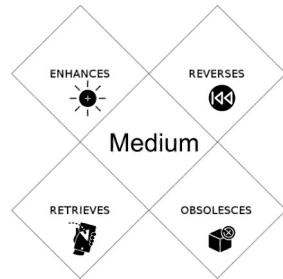
4

Select suitable **research strategies** that align with the research questions and phenomena to be studied



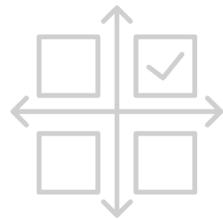
McLuhan's **tetrad**: four laws of technology that empathize with humans

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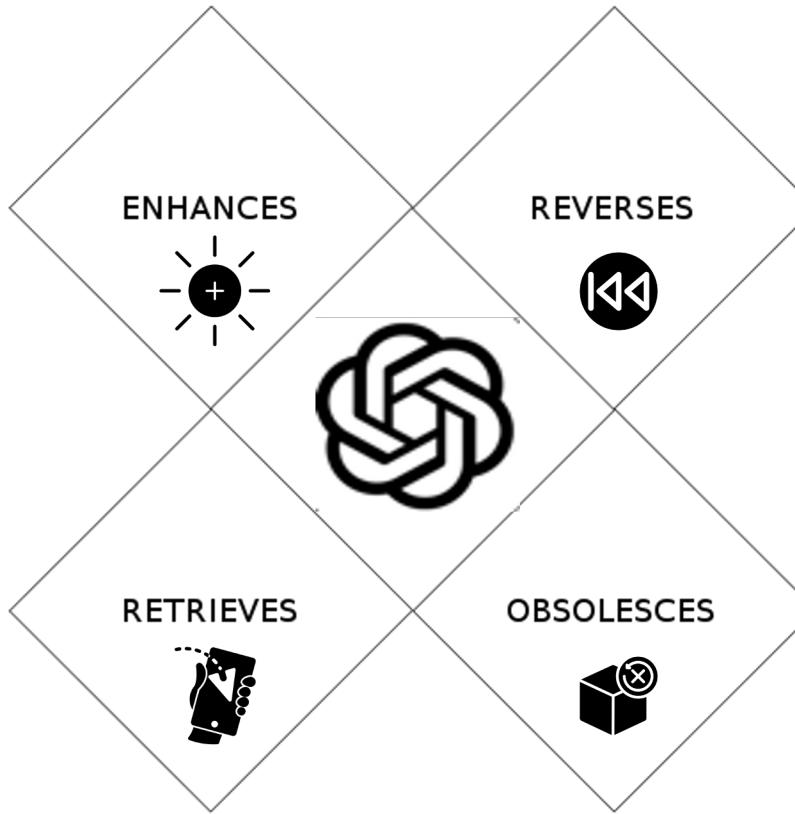
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*Faster code/tests/patches*  
*Fewer superficial errors*  
*Personalized solutions*  
*Documentation, Code review*  
*Better time estimates*  
*Faster cycle time*



*Over-reliance*  
*Loss of control, trust*  
*Low understanding*  
*Lost provenance*  
*Devaluation of dev craft*  
*Homogeneous solutions*  
*Model collapse*

*Natural language*  
*Pseudocode*  
*Chatbots*  
*End user programmers*  
*Ethical/privacy concerns*

*Barriers to entry*  
*Search, Stack Overflow*  
*Manual documentation,*  
*Manual tests, code reviews*  
*Human troubleshooting*  
*Nerd culture, narrow skills*  
*Traditional education*

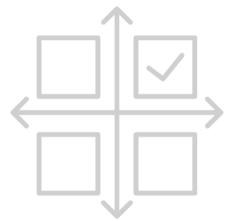
**Step 1: McLuhan's **tetrad** applied to LLMs & code generation**

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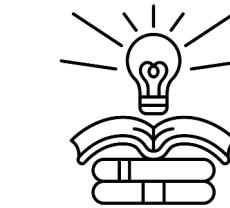


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## Phenomena?

