

The logo for Carnegie Mellon University, featuring the text "Carnegie Mellon University" in a white serif font, set against a dark blue background with a complex, colorful grid pattern of red, green, and yellow lines.

Carnegie
Mellon
University

Getting Dirty with Product Design

Brad Eiben

Executive Director, MS in Product Management



Go see, ask why, show respect.

— *Fujio Cho* —

AZ QUOTES



Go see, ask why, show respect.

— *Fujio Cho* —

AZ QUOTES

In 6 words, this is 90% of today's message.



DESIGN ACTIVITY #1

ACTIVITY #1 -- Sketch a superhero problem solver.

Don't sketch this one...



... create your own.

Eyes like an owl...



Source: theatlantic.com

Ears like an bat...



Source: treehugger.com

Heart like an lion...



Source: [brittanica.com](https://www.brittanica.com)

Build like a beaver...



Source: patch.com

Teamwork like a beehive...



Source: twitter.com



My superhero “sketch...”



Source: littletykes.com



Homework:

When facing a problem and you don't know where to begin, ask, "Where is the sandbox?" and go there!

TODAY'S DISCUSSION

Broad definition of “Product”

- Software
- Hardware
- Service



This discussion is a product



This discussion is a product

Your goals >> my goals.



Assumed Goals

- Why? Importance of “getting dirty.”
- How? Exploring a problem.
- What next? Resources and activities.



Assumed Goals

- Why? Importance of “getting dirty.”
- How? Exploring a problem.
- What next? Resources and activities.



Assumed Goals

- Why? Importance of “getting dirty.”
- How? Exploring a problem..
- What next? Resources and activities.



Assumed Goals

- Why? Importance of “getting dirty.”
- How? Exploring a problem.
- What next? Resources and activities.



Interaction

- Have fun. No wrong answers.
- Have a sketch / notepad.
- Conversational. Ask questions.



Interaction

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Interaction

- Have fun. No wrong answers.
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- Conversational. Ask questions.



DESIGN ACTIVITY #2



ACTIVITY #2 – Design a toothbrush.



Who had a user in mind?

- For a dentist?
- For an astronaut?
- For a traveler?



A better starting point...

Travelers need a way to clean their teeth because they don't always have access to water.

Solving users' problems?

Opportunity statement / POV madlib

USERS (Be very specific)	NEEDS (verb)	Surprising INSIGHTS
<div></div>	<div></div>	<div></div>

Source: Stanford d.school

Solving users' problems?



+



=





Roll over image to zoom in

Power Rechargeable Electric Toothbrush with Bluetooth Connectivity, White Edition

★★★★★ 6,357 ratings | 503 answered questions

Amazon's Choice in Rotating Power Toothbrushes

-41% \$95⁰⁰ (\$95.00 / Count)

List Price: ~~\$159.99~~

& FREE Returns

Pay \$17.26/month or less for 6 months with Affirm. [Learn more](#)

Available at a lower price from [other sellers](#) that may not offer free Prime shipping.

Style: **White Electric Toothbrush**

Brand

Age Range (Description) Adult


Special Feature Bluetooth, Deep Clean, Whitening, Sensitive, Travel Case

Power Source Battery Powered

Color White Edition

About this item

- Bluetooth communication between brush and smartph1 provides real-time feedback on brushing habits, helping you achieve amazing results



Roll over image to zoom in

APP TRACKS BRUSHING HABITS

Power Rechargeable Electric Toothbrush with Bluetooth Connectivity, White Edition

★★★★★ 6,357 ratings | 503 answered questions

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Style: **White Electric Toothbrush**

Brand	
Age Range (Description)	Adult
Special Feature	Bluetooth, Deep Clean, Whitening, Sensitive, Travel Case
Power Source	Battery Powered
Color	White Edition

About this item

- Bluetooth communication between brush and smartph1 provides real-time feedback on brushing habits, helping you achieve amazing results

Connecting your toothbrush to your Smart Phone

Download the [redacted] app for free from App Store^(SM) or Google PlayTM. The [redacted] app gives you the opportunity to use your time more efficiently, chart your brushing progress and customize your toothbrush settings (for more benefits see the [redacted] instructions).

- Start the [redacted] app and let it guide you through the *Bluetooth* pairing procedure. Not [redacted] app functionality is limited if *Bluetooth* is deactivated on your phone (for directions please refer to your smart phone's user manual).
- Once you start using your toothbrush by lifting it off the plugged-in charger (h) or pressing any button (c)/(d), it automatically connects to the [redacted] app. If no connection has been established, briefly press the mode button (d) on your toothbrush handle and wait for a connection.
- Any further app instructions will be displayed on your smart phone.
- Keep your smart phone in close proximity when using it with your toothbrush handle. Make sure the smart phone is safely positioned in a dry place.

Note: Your smart phone must support *Bluetooth* 4.0 (or higher) in order to connect to your toothbrush handle.



Amazon User

★★★★★ Bluetooth can be turned off!!! Easy to use, leaves teeth feeling very clean :)

Reviewed in the United States on November 13, 2016

I had a Phillips Sonicare electric toothbrush for several years, and it finally died. I decided to replace it with the [redacted]

Rechargeable Electric Toothbrush with Bluetooth Connectivity [redacted] and I am very pleased with this new toothbrush. It leaves my teeth feeling very clean, I like the battery indicator and the travel case. Also, the instructions say that a full charge "...enables up to ten days of regular brushing (twice a day, 2 minutes)."While researching this toothbrush, I had several questions which I wasn't able to find answers for. Now that I have this toothbrush, I can answer those questions: 1) Can you turn off the Bluetooth? - Yes, press and hold both the on/off and mode button for 3 seconds 2) Does it come with any brush holder or so what kind? - Yes, it comes with a 4-brush

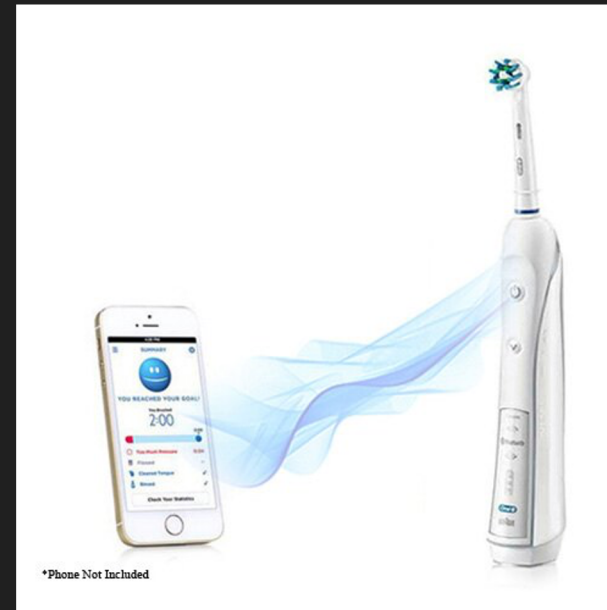
Solving users' problems?



+



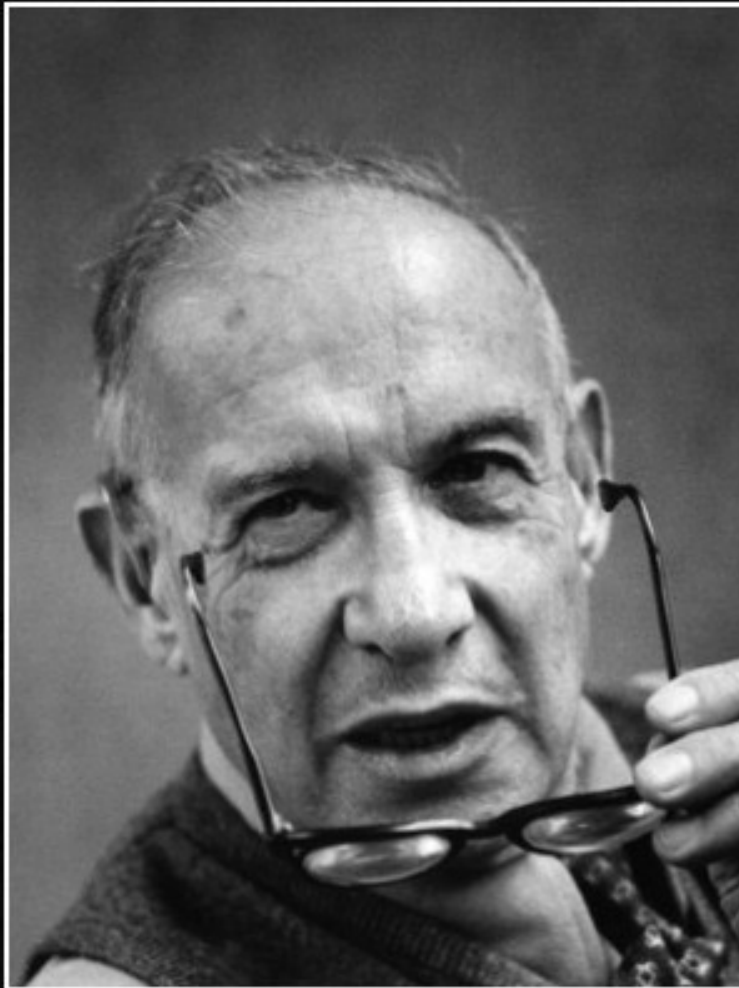
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Is this using tech to solve a nonexistent problem?



How might this have happened?



The manager who comes up with
the right solution to the wrong
problem is more dangerous than the
manager who comes up with the
wrong solution to the right problem.

— *Peter Drucker* —

AZ QUOTES



How do we avoid solving the wrong problem?



So, what is design?



Engineer a tech gadget because we can.



Solve your customer's problems.



Homework:

Write a madlib for your product.

Why does it exist and for whom?



FOUNDATION & PHILOSOPHY



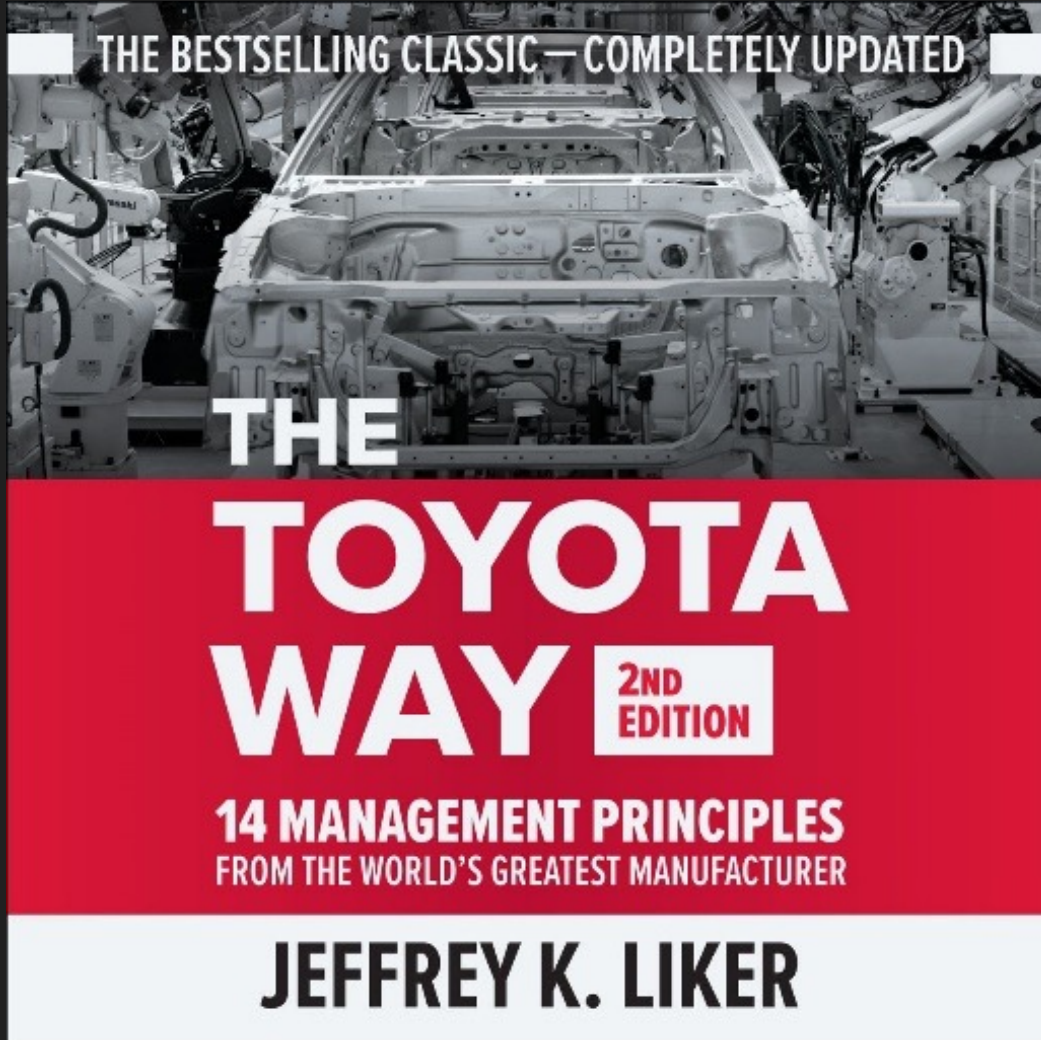
If you know the way broadly you
will see it in everything.

~ Miyamoto Musashi

AZ QUOTES



Foundation at Toyota in lean culture.



