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Design Thinking

A method to design for easier data access

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U.S. DEPARTMENT OF ENERGY BATTELLE

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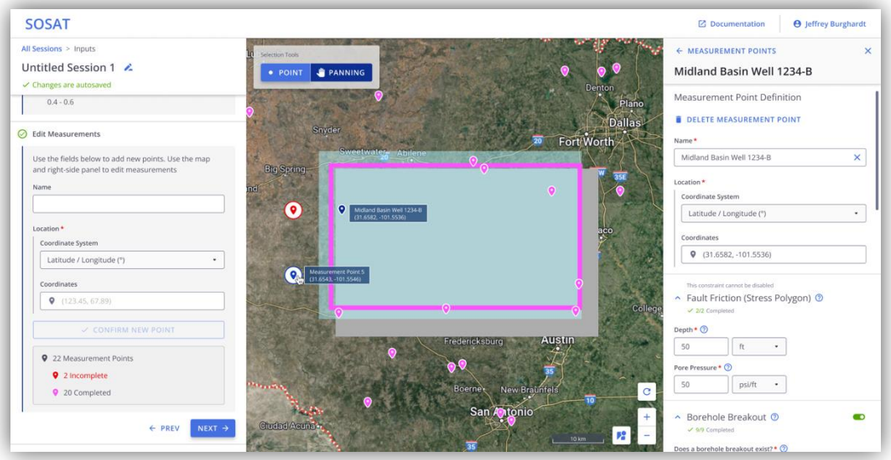

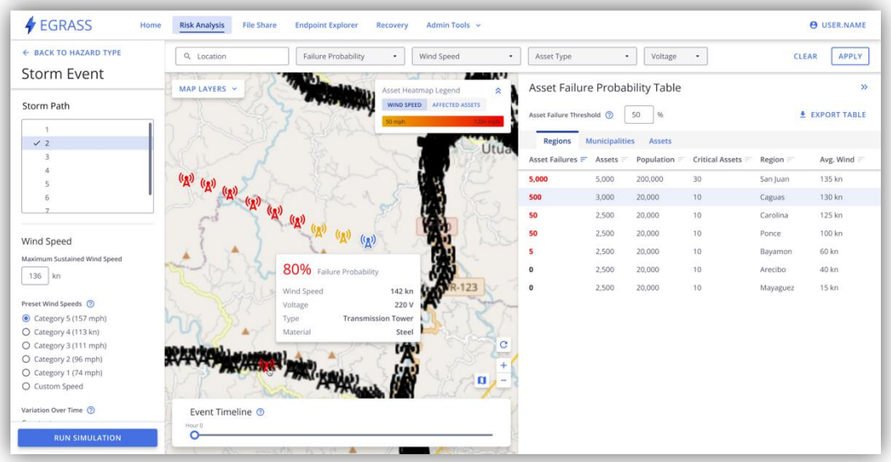

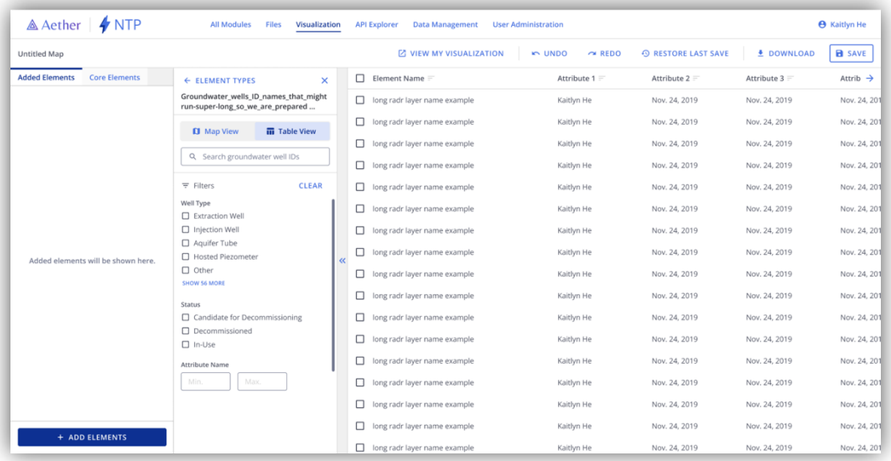

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What is Design Thinking?

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Imagine with me…

You are trying to choose a restaurant for you and your partner without consulting that partner.