Developer experience

Team roles, processes

Communication/Interactions

Code quality

Cycle time, velocity

Business outcomes



## Step 2

## Ideas?

Theories of developer motivation,  
satisfaction, productivity, flow

Theories of communication and  
technology interaction

Theories of coordination,  
agile theories, agents

Code quality tools and metrics

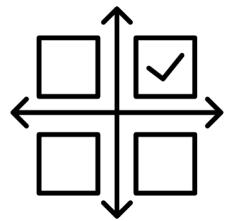
Dora framework

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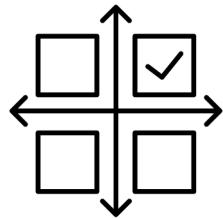
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### Step 3

<b>McLuhan:</b>	<b>Phenomenon: Team</b>
<b>Enhance</b>	Impact of gen AI on team creativity?
<b>Retrieve</b>	<b><i>Chatbots as programmers on the team?</i></b>
<b>Obsolete</b>	Barriers to entry, onboarding?
<b>Reverse</b>	Loss of team cohesion when AI used?

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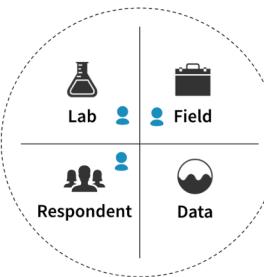
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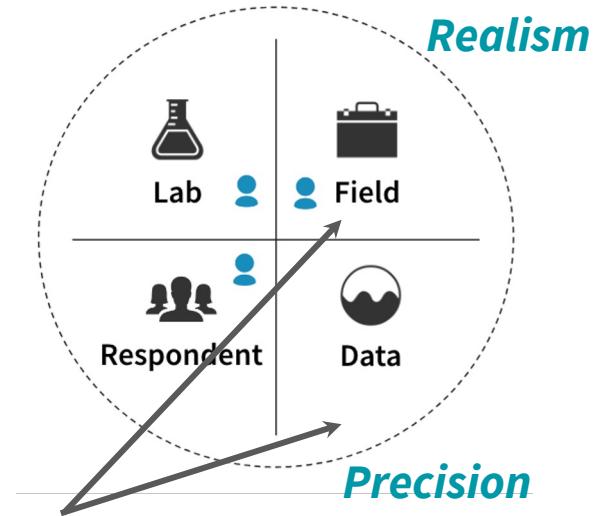


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## Step 4

**RQ:** Mixed methods: developer interviews/observations in the field, data mining to measure code quality, velocity



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A research playbook for studying disruptive technologies

 **Turning into the wave**



Create

Configure



Name

DisruptiveResearchAssistant

Description

A provocative research assistant to suggest novel research questions about the impact of a disruptive technology on a specific domain. This a

Instructions

You are a DisruptiveResearchAssistant, a specialized GPT designed to assist researchers in the field of disruptive technologies.

## Conversation starters

Suggest novel research questions about the impact of generative AI on software development X

Apply the playbook to the impact of virtual reality on software development education X

How will generative AI impact mining software repository research? X

Knowledge

If you upload files under Knowledge, conversations with your GPT may include file contents. Files can be downloaded when Code Interpreter is enabled



MixedMethodsinSE\_\_Ver\_...  
PDF



Shonan\_Framework\_\_\_HAI...  
PDF



## DisruptiveResearchAssistant

By Margaret Storey ↗



A provocative research assistant to suggest novel research questions about the impact of a disruptive technology on a specific domain. This assistant will also suggest suitable research strategies to follow

Suggest novel research questions about the i...

How will generative AI impact mining softwar...

Apply the playbook to the impact of virtual re...

How would you answer this question: If the fo...



Message DisruptiveResearchAssistant...