- Create Value
- Hands-On
- Customer-Focused
- Problem First



[Source: Vimont Toyota Laval - YouTube](#)

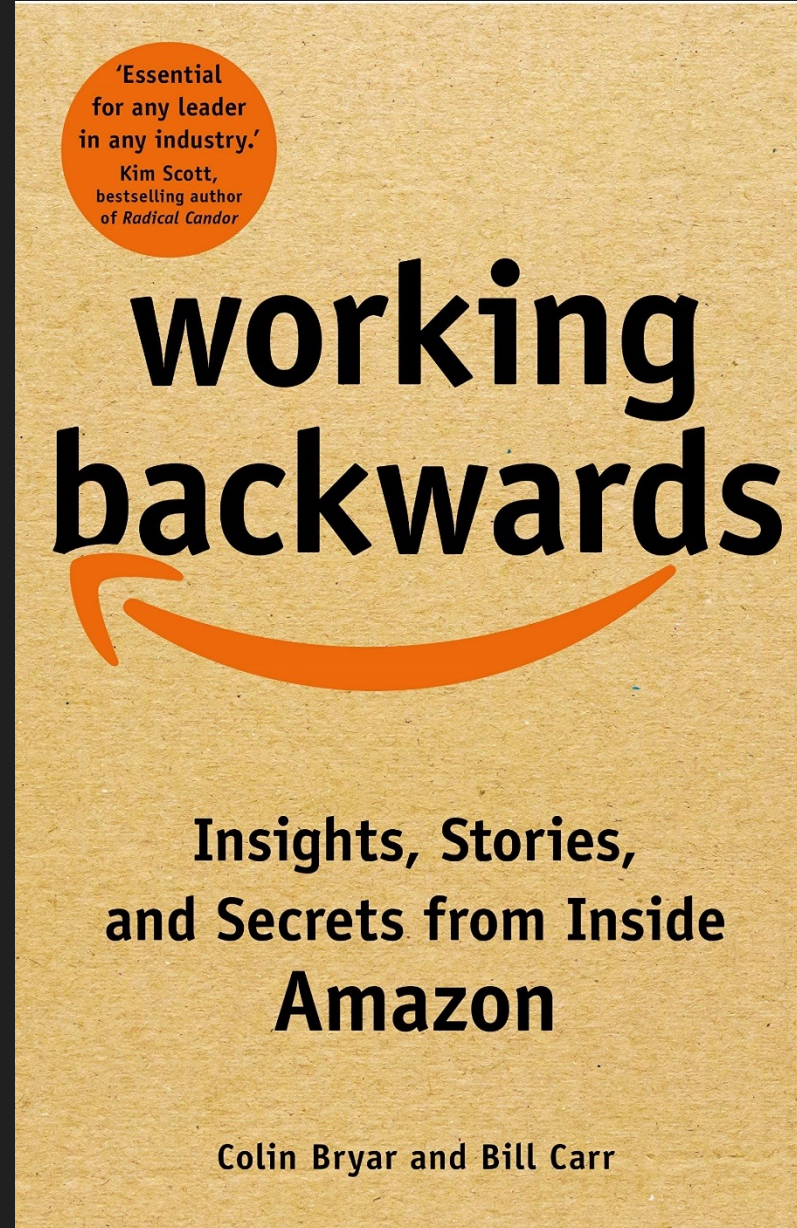
Research & Development



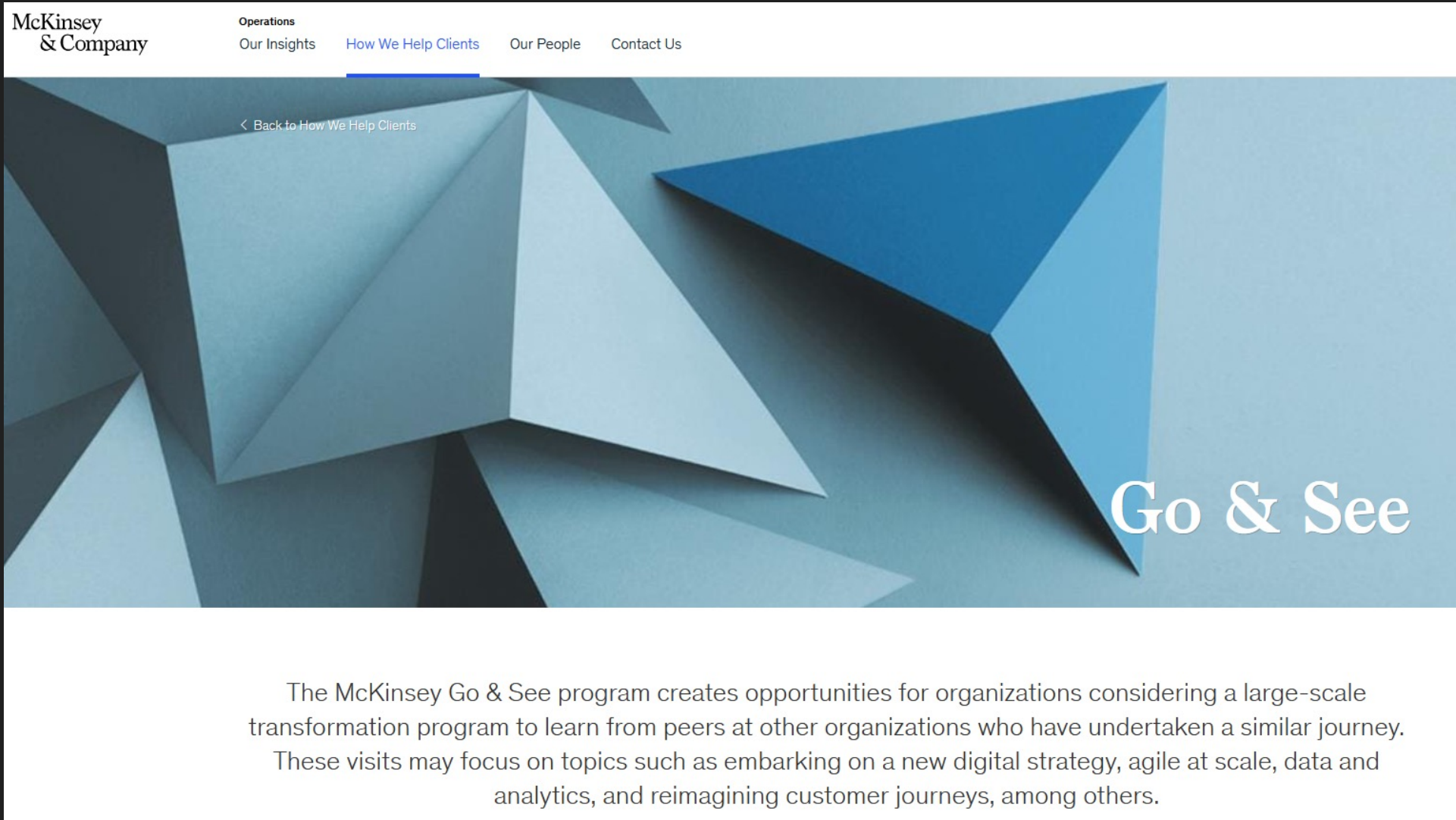
Source: <https://www.toyota.com/usa/operations/>

Engineering & Manufacturing

Not just true at Toyota



Not just true at Toyota



McKinsey & Company

Operations
Our Insights [How We Help Clients](#) Our People Contact Us

[← Back to How We Help Clients](#)

Go & See

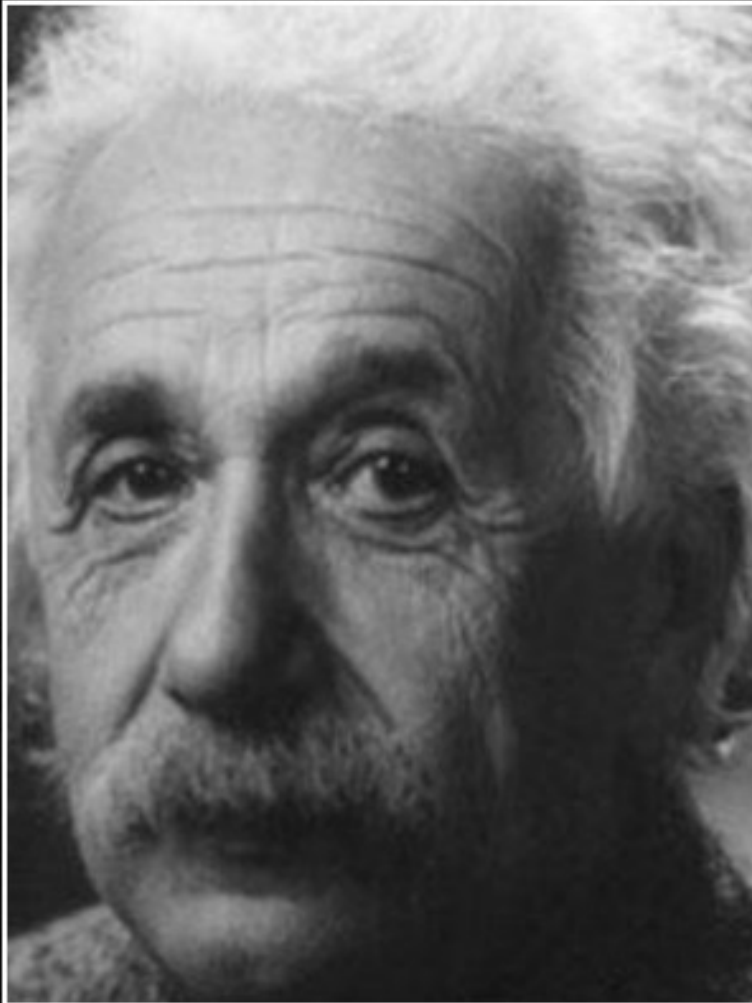
The McKinsey Go & See program creates opportunities for organizations considering a large-scale transformation program to learn from peers at other organizations who have undertaken a similar journey. These visits may focus on topics such as embarking on a new digital strategy, agile at scale, data and analytics, and reimagining customer journeys, among others.

Not just true at Toyota





DESIGN PROCESS DOUBLE DIAMOND FRAMEWORK

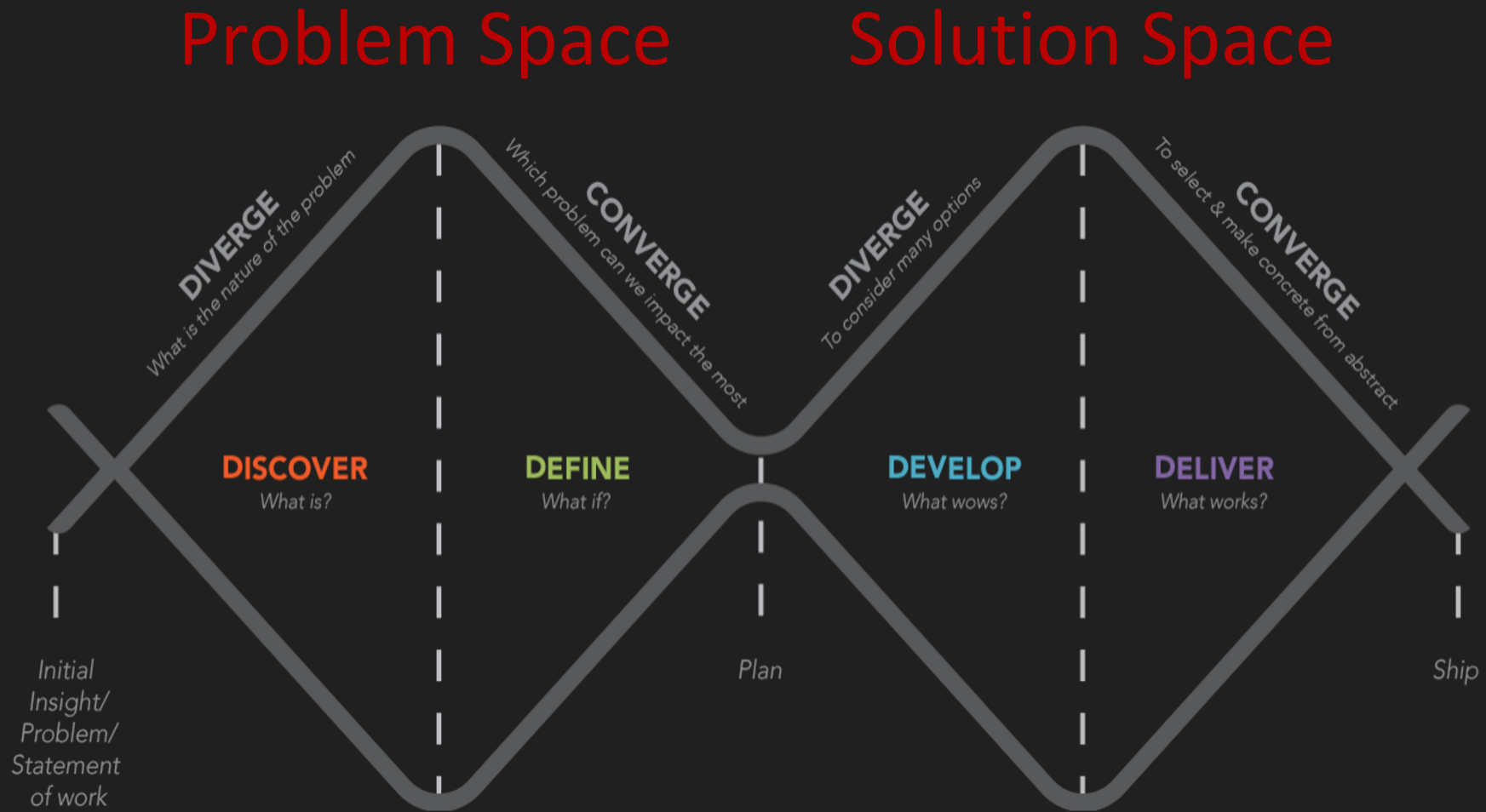


If I had an hour to solve a problem
I'd spend 55 minutes thinking about
the problem and 5 minutes thinking
about solutions.