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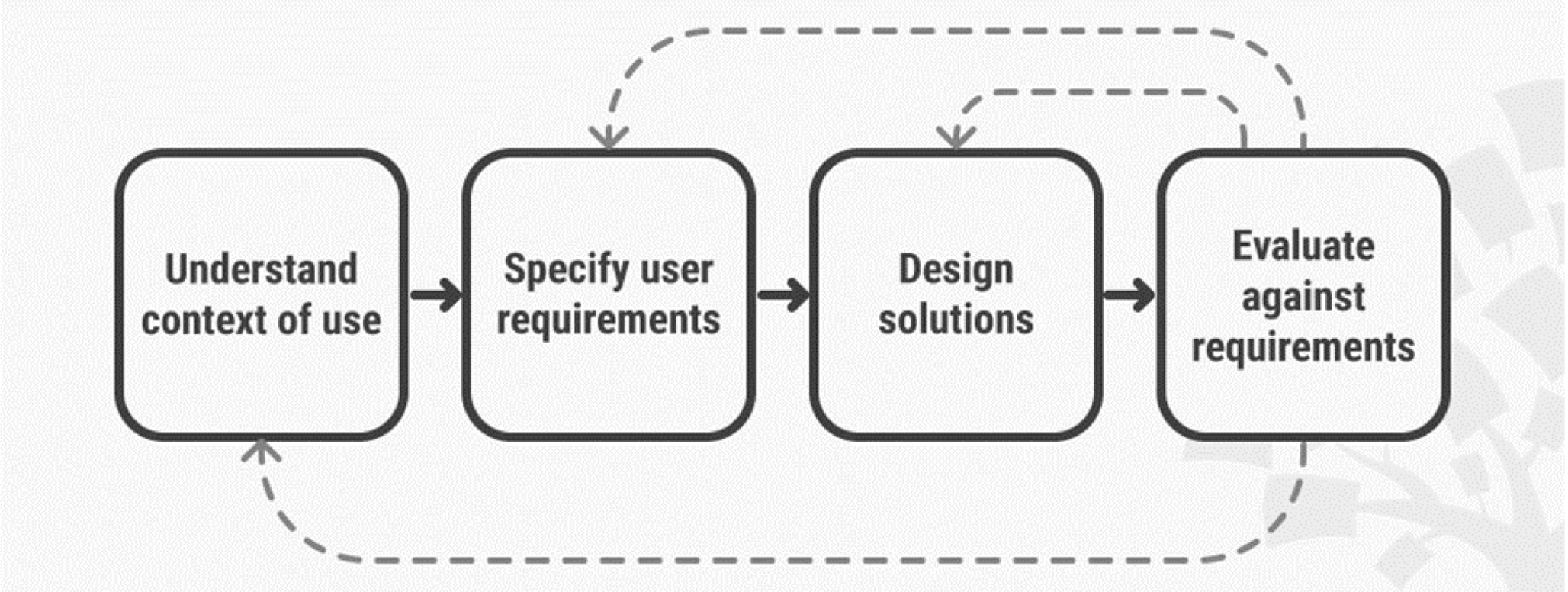
Actions “you” might take

Make assumptions

Judge on past experiences

Pick your favorite…

How might we apply Design Thinking to the dinner spot selection scenario?



Why does Design Thinking matter to us?

- Design Thinking is a way of thinking that can help us:
  - Make data accessible and maintainable by more than one person
  - Ensure digital equity and practice of FAIR principles
    - FAIR = Findable, Accessible, Interoperable, and Reusable
  - Prepare data based on the needs of the end users, facilitating data usage