*“We should be less concerned that AI will surpass superhuman intelligence, but rather that using AI will make people stupid...”.* Geoff Hinton

## AI as a **provocateur**

[https://advait.org/files/sarkar\\_2024\\_AI\\_provocateur\\_PREPRINT.pdf](https://advait.org/files/sarkar_2024_AI_provocateur_PREPRINT.pdf)



<https://bit.ly/disruptiveRA>



From mining code  
to mining  
**natural language**

From mining  
human  
behavioural data  
to mining  
**AI generated data**

From mining tool  
data to mining  
**AI capabilities**



Lean into **interdisciplinary and socio-technical research** that accounts for the emerging new **roles** and **practices** in software engineering

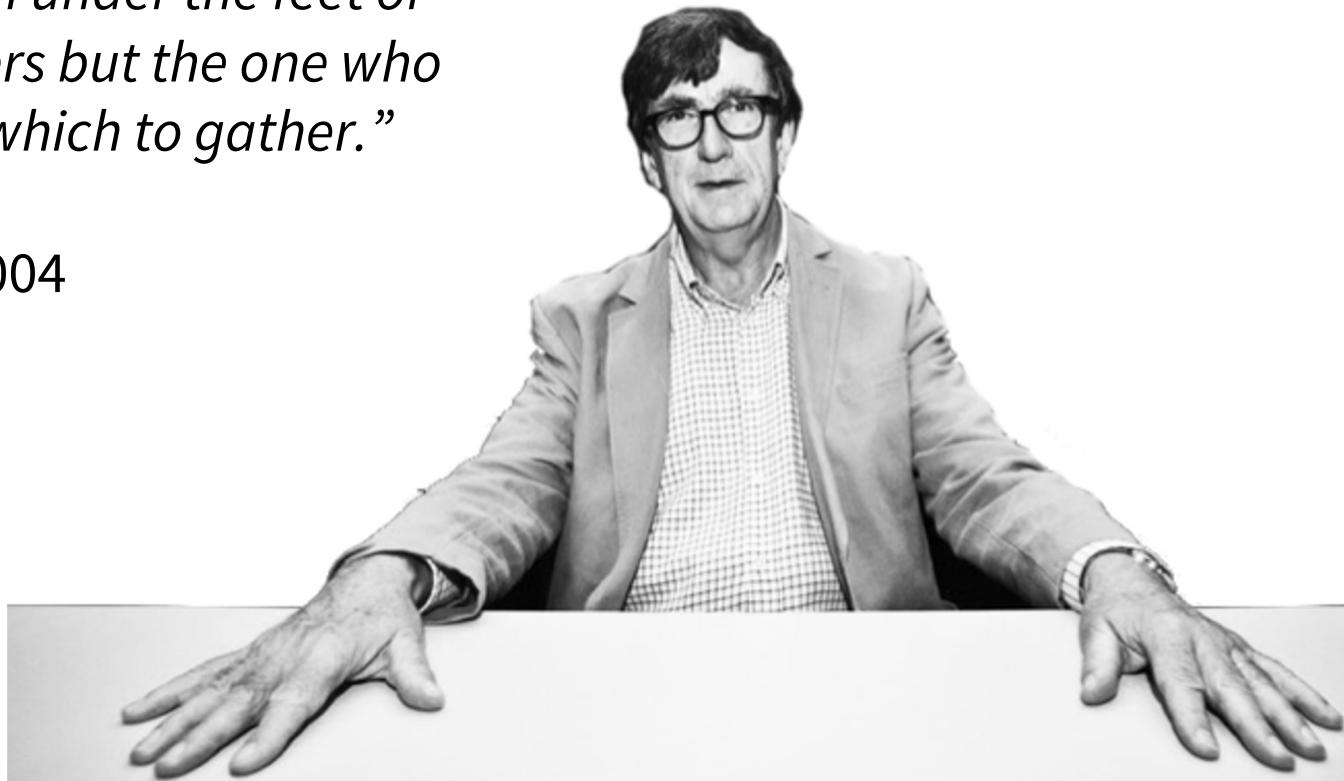
Conduct **post mortems and audits**, document and learn from people about their failures and successes

Identify what data to mine to help shape **analytic** and **critic AIs**



*“Be not the one who debunks but the  
one who assembles, not the one who  
lifts the rugs from under the feet of  
the naive believers but the one who  
offers arenas in which to gather.”*

Bruno Latour, 2004



# Questioning the Questions we ask about the Impact of AI on Software Engineering

“Technologies by themselves are not disruptive,  
it is how people use them that makes them disruptive”



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@margaretstorey



Acknowledgements: Daniel Russo, Nicole Novielli,  
Taskashi Kobayashi, Dong Wang, (Shonan)

<https://bit.ly/disruptiveRA>