— *Albert Einstein* —

AZ QUOTES

DOUBLE DIAMOND



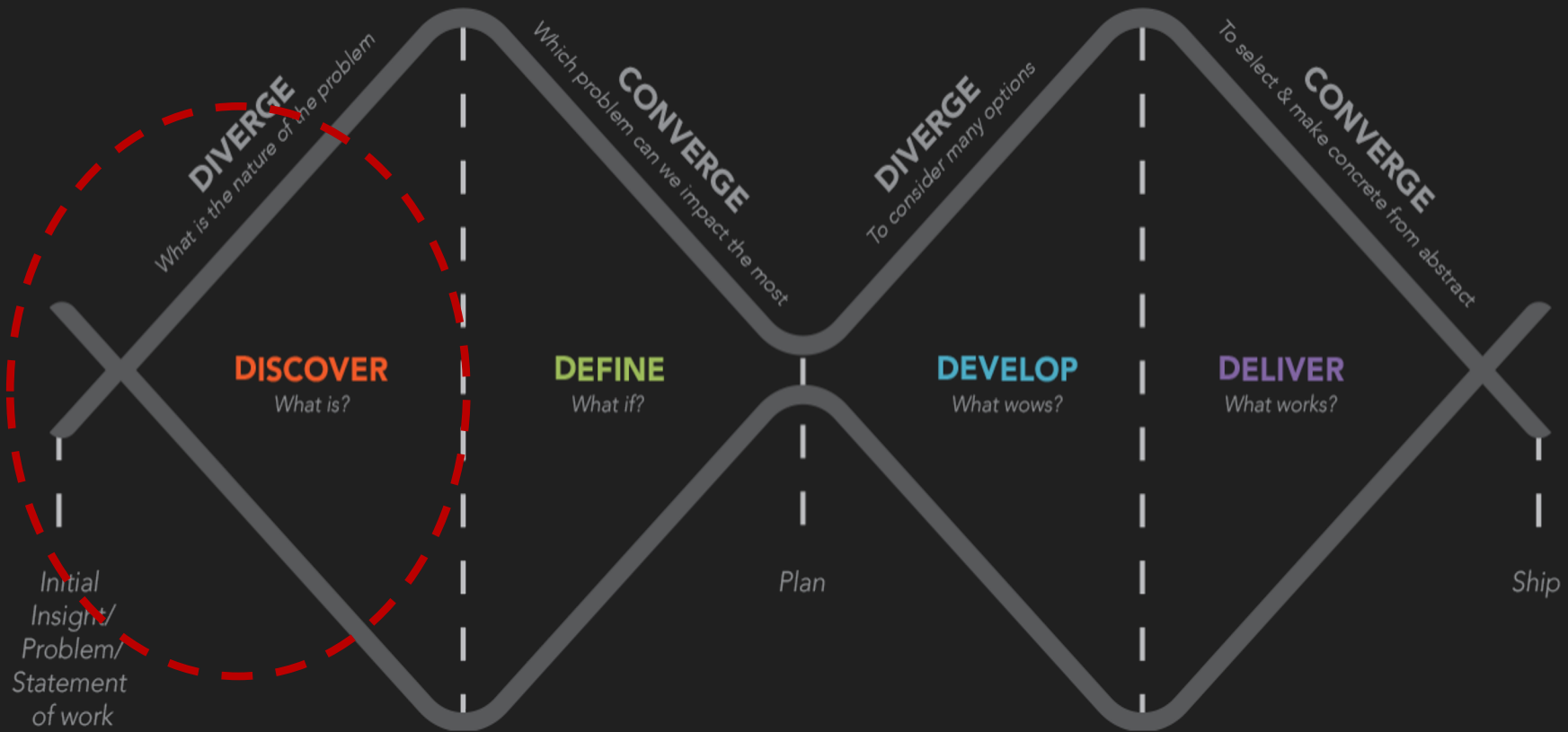
Iterate Throughout

Source: <https://www.nicepng.com/maxp/u2t4r5q8t4a9e6u2/>

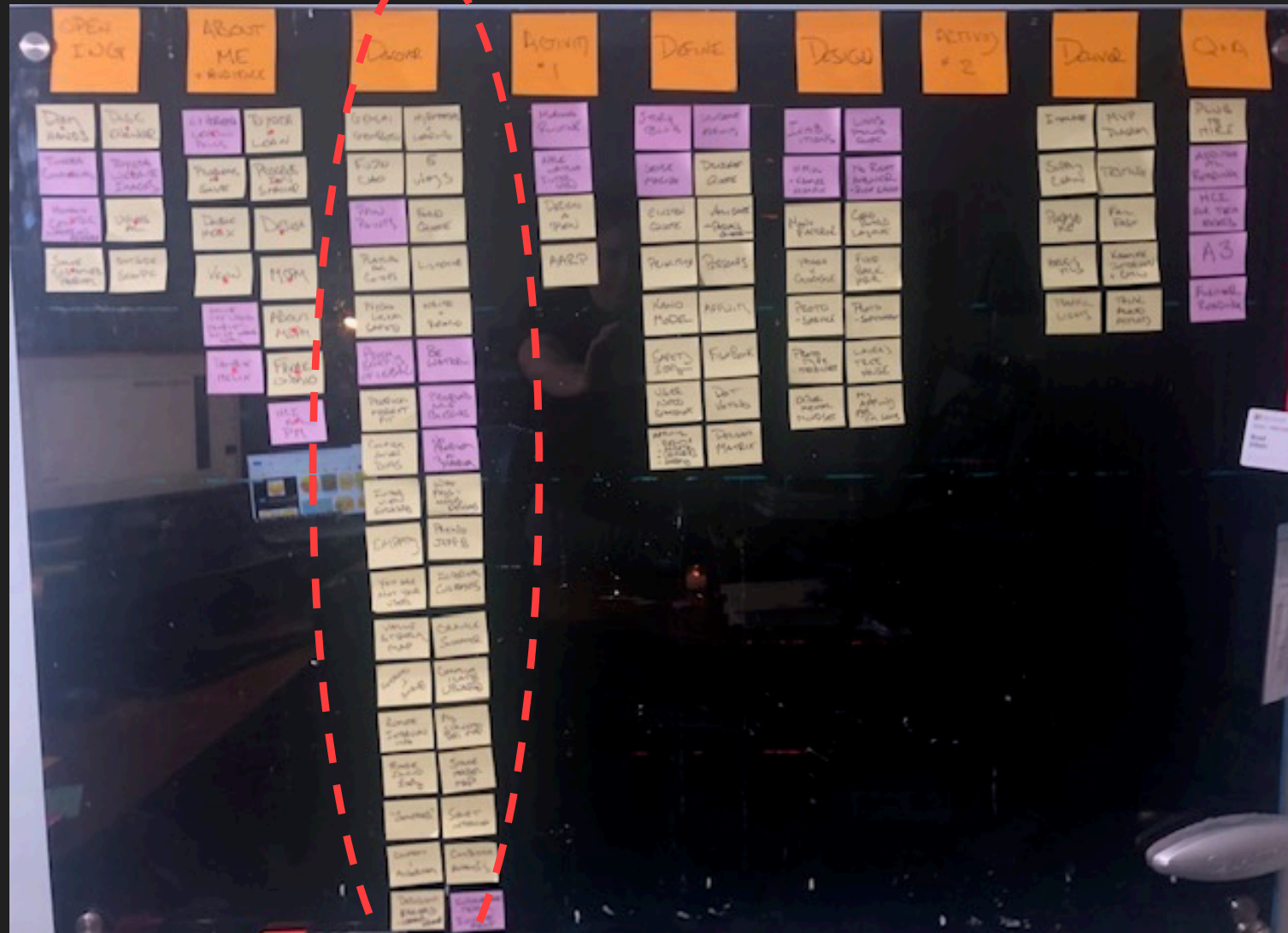


DISCOVER

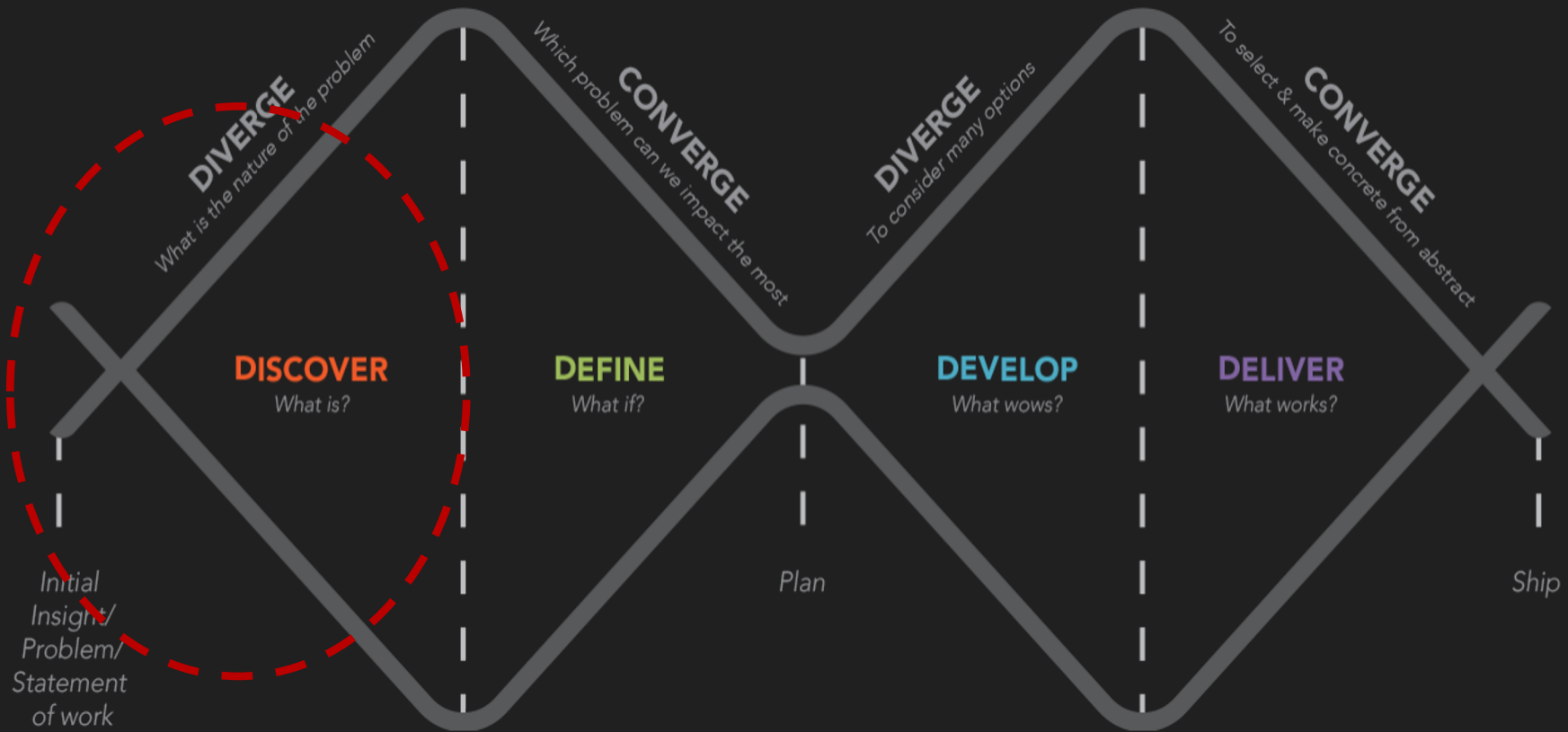
DISCOVER



DISCOVER - IMPORTANCE



DISCOVER



DISCOVER



Goals:

- Collect Data
- Empathize
- Observe

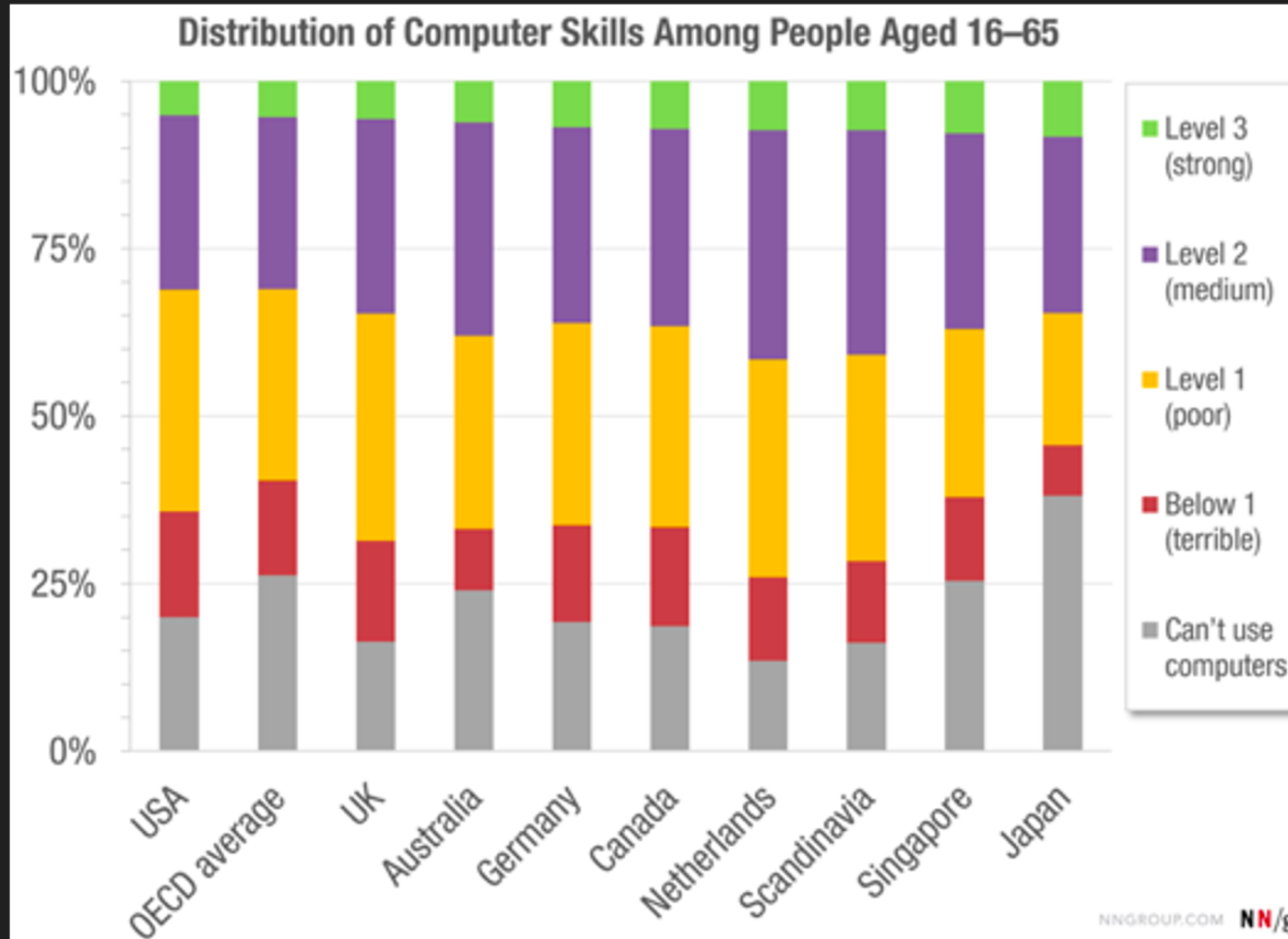
DISCOVER



Mindset:

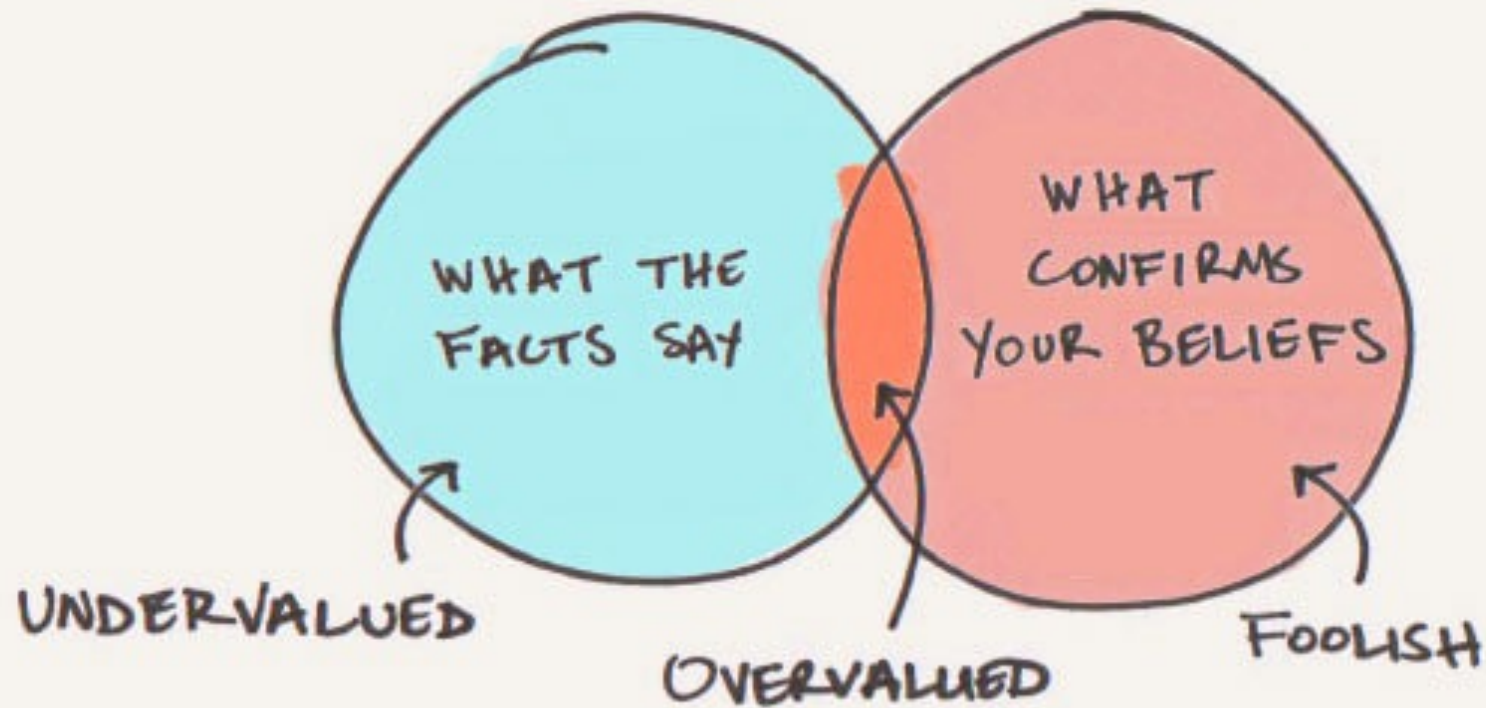
- Respectful
- Inquisitive
- Hands-on

DISCOVER – INTERVIEWEES



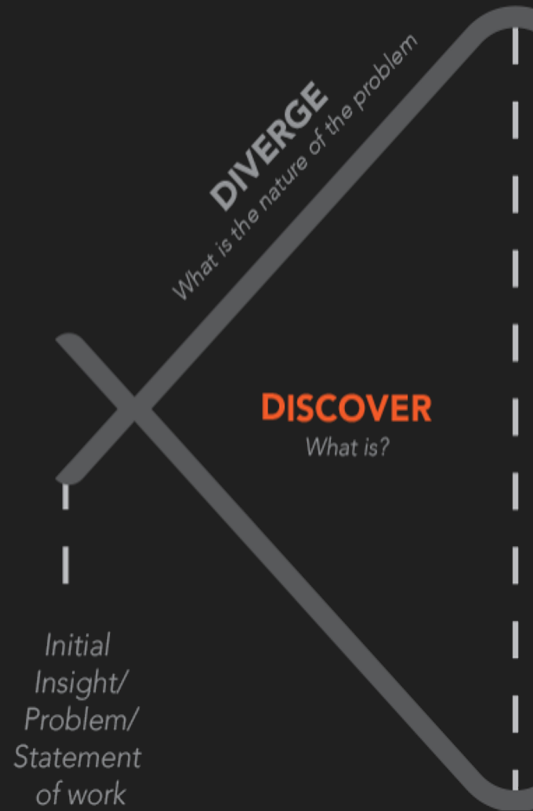
The user is not like me!