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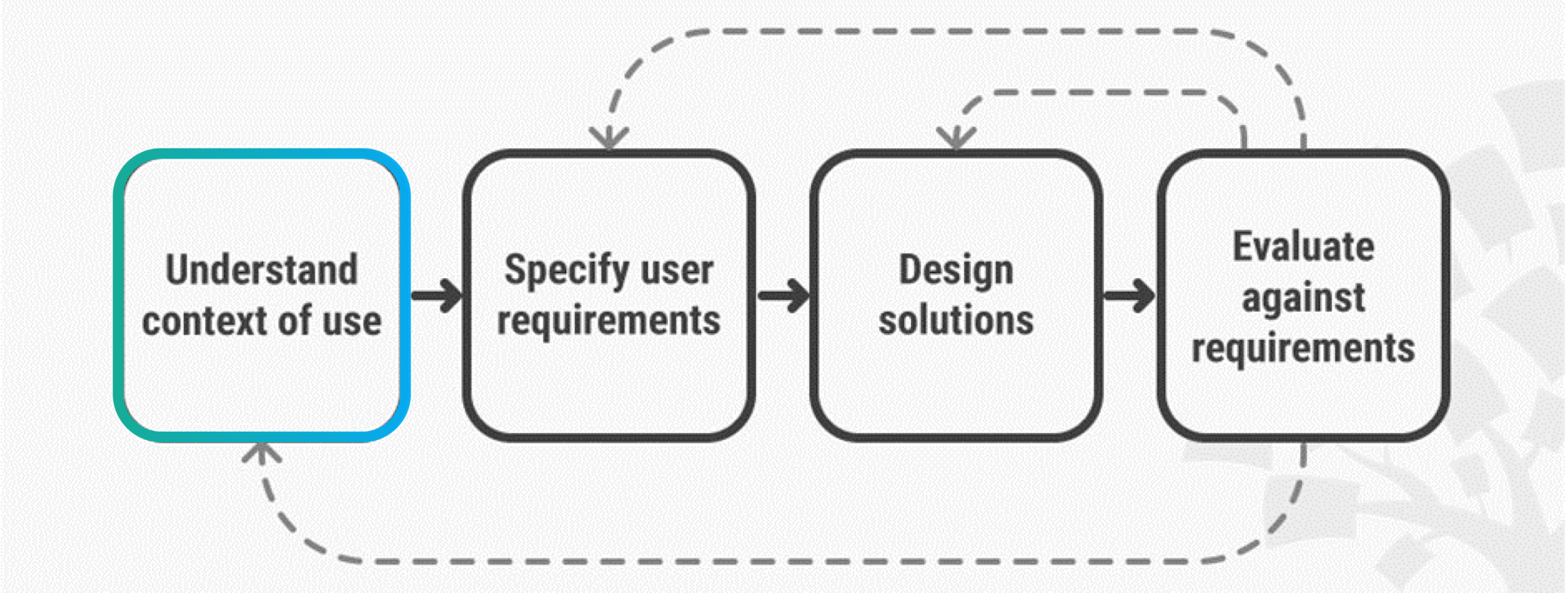
How can we practice design thinking?

Understand Context of Use



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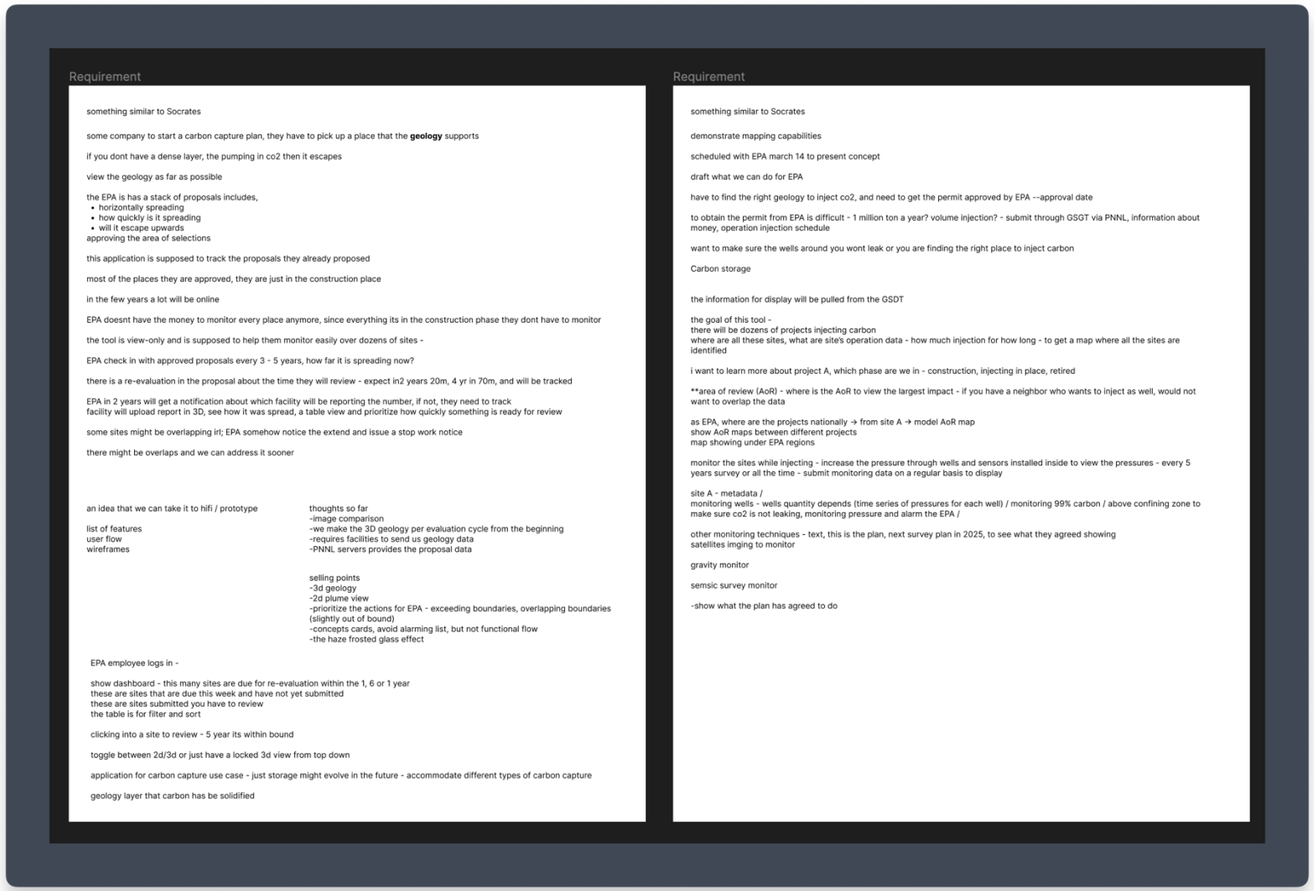
Understand context of use could look like this →



Requirement

something similar to Socrates

some company to start a carbon capture plan, they have to pick up a place that the **geology** supports

If you dont have a dense layer, the pumping in co2 then it escapes

view the geology as far as possible

the EPA is has a stack of proposals includes,
- horizontally spreading
- how quickly is it spreading
- will it escape upwards

approving the area of selections

this application is supposed to track the proposals they already proposed

most of the places they are approved, they are just in the construction place

in the few years a lot will be online

EPA doesnt have the money to monitor every place anymore, since everything its in the construction phase they dont have to monitor

the tool is view-only and is supposed to help them monitor easily over dozens of sites -

EPA check in with approved proposals every 3 - 5 years, how far it is spreading now?

there is a re-evaluation in the proposal about the time they will review - expect in2 years 20m, 4 yr in 70m, and will be tracked

EPA in 2 years will get a notification about which facility will be reporting the number, if not, they need to track
facility will upload report in 3D, see how it was spread, a table view and prioritize how quickly something is ready for review

some sites might be overlapping irl; EPA somehow notice the extend and issue a stop work notice

there might be overlaps and we can address it sooner

an idea that we can take it to hifi / prototype

list of features
user flow
wireframes

thoughts so far
-image comparison
-we make the 3D geology per evaluation cycle from the beginning
-requires facilities to send us geology data
-PNNL servers provides the proposal data

selling points
-3d geology
-2d plume view
-prioritize the actions for EPA - exceeding boundaries, overlapping boundaries (slightly out of bound)
-concepts cards, avoid alarming list, but not functional flow
-the haze frosted glass effect

EPA employee logs in -

show dashboard - this many sites are due for re-evaluation within the 1, 6 or 1 year
these are sites that are due this week and have not yet submitted
these are sites submitted you have to review
the table is for filter and sort

clicking into a site to review - 5 year its within bound

toggle between 2d/3d or just have a locked 3d view from top down

application for carbon capture use case - just storage might evolve in the future - accommodate different types of carbon capture

geology layer that carbon has be solidified

Requirement

something similar to Socrates

demonstrate mapping capabilities

scheduled with EPA march 14 to present concept

draft what we can do for EPA

have to find the right geology to inject co2, and need to get the permit approved by EPA --approval date

to obtain the permit from EPA is difficult - 1 million ton a year? volume injection? - submit through GSGT via PNNL, information about money, operation injection schedule

want to make sure the wells around you wont leak or you are finding the right place to inject carbon

Carbon storage

the information for display will be pulled from the GSDT

the goal of this tool -
there will be dozens of projects injecting carbon
where are all these sites, what are site's operation data - how much injection for how long - to get a map where all the sites are identified

i want to learn more about project A, which phase are we in - construction, injecting in place, retired