THE CONFIRMATION BIAS



JamesClear.com

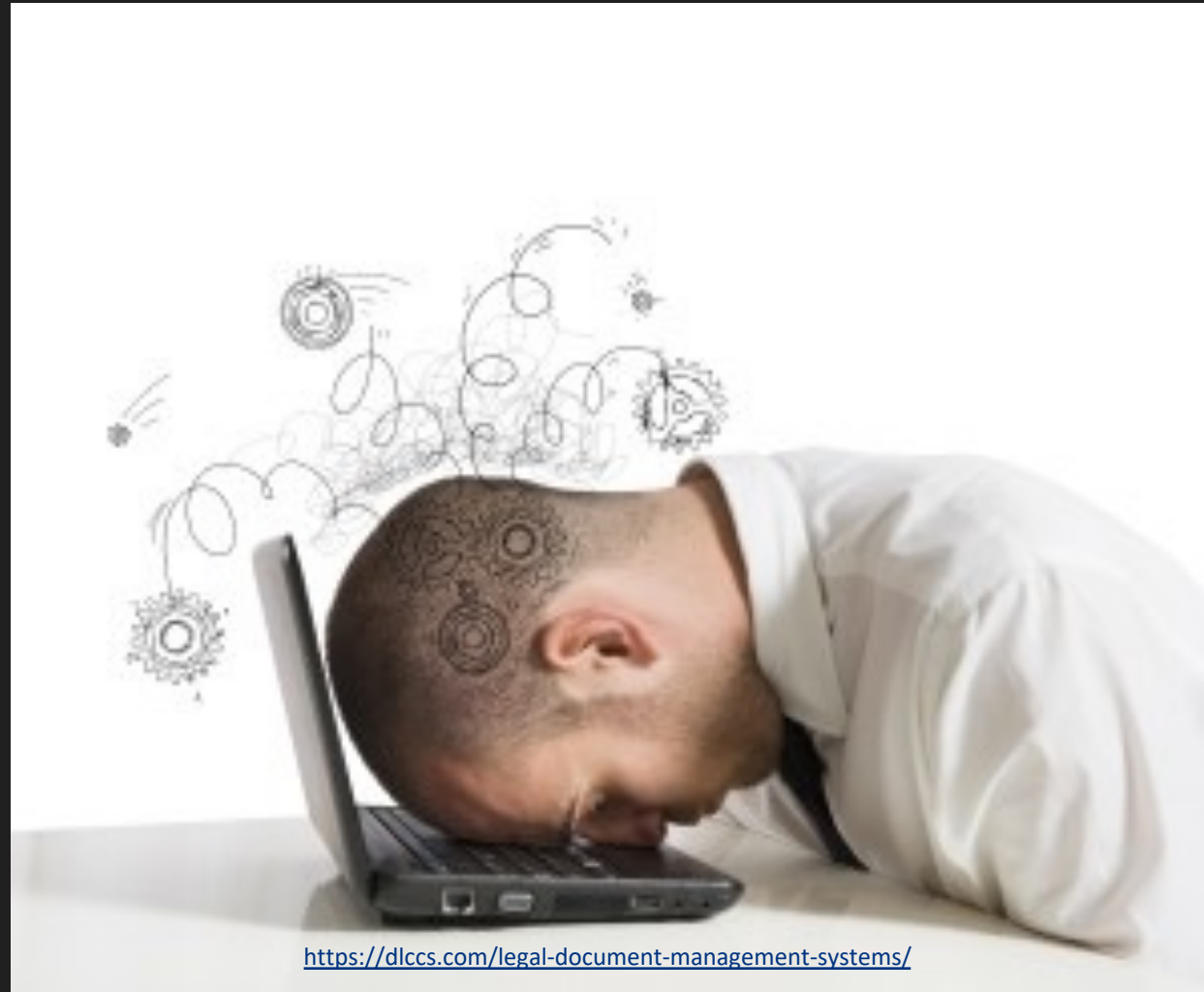
DISCOVER



Tactics:

- Contextual Interviews
- 5 Whys
- Journey Mapping
- Stakeholder Mapping

DISCOVER – Frustration Is Data

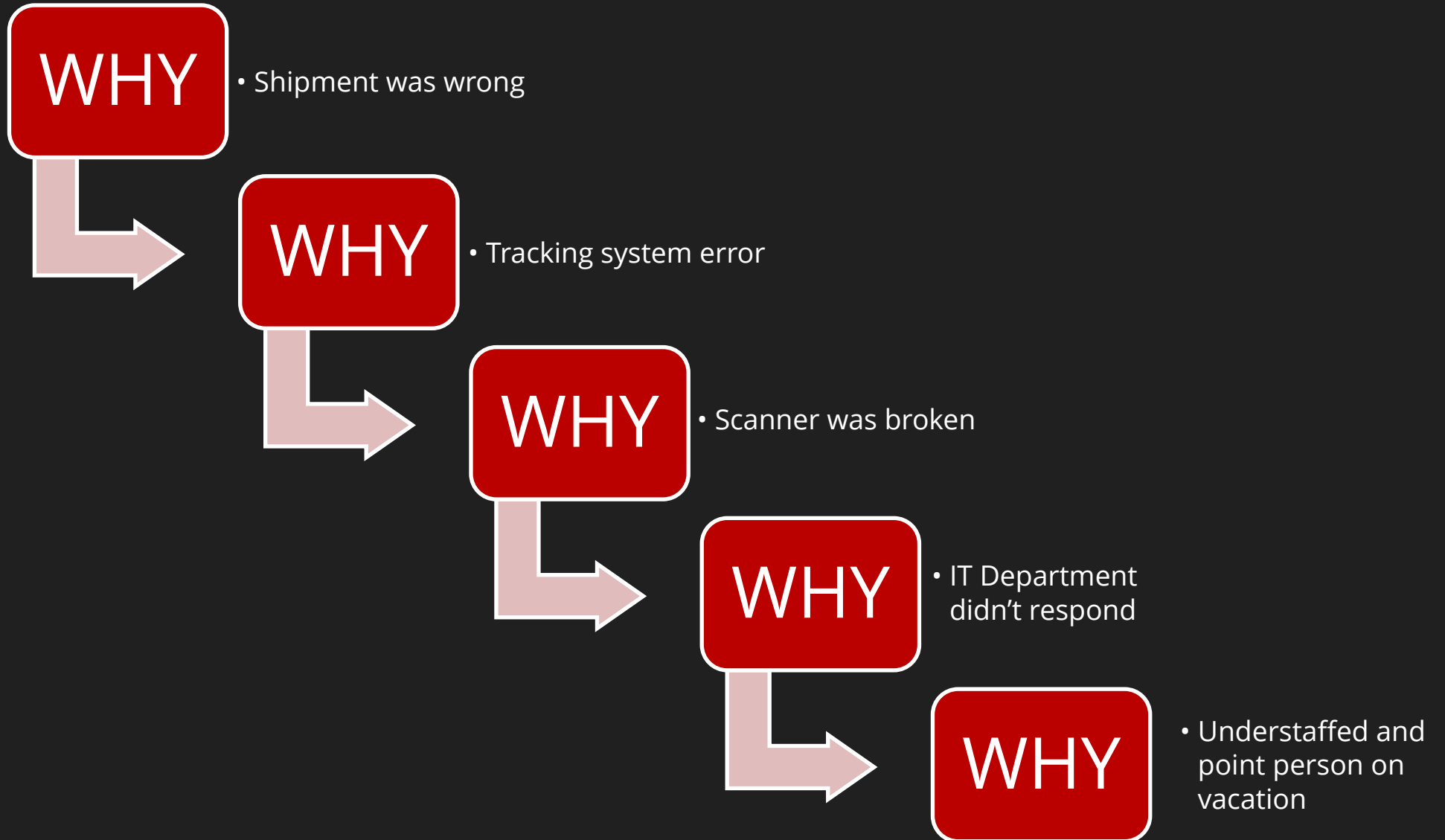


<https://dlccs.com/legal-document-management-systems/>

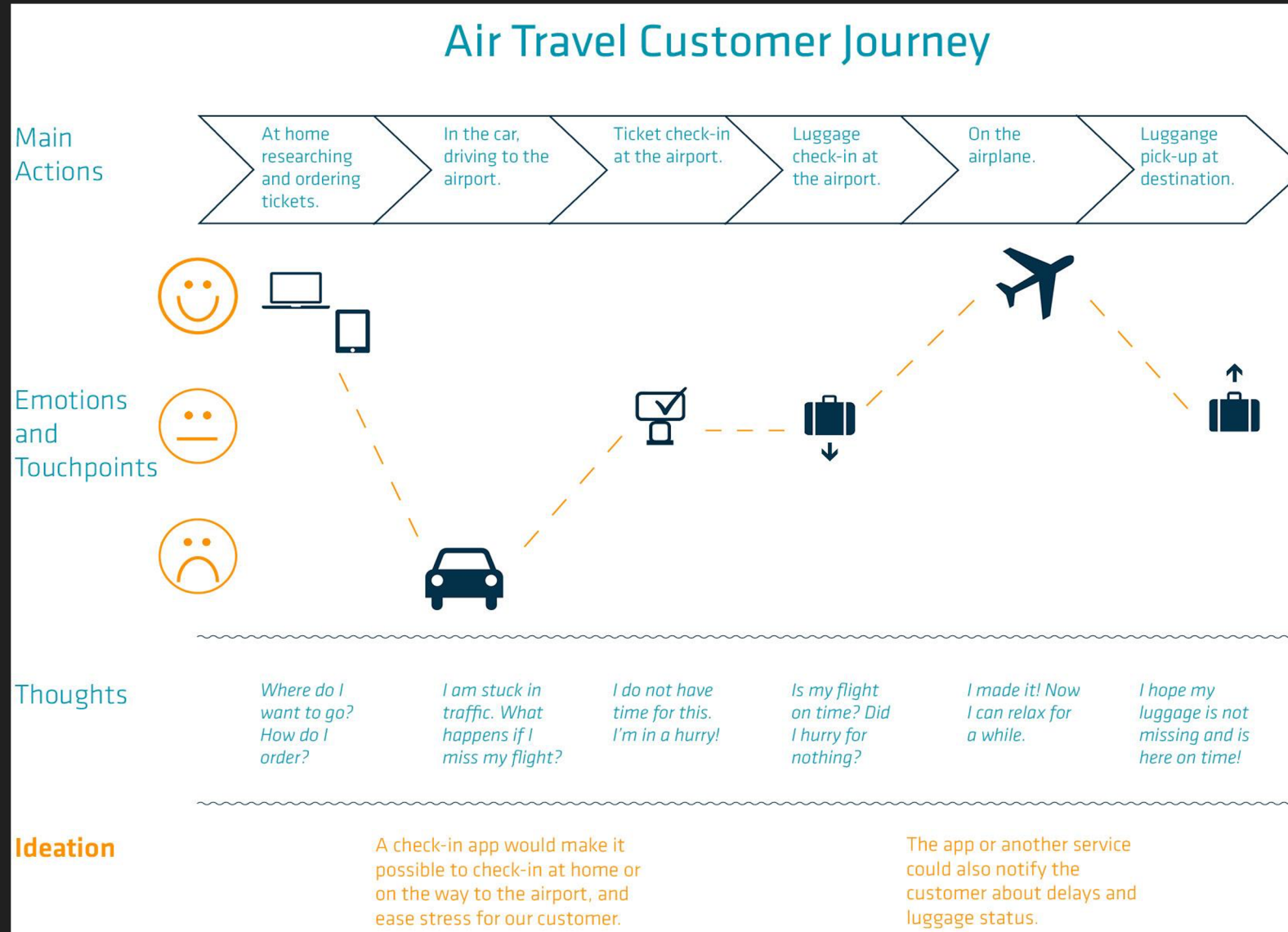
DISCOVER – Contextual Interviews



DISCOVER – 5 Whys



DISCOVER – Journey Mapping

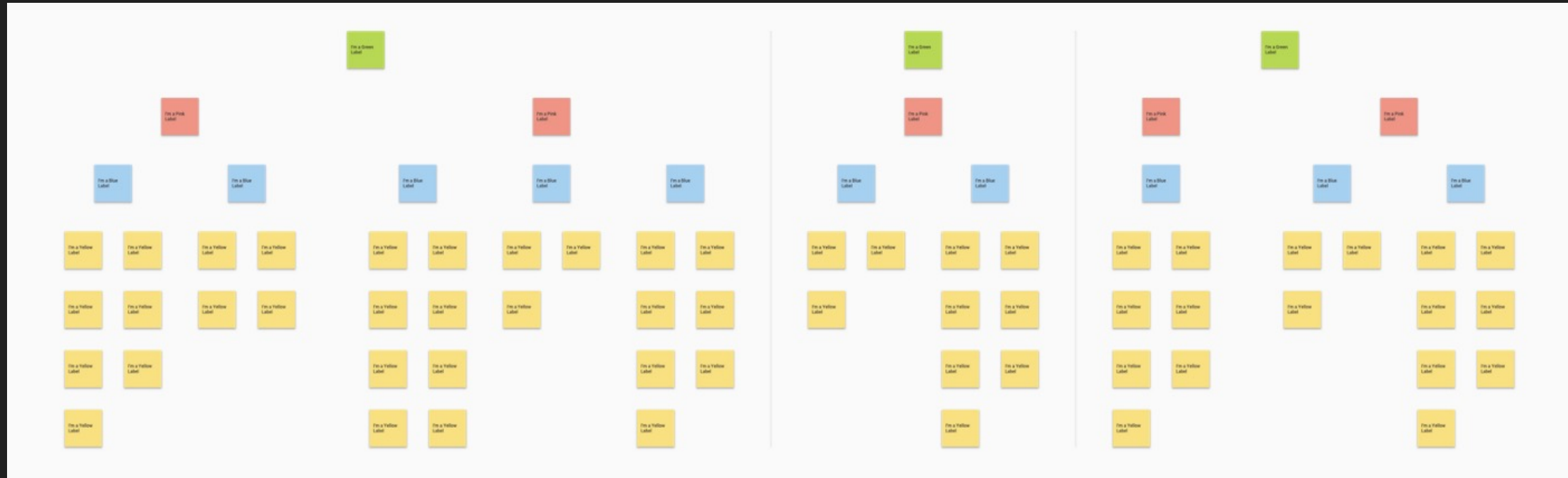


Source: UXPressia

DISCOVER – Contextual Interviews

A		B		C		D		E	
IN PERSON	SCS APPEAL	WORKED W/ BAD PMs	NEEDED A PM PATHWAY	TRIED INTERNAL TRANSFER	PMs GET RESPECT	4 YR EXP	INTERVIEW FOR PM APPOINT	CREATED PM FOCUS	CMU REVOLUTION
NO GRE BIG +	CONS. MY TECH MGR TEPPER	COMP: 0 ORGON	AUTONOMY (NOT @ RISK)	X VAS 87 EXP	JOB SATISFACTION PM = FUN	SOURCE DAD	YEAR = 4 YEARS	TRIED PM INTERVIEW	NOW OR NEVER
LEFT OUTCOMES	INTERESTING JOB	1 YEAR	COMP: MBA NOT TEPPER	TRIED FUNDING	CMU > TEHN SOURCE PMIDS	1 YEAR	VENN ON WEBSITE	CAPSONE EXP APPEAL	MBA
MBA TRADITION	9-10 YR EXPERIENCE	LEFT	FOUND THEN ADS	QUICK LAUNCH 1-YEAR	COMP: USC TEHN BUS DES	LINKEDW	+ OUTCOME	1 YEAR	LINKEDW
LEFT	PM FOCUS	+ OUTCOMES	OUTCOME DATA BIG FACTOR	ASKED STUDENT AMBASSADOR	CONFUSED MSUM v. MSUM	COMP: NYO TECH NORTHWESTERN	LUCK: OFF-CYCLE	+ OUTCOME	8 YRS OFF PM
INTERNAL TRANSFER INTERVIEW	SOURCE DAD?	IN PERSON	CURRICULUM	MSPM \neq MUMI MBA	PM FOCUS	IN PERSON	PEER RELATION SHIPS	ROI	+ DESIGN
JOB SATISFACTION	APPLIED FOR PM PREVIOUSLY	+ DESIGN	5 YR EXP	+ REMOTE	MBA ALREADY	PM FOCUS	PM EXP \neq KNOWLEDGE	IN PERSON	
MANAGER'S DECISION APPEAL	+ OUTCOME			SOURCE RESEARCH					
EXTERNAL MANAGER									

DEFINE - AFFINITY



<https://uxplanet.org/free-sketch-template-for-building-a-meaningful-affinity-diagram-during-the-ux-process-f832e081782d>

Design Activity #3



ACTIVITY #3 – Sketch a hypothetical user's journey of your product or that of a competitor.



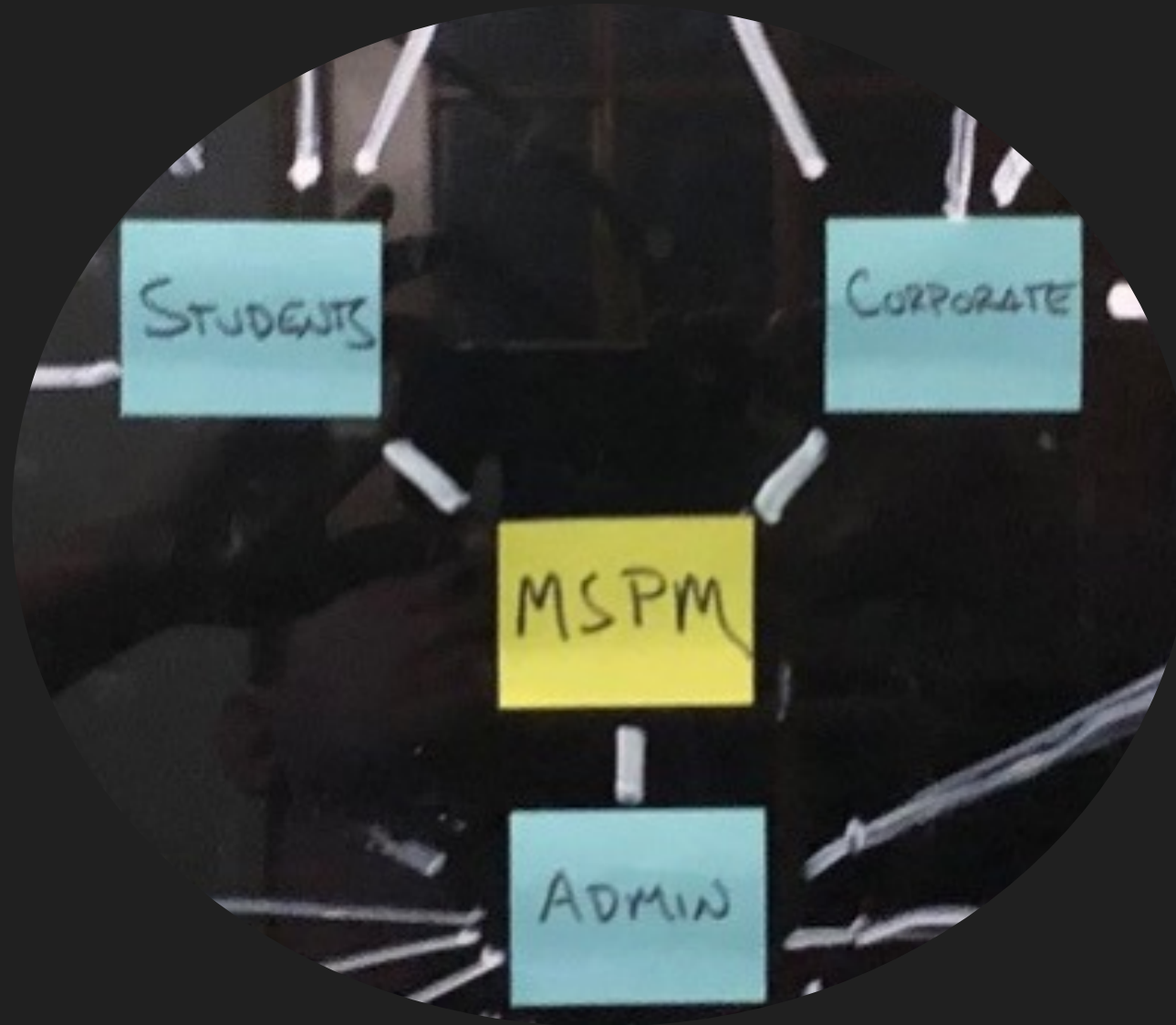
Homework:

Make it real.

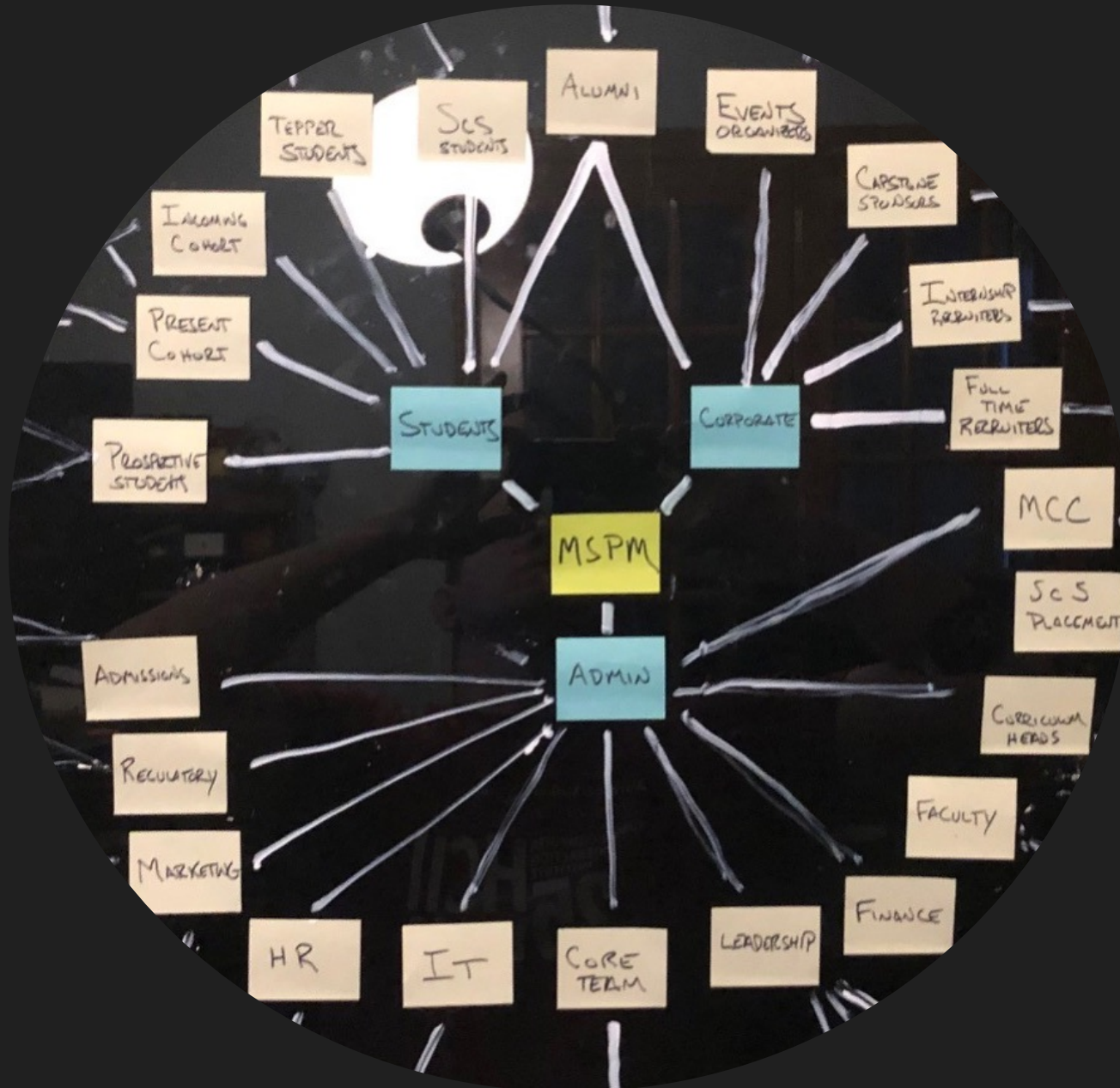
Use your own product and map your journey. Do the same for a competitor's product.

Follow a user through your workflow. Observe their pain points and moments of joy. Do the same with a user of a competitive product.

DISCOVER – STAKEHOLDER MAPS



DISCOVER – STAKEHOLDER MAPS



An abstract graphic featuring a dark blue background with a grid of intersecting red, green, and yellow lines. The lines are arranged in a pattern that creates a sense of depth and movement, with some lines appearing more prominent than others. The overall effect is a complex, layered geometric design.



Design Activity #4



ACTIVITY #4 – Sketch your own stakeholder map.



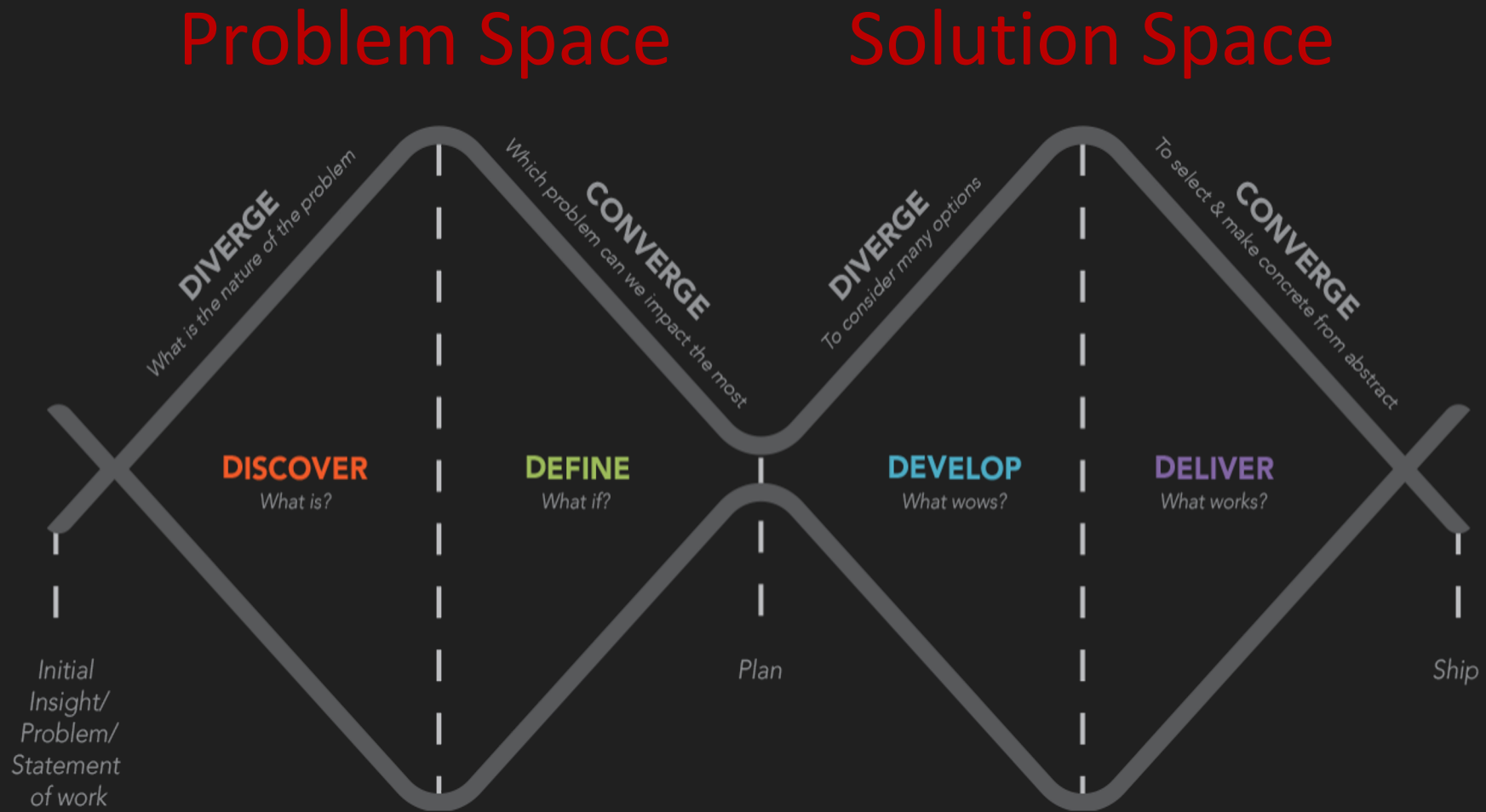
Homework:

Do you have adequate communication with all stakeholders?