**area of review (AoR) - where is the AoR to view the largest impact - if you have a neighbor who wants to inject as well, would not want to overlap the data

as EPA, where are the projects nationally → from site A → model AoR map
show AoR maps between different projects
map showing under EPA regions

monitor the sites while injecting - increase the pressure through wells and sensors installed inside to view the pressures - every 5 years survey or all the time - submit monitoring data on a regular basis to display

site A - metadata /
monitoring wells - wells quantity depends (time series of pressures for each well) / monitoring 99% carbon / above confining zone to make sure co2 is not leaking, monitoring pressure and alarm the EPA /

other monitoring techniques - text, this is the plan, next survey plan in 2025, to see what they agreed showing
satellites imging to monitor

gravity monitor

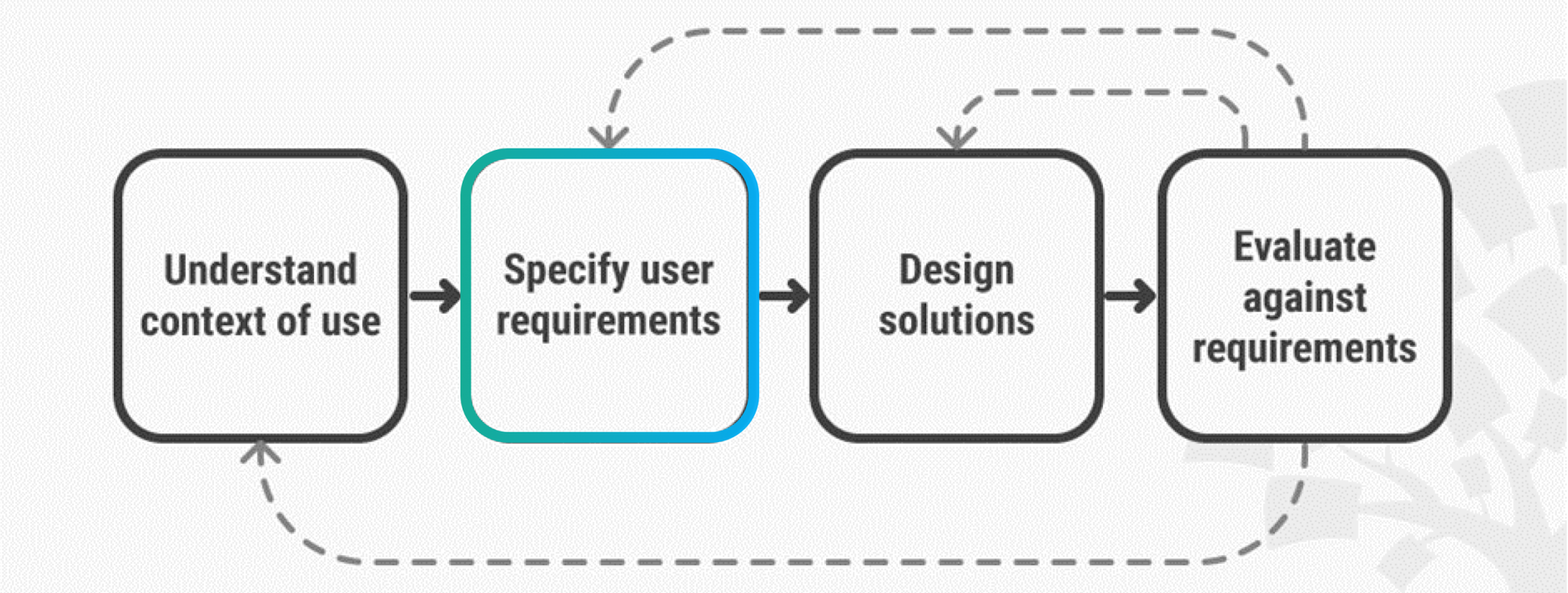
semsic survey monitor

-show what the plan has agreed to do

Questions to Help Understand Context of Use

- **Who** is going to use, view, or be impacted by the data?
- **What** does the data include? What purpose does the data serve?
- **When** are people going to access the data? (Is there urgency? Is the data used after a certain step in a process?)
- **Where** do people naturally look for this type of data?
- **Why** do people need access to the data?
- **How** will people maintain the data?