Do you understand how their needs affect your design process?

How confident are you?

DOUBLE DIAMOND



Iterate Throughout

Source: <https://www.nicepng.com/maxp/u2t4r5q8t4a9e6u2/>

WRAP-UP



Go see, ask why, show respect.

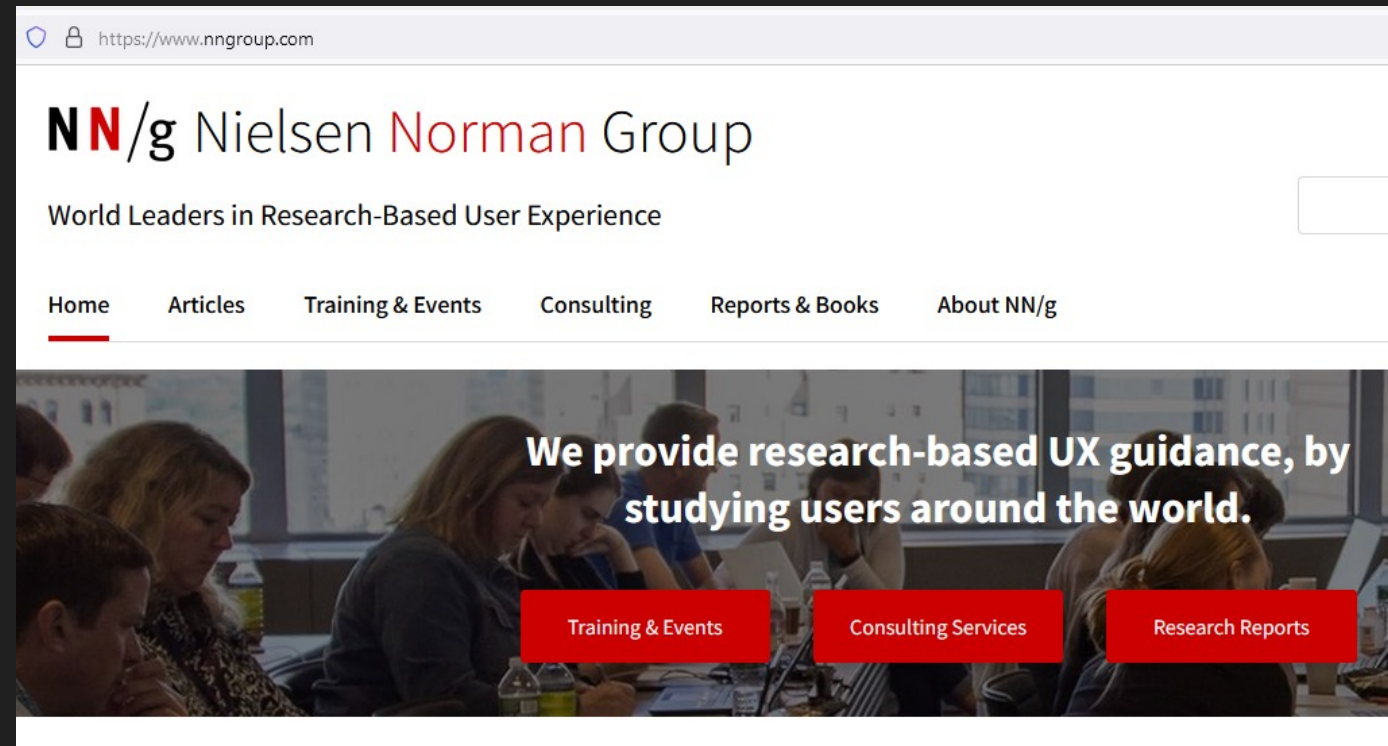
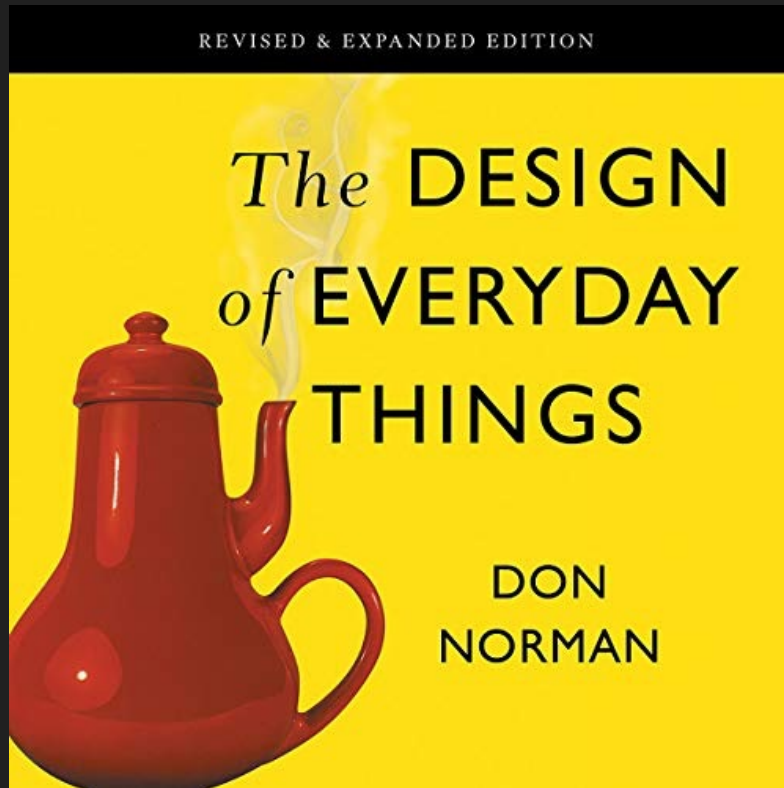
— *Fujio Cho* —

AZ QUOTES

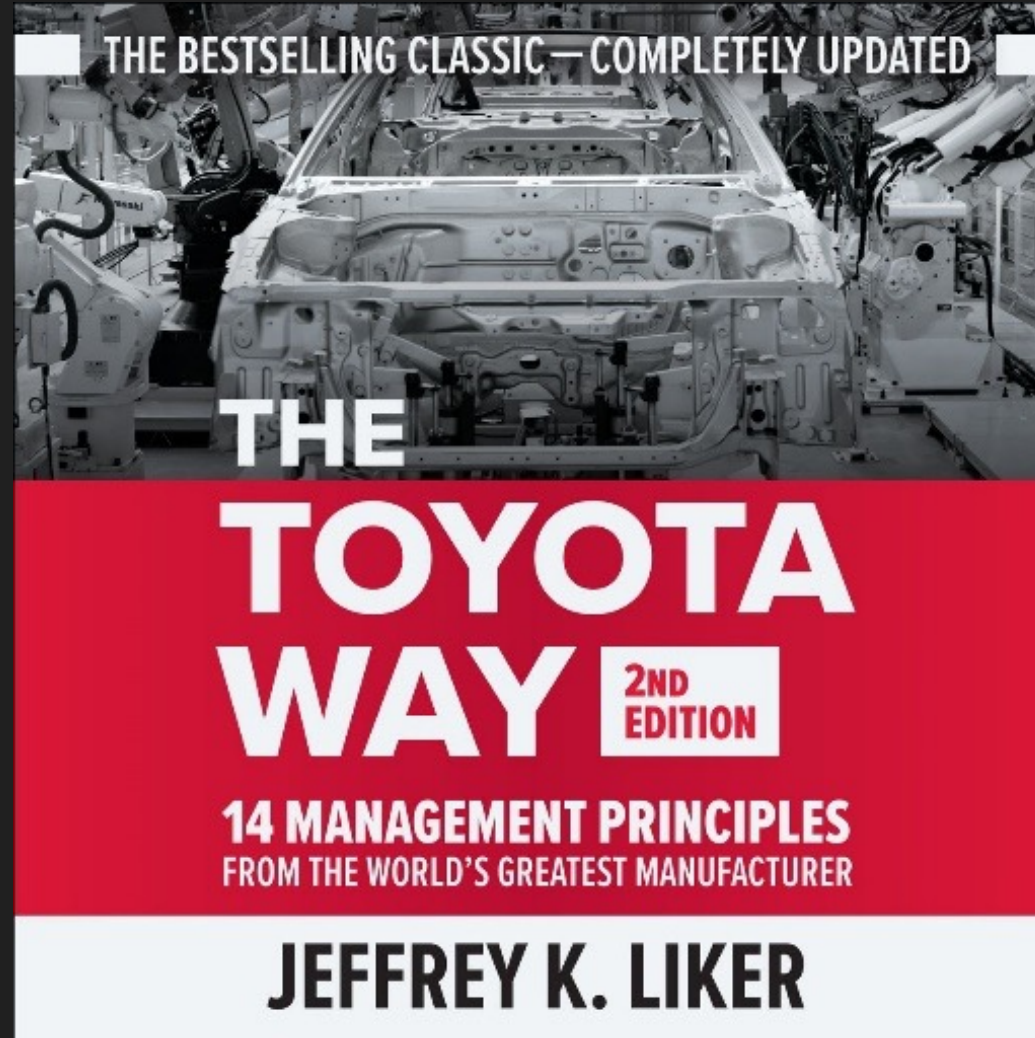
Assumed Goals

- Why? Importance of “getting dirty.”
- How? Exploring a problem.
- What next? Resources and activities.

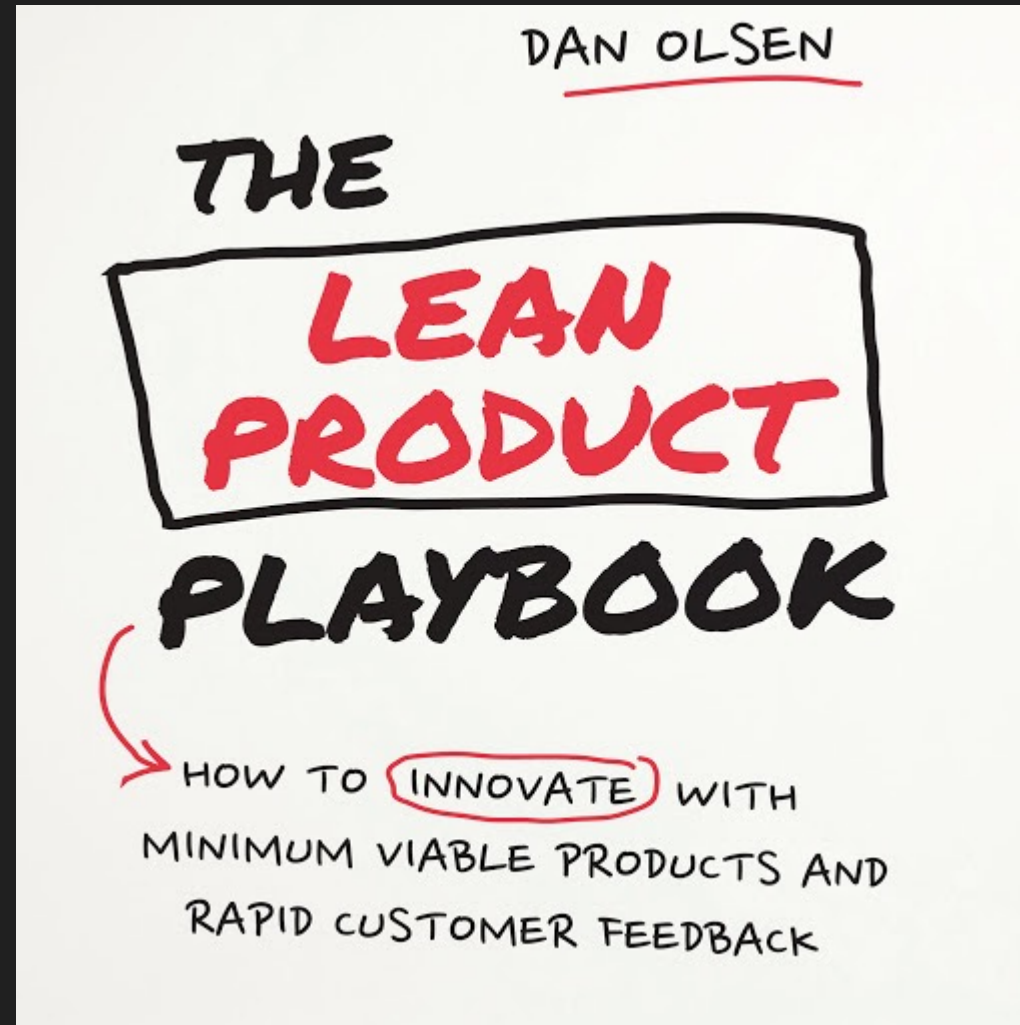
Resources



Resources



Resources



Resources

**Carnegie
Mellon
University**

Tepper School of Business +
School of Computer Science
MS in Product Management

Contact me...

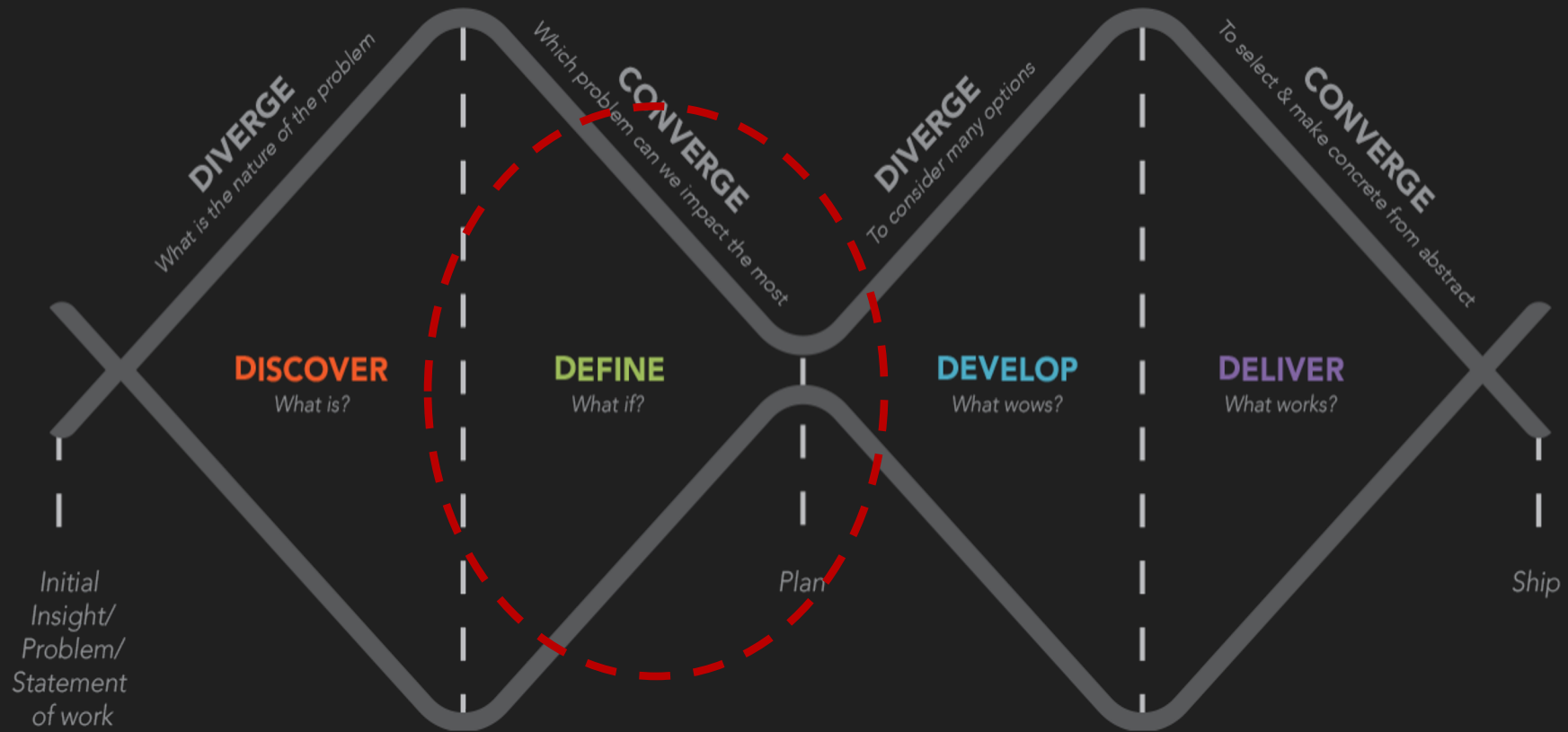


Brad Eiben
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DEFINE

DEFINE



DEFINE

Goals: interpret, synthesize, prioritize

Mindset: analytical, collaborative

Tactics:

- Affinity Diagram
- Decision Matrix
- Personas

A

IN PERSON	SCS APPEAL
NO GRE BIG +	CONS. MY TECH MGR TEPPER
LEFT OUTCOMES	INTERESTING JOB
MBA TRADITIONAL	9-10 YR EXPERIENCE
GO	PM FOCUS
INTERVIEW TEPPER	SOURCE DAD?
JOB SATISFACTION	APPLIED FOR PM PREVIOUSLY
MBA'S DEGREE APPEAL	+ OUTCOME
ENROLL TEPPER	

B

WORKED W BAD PMs	NEEDED A PM PATHWAY
COMP: U OREGON	AUTONOMY (NOT @ TEPPER)
1 YEAR	COMP: MBA NOT TEPPER
LEFT	FOUND THEIR ADS
+ OUTCOMES	OUTCOME DATA BIG FACTOR
IN PERSON	CURRICULUM
+ DESIGN	5 YR EXP

C

TRIED INTERNAL TRANSFER	PMs GET RESPECT
X VAS 87 EXP	JOB SATISFACTION PM = FUN
TRIED FUNDING	CMU > TEUN SOURCE PROBS
QUICK LAUNCH 1-YEAR	COMP: USC TEUN BUS DES
ASKED STUDENT AMBASSADOR	CONFUSED MSBA v. MSPM
MSPM \neq MUI MBA	PM FOCUS
+ REMOTE	MBA ALREADY
SOURCE RESEARCH	

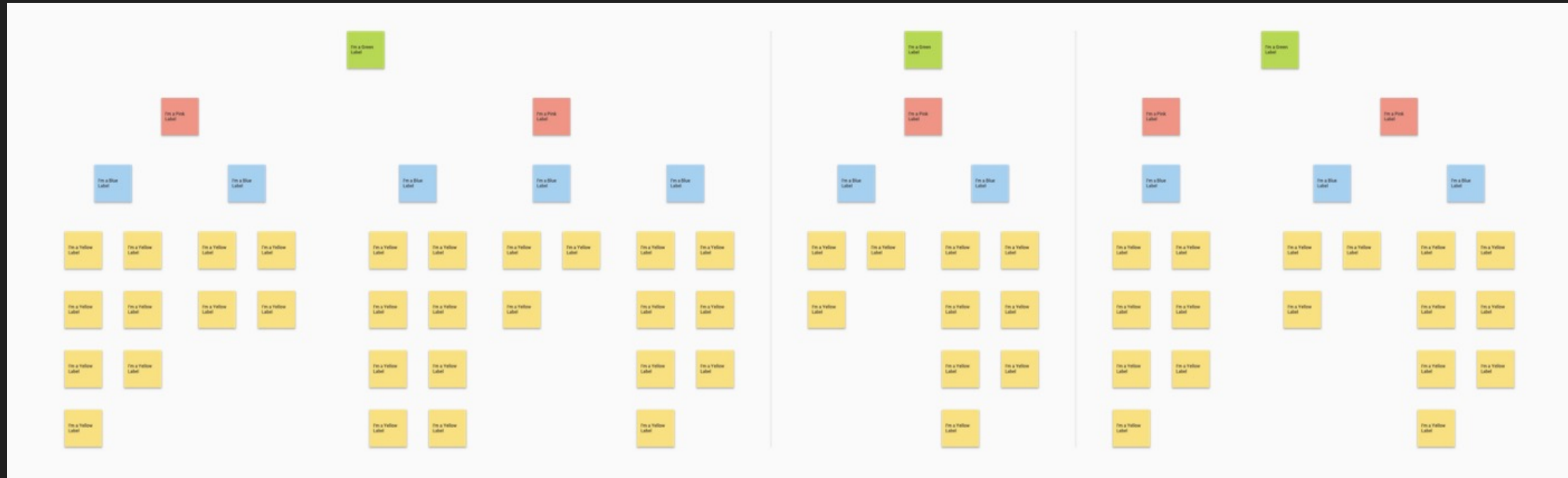
D

4 YR EXP	INTERVIEW FOR PM (PROB)
SOURCE DAD	YEAR = 4 YEARS
1 YEAR	VENN ON WEBSITE
LINKEDW	+ OUTCOME
COMP: NYU TEUN NORTHWESTERN	LUCK: OFF-CYCLE
IN PERSON	PEER RELATION SHIPS
PM FOCUS	PM EXP \neq KNOWLEDGE

E

CREATED PM FOCUS	CMU REPUTATION
TRIED PM INTERVIEW	NOW OR NEVER
CAPSONE EXP APPEAL	MBA
1 YEAR	LINKEDW
+ OUTCOME	8 YRS OFF PM
ROI	+ DESIGN
IN PERSON	

DEFINE - AFFINITY



<https://uxplanet.org/free-sketch-template-for-building-a-meaningful-affinity-diagram-during-the-ux-process-f832e081782d>

DEFINE - PERSONA



THE LIFER

I frequently use VA services and plan to continue doing so. I look to the VA to play a supporting, community building role in my life. I am grateful for my VA benefits, but I get frustrated when problems arise which break up the continuity of my care - like when my doctors change too frequently and when I can't transportation to VA facilities. Generally, I try to speak highly of the VA and want to contribute to making it work better for fellow Vets.



EXPECTATIONS

- That the VA cares and takes the time to understand my needs and story
- Cost of VA services won't rise
- That I can reach someone at the VA anytime I need anything

NEEDS

- I don't want to tell my story over and over, especially after using the VA for so long
- I want to know what's going on with my services and especially my benefits
- I'd like patient, nurturing healthcare

DESIGNING FOR THE LIFER

Allow me to pause and ask questions, and to have access to a VA professional to speak with frequently and in a timely manner. Include info about local Veteran support chapters in communications. Provide me with a single online tool or a call center where they can refill prescriptions, see test results, and maintain all aspects of the VA needs. Give high level of feedback loops so that I can be assured my request was submitted and is being handled.

DEFINE - PERSONA

2 // MEET VA'S USERS // PERSONAS



THE LIFER

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THE TRANSACTIONAL

I joined the military largely based on the promise of a the opportunities it would afford me in life. I plan to use VA services to 'get my life on track' post-service. I tend to be in the younger generation of Vets (OIF, OEF, OND). I am often engaged in the Veteran community, see other Veterans as allies and I advocate in helping folks understand and use their benefits. But I will share my frustrations if I feel like the VA isn't helping me as promised.



EXPECTATIONS

- That the VA will deliver on it's promises and help me to access the me the benefits I've earned
- That the VA has benefits available to my family
- That it'll be a headache, and I'll have to figure it out on my own with the help of my network

NEEDS

- Accurate expectations
- Financial support at times, especially if I grow a family
- To feel like I am part of a community

DESIGNING FOR THE TRANSACTIONAL

Explain VA benefits and services comprehensively and early so that life plans can be made upon quickly post-service. Include lists of phone numbers, websites, resources, and why they are relevant. Auto-enroll when it's possible.

Present benefits as they relate to life events (school GI Bill, employment, Job resources, family, home loan). Visualize processes, timelines and how I should be prepared.



THE JUST-IN-CASE

I am proud of my service, but don't need the VA and plan on using it only as a backup. Mature and organized by nature, I have all of their papers in order with the VA and have a good idea of what I am eligible for.

I am grateful for the benefits available to me, but see working with the VA as a tradeoff for my time and will likely only lean on the VA as backup plan, to make sure my family is taken care of.



EXPECTATIONS

- That I'll likely never need VA benefits
- That the VA will be there for me if I need it
- That there are benefits available to my family
- Private benefits are of higher quality & greater ease

NEEDS

- Peace of mind
- To be assured that all documents are in line
- To easily get in touch with one person about one question

DESIGNING FOR THE JUST-IN-CASE

Offer straightforward information about VA benefits that is easy to then communicate to others. Clearly articulate what is available, when, and to whom involved in my life.

Establish an online portal or phone system where both Veteran and the VA can see that all of paperwork is up-to-date and notify me if something is missing.



THE INFREQUENT

I really don't think very much about the VA. I have used VA benefits in my lifetime, yet often years will go by between those interactions.

This might be because I live in a place where it's difficult to access VA services, because I am financially comfortable or because it seems like too much hassle. I tend to prefer quick interaction - a short phone call or a few clicks on a website.



EXPECTATIONS

- The VA is slow - like any bureaucracy
- The VA is for "other, injured Vets who need it more"
- Someone will tell me when and if I am eligible for something

NEEDS

- To be able to quickly navigate processes
- To be reminded every few years of how the VA might be able to help me

DESIGNING FOR THE INFREQUENT

Provide ways for me to learn about and access benefits both through third parties (i.e. at the bank when securing a home loan).

I will most likely use VA services if I can a) see the value for my life and b) accomplish my goals in convenient, simple service interactions. Offer me easy-to-use websites and the ability to speak with someone.

DEFINE – DECISION MATRIX

A	B	C	D	E	F	G	H
	ITEM	IMPACT	FEASIBLE + RISK	COST	TIMING	OTHER	OVER ALL
	Add / improve PPE. New mechanic style work gloves. Make sure enough equipment is available	5	5	5	5		20
	Add safety attitude dialogue to every safety meeting. Get employees to define and find bad safety attitudes	5	5	5	5		20
	Implement a safety reward program - Random raffle tickets. Monthly drawing	5	5	5	5		20
	Have every employee perform a department safety inspection. Do this weekly until 1 full roster rotation is completed.	5	5	5	5		20
	Enforce disciplinary action on safety violations	5	3	5	5		18
	Chart department accident rates and display. Look a number of accidents VS accident rate	3	5	5	5		18
	Create designated walk ways through department. 3 feet wide?	3	5	5	4		17
	Ergonomic assement of the Tool room	3	5	3	5		16
	Improve shop work space. Limit number of pallets in the department. Designated storage areas. Overflow area?	3	3	5	5		16
	Exercise program - Strecthing	2	1	5	5		13
	Change dress code to no shorts or sleeveless shirts.	2	1	5	3		11
	Setup proficiency tests for Toolmakers. Levels?	4	1	2	1		8
	Add new brighter lighting to department	3	1	1	1		6
	Mold storage racks for long term mold/job storage. *Requires additional forklift added to department	2	1	1	1		5



DEVELOP

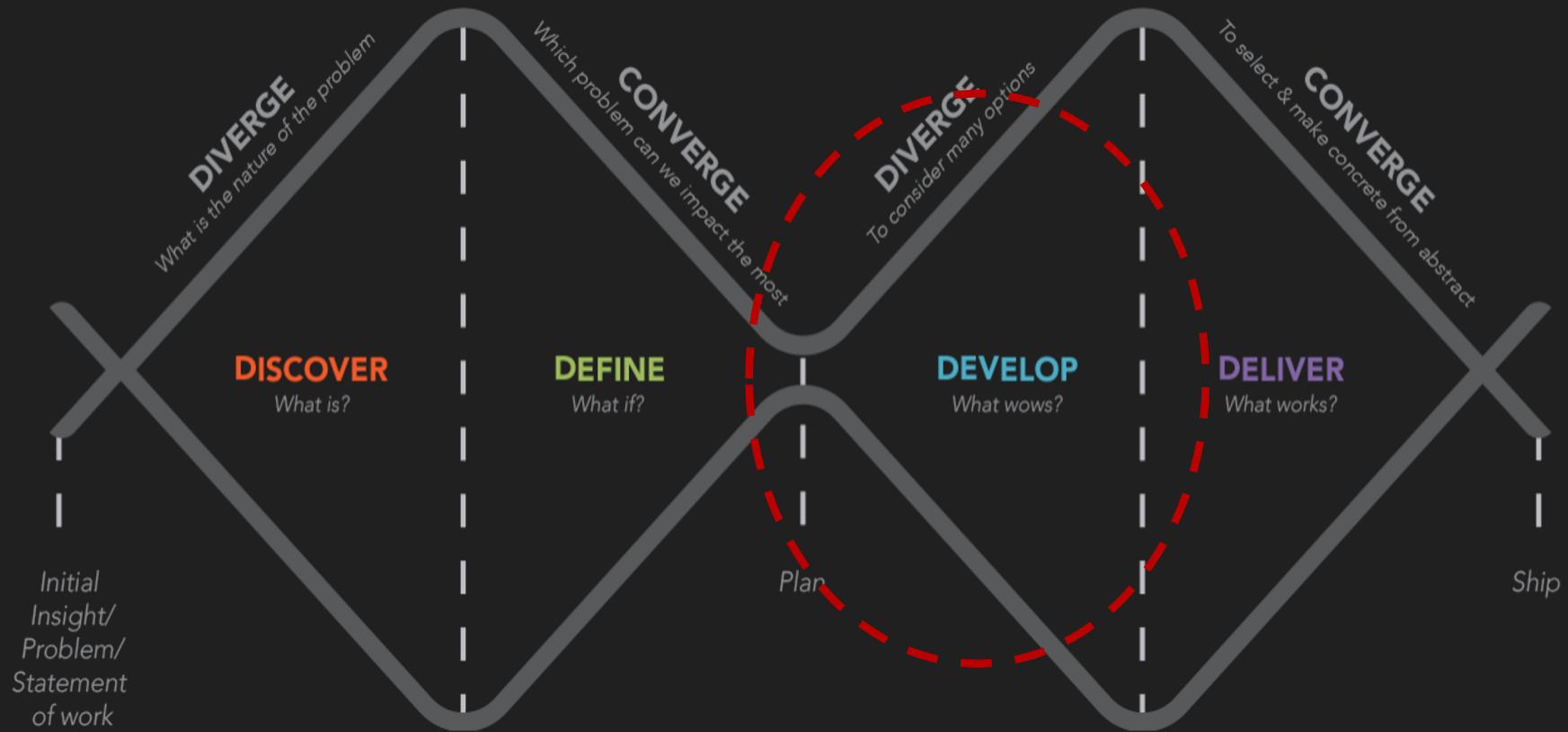


The best way to have a good idea is
to have a lot of ideas.