Specify User Requirements

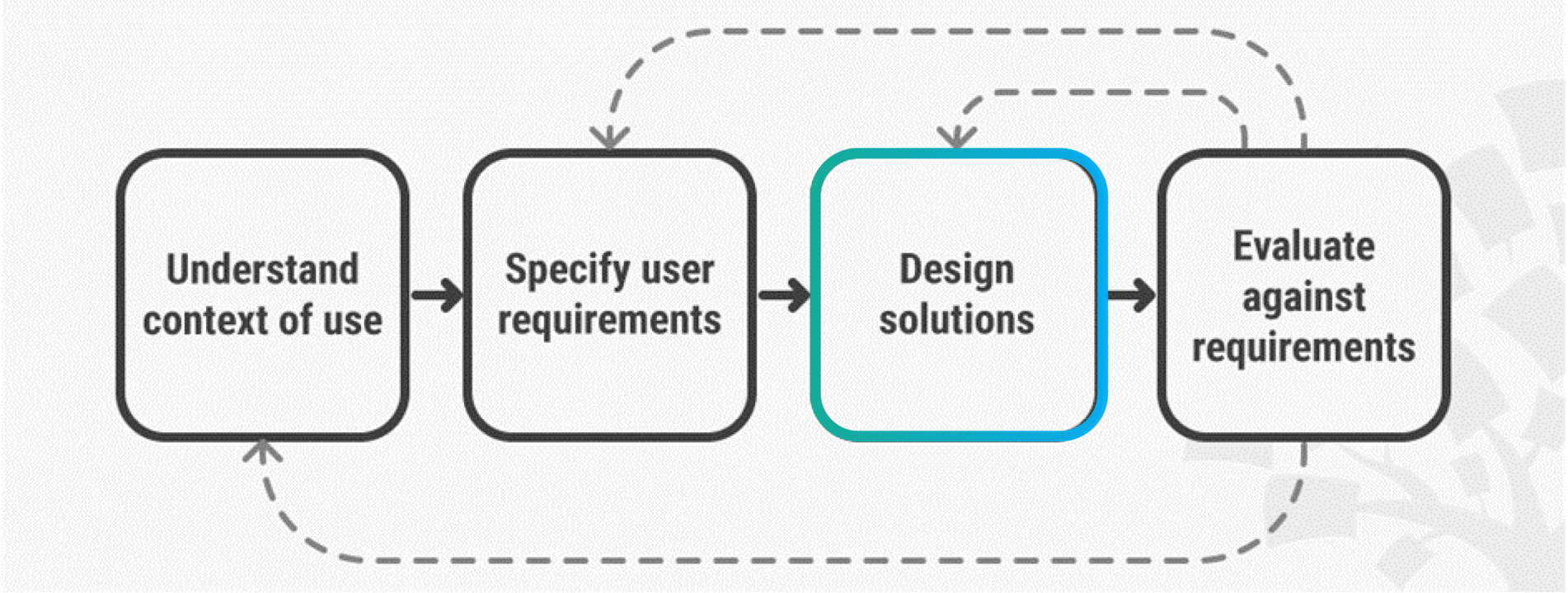


How do you open a ramen package?

Define Requirements Before Brainstorming Solutions

- *For Ramen - An easy way to access the ramen inside the packaging*
- Example data-related requirements could be
  - FAIR data principle
  - Readable/recognizable names, standardized units, logically ordered data
  - Easy-to-follow maintenance procedure

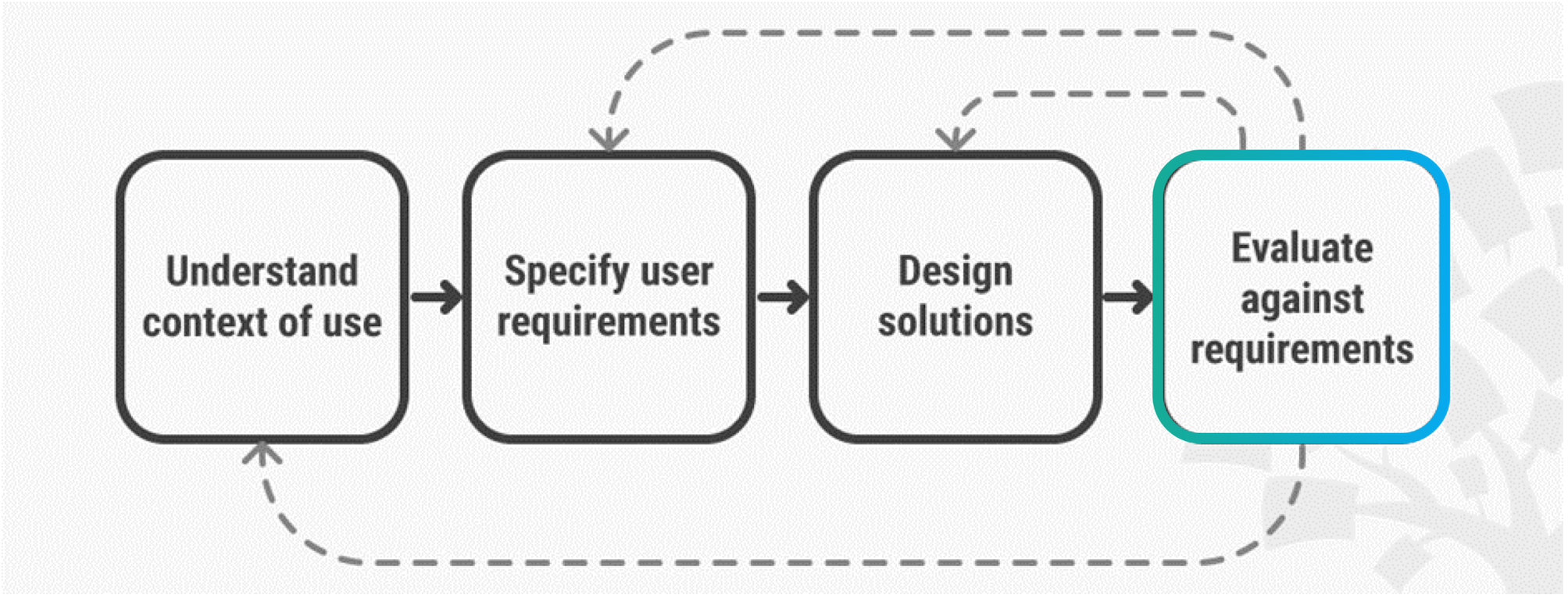
Design Solutions



Design Solution Tips & Questions

- Tips for finding solutions
  - Brainstorm as many ideas as possible
  - Try ideas out on a smaller dataset
  - Don’t fall in love with the first solution
- Questions I ask myself
  - Does this solution meet one or all the defined requirements?
  - Can other people follow the procedures to maintain data?
  - Do people understand the intended approach to access data?

Evaluate Against Requirements



Evaluating Solutions Benefits and How-do

- Benefits of evaluating potential solutions
  - Gain a different perspective
  - Helps us to take a step back from the problem
  - Deliver a solution the target audience desires and wants to use
- How do we evaluate
  - Good: Approach a colleague to ask if they understand your intent
  - Better: Ask people best representing intended data users if the data preparation meets their needs and fits into their workflow
  - Best: Reach out directly to the people who need the data

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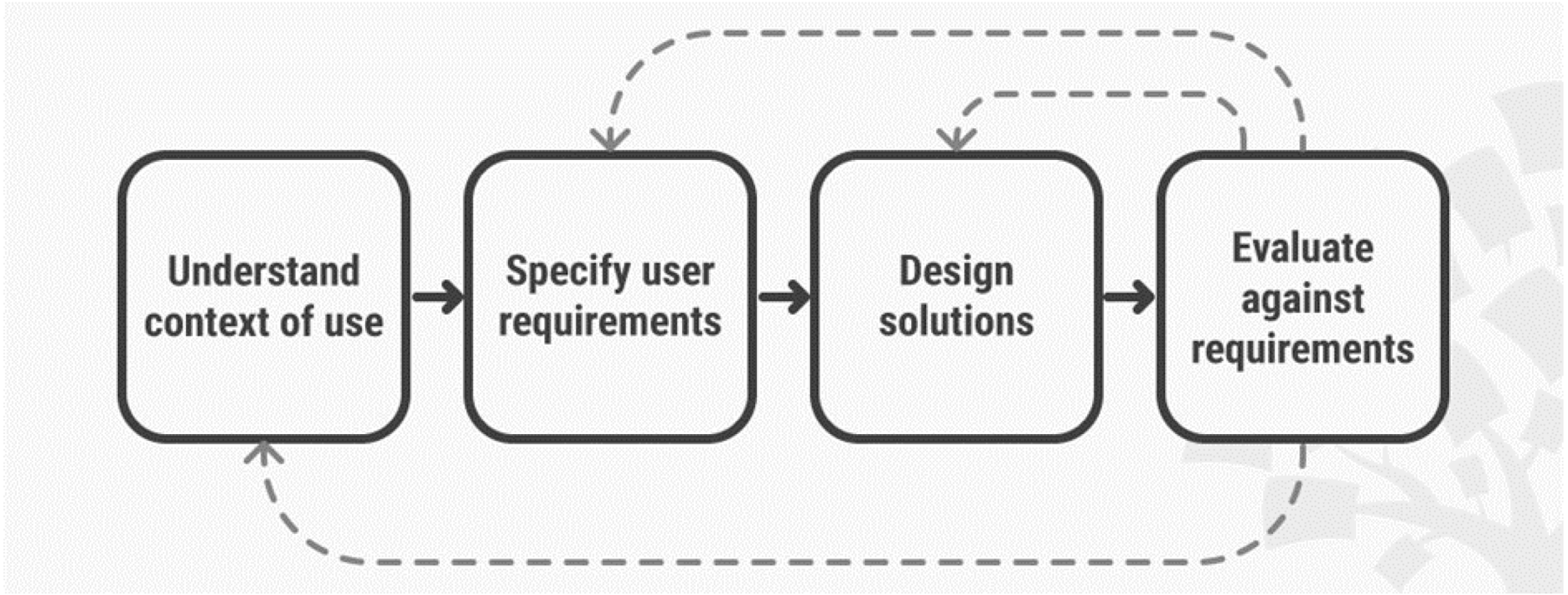
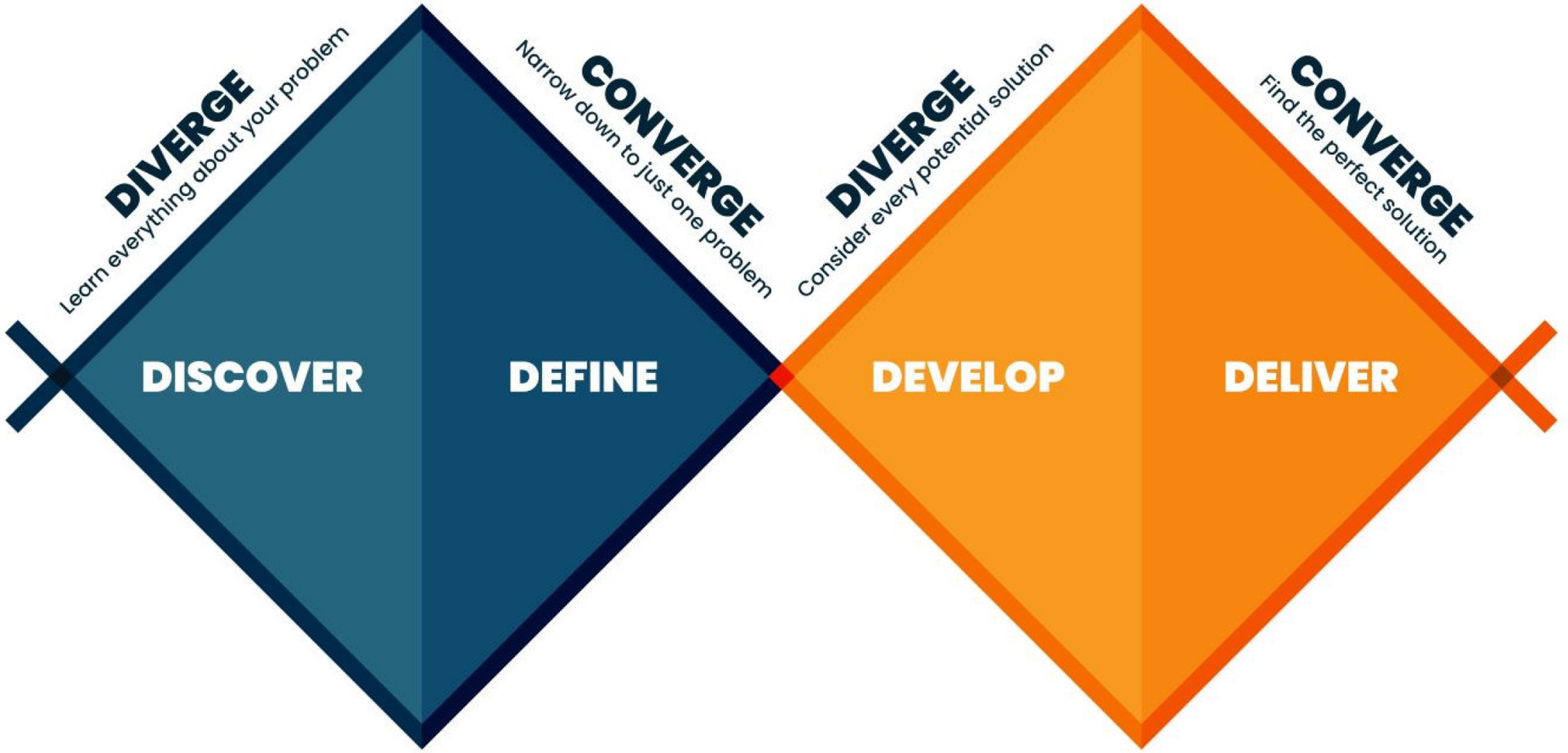
How do we execute?


Understand context of use
Specify user requirements
Design solutions
Evaluate against requirements

Double Diamond Design Process



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Thank you

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Further exploration

Human System Engineering Foundation

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