— *Linus Pauling* —

AZ QUOTES

DEFINE





DESIGN

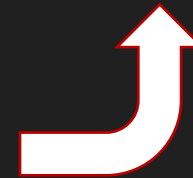
Goals: ideate, experiment, prototype

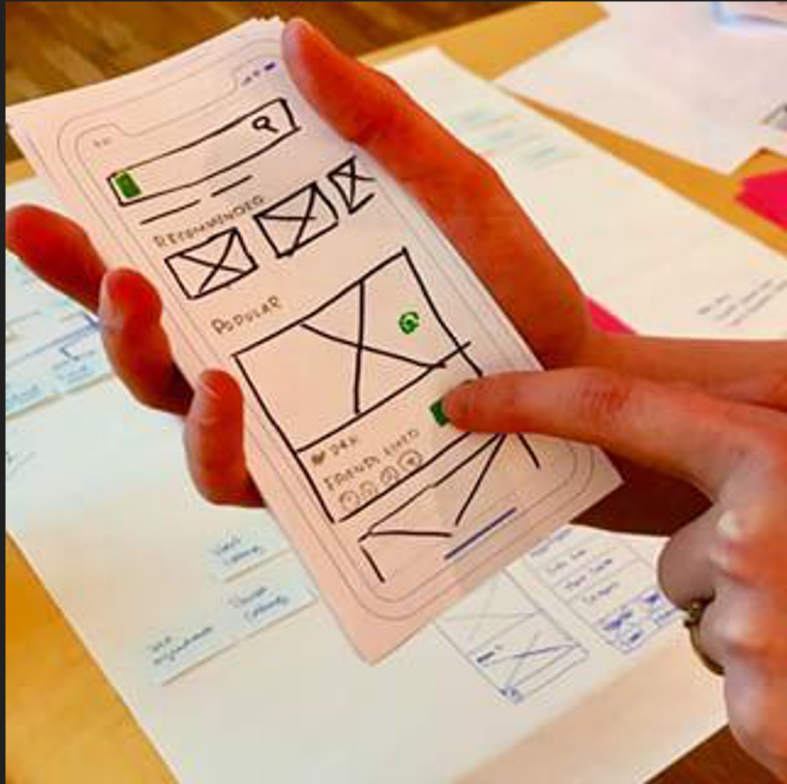
Mindset: exploratory, egoless, hands-on

Tactics:

- Prototyping
- Sketching
- “How Might We”

DESIGN - PROTOTYPING





[Source: Johny Vinoux](#)



PalmPilot wooden model

Jeff Hawkins, 1995

"Tested design with this model using a chopstick for a stylus."

He took pretend notes in meetings and counted the steps it took to perform common tasks."



[Source: Computer History Museum](#)

DESIGN - SKETCHING



Source: <https://www.walmart.com/ip/LEGO-Marvel-Avengers-Tony-Stark-Minifigure-Black-Iron-Man-Suit-No-Packaging/205572104>

DESIGN – HOW MIGHT WE



https://www.youtube.com/watch?v=ry55--J4_VQ



DELIVER

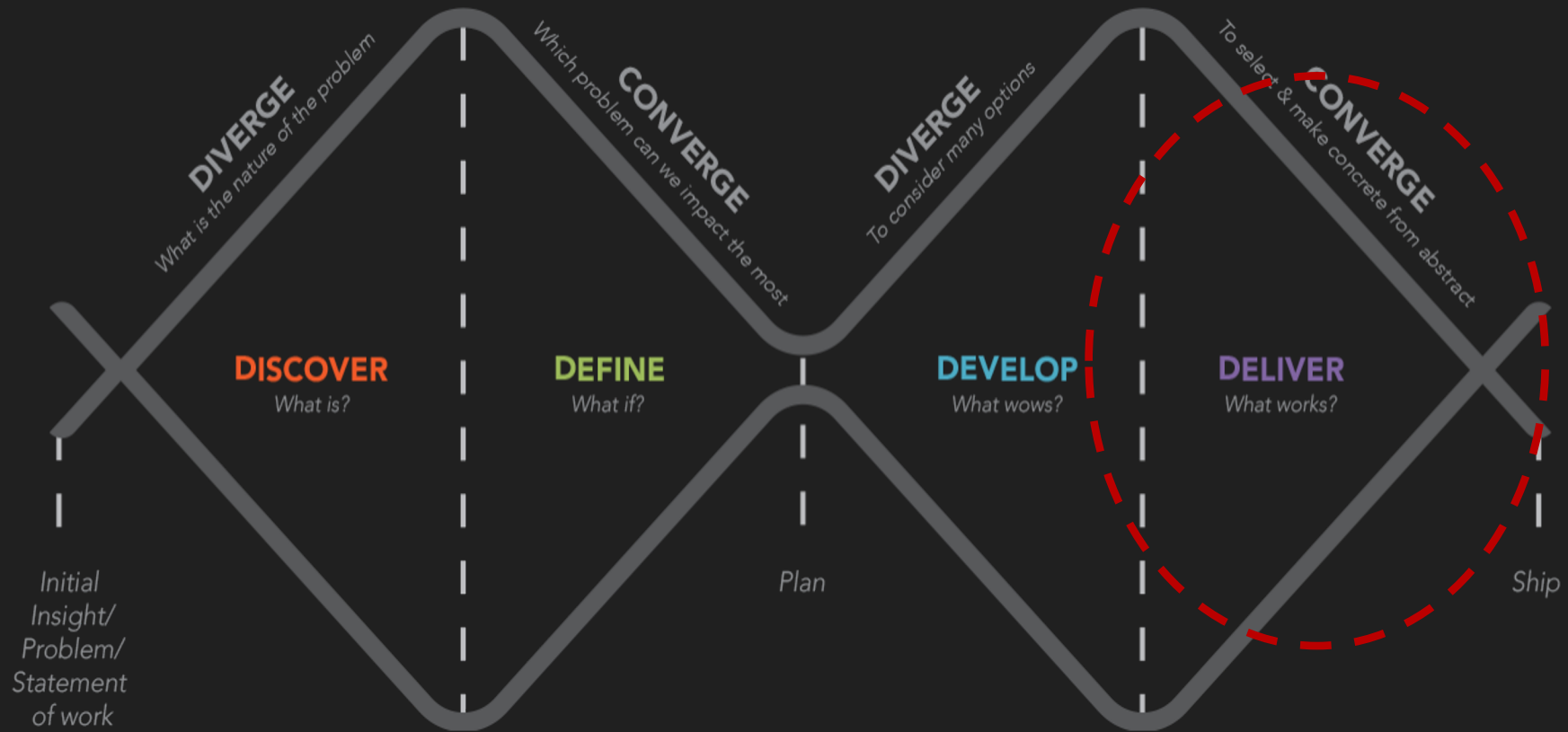


Design is not just what it looks like
and feels like. Design is how it works.

— *Steve Jobs* —

AZ QUOTES

DEFINE



DELIVER

Goals: test, debug, launch

Mindset: critical, entrepreneurial, strategic

Tactics:

- Think Aloud Testing
- Heuristic Evaluation
- Iteration













DESIGN – THINK ALOUD

- Similar to interviews in discover phase
- Performed on your prototype
- Encourage the tester to speak as they perform tasks

DESIGN – HEURISTIC EVALUATION

10 Usability Heuristics

-  Visibility of system status
-  Recognition rather than recall
-  Match between system and the real world
-  Flexibility and efficiency of use
-  User control and freedom
-  Aesthetic and minimalist design
-  Consistency and standards
-  Helps users recognise, diagnose, and recover from errors
-  Error prevention
-  Help and documentation

[Source: Interaction design foundation](#)



<https://www.nbcbayarea.com/news/local/New-Traffic-Lights-in-Santa-Clara-Leave-Drivers-Baffled-430054623.html>



CROSSWALK CONFUSION SANTA CLARA

NBCBAYAREA.COM

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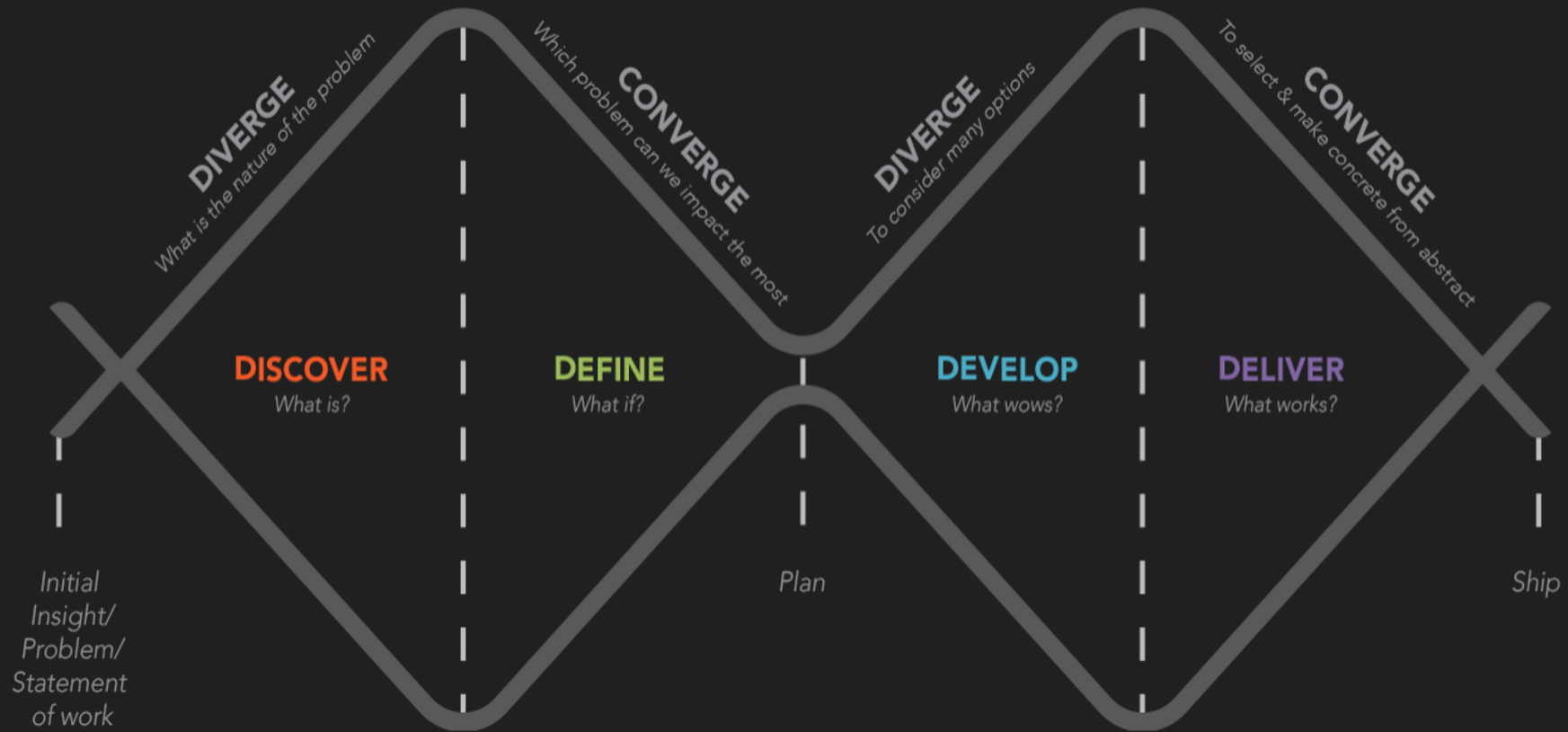


Never give an order that can't be
obeyed.

— Douglas MacArthur —

AZ QUOTES

DESIGN – ITERATE



Source: <https://www.nicepng.com/maxp/u2t4r5q8t4a9e6u2/>



BONUS ACTIVITY THINK ALOUD



Find a partner

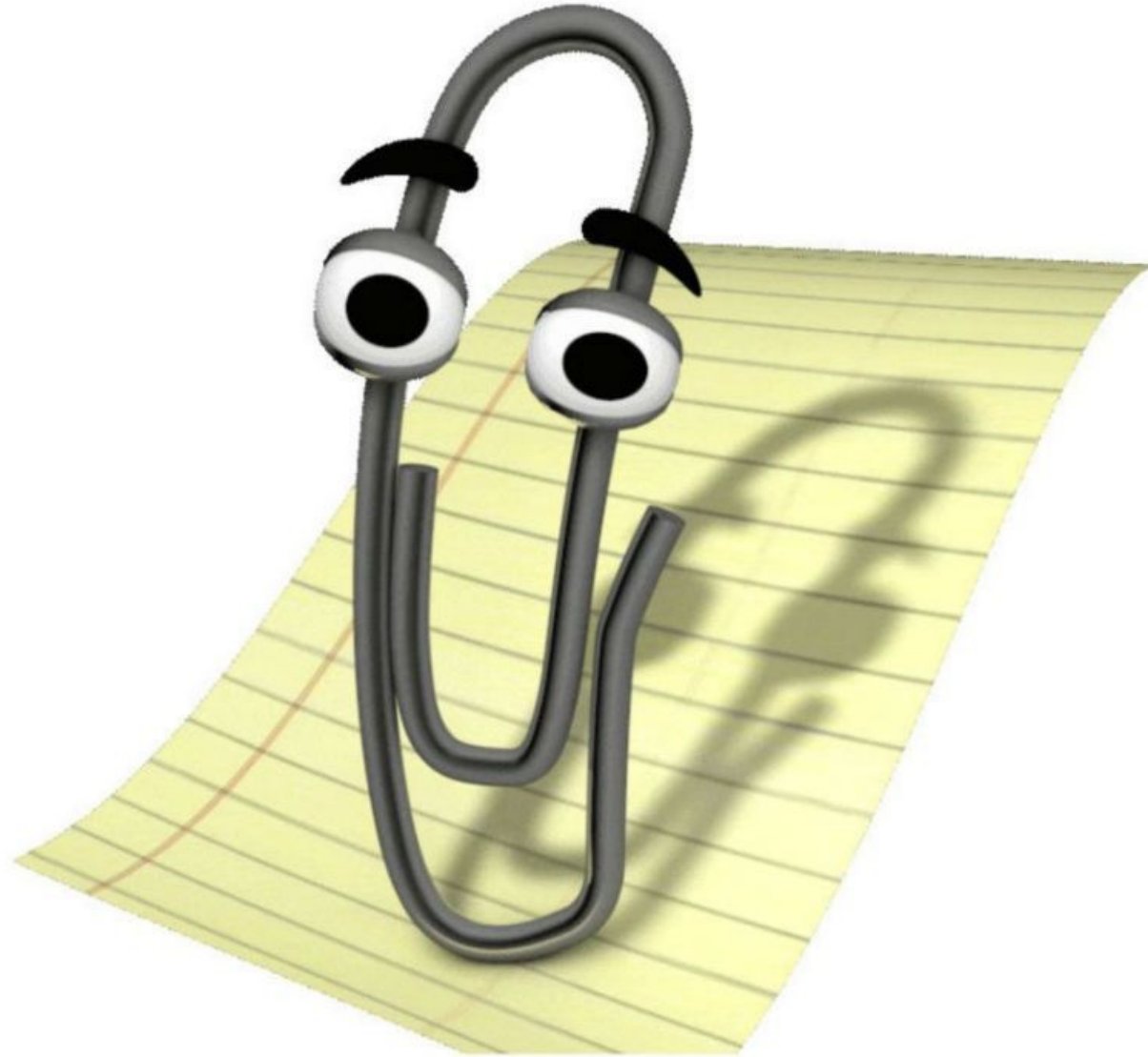
Conduct a 5 minute think aloud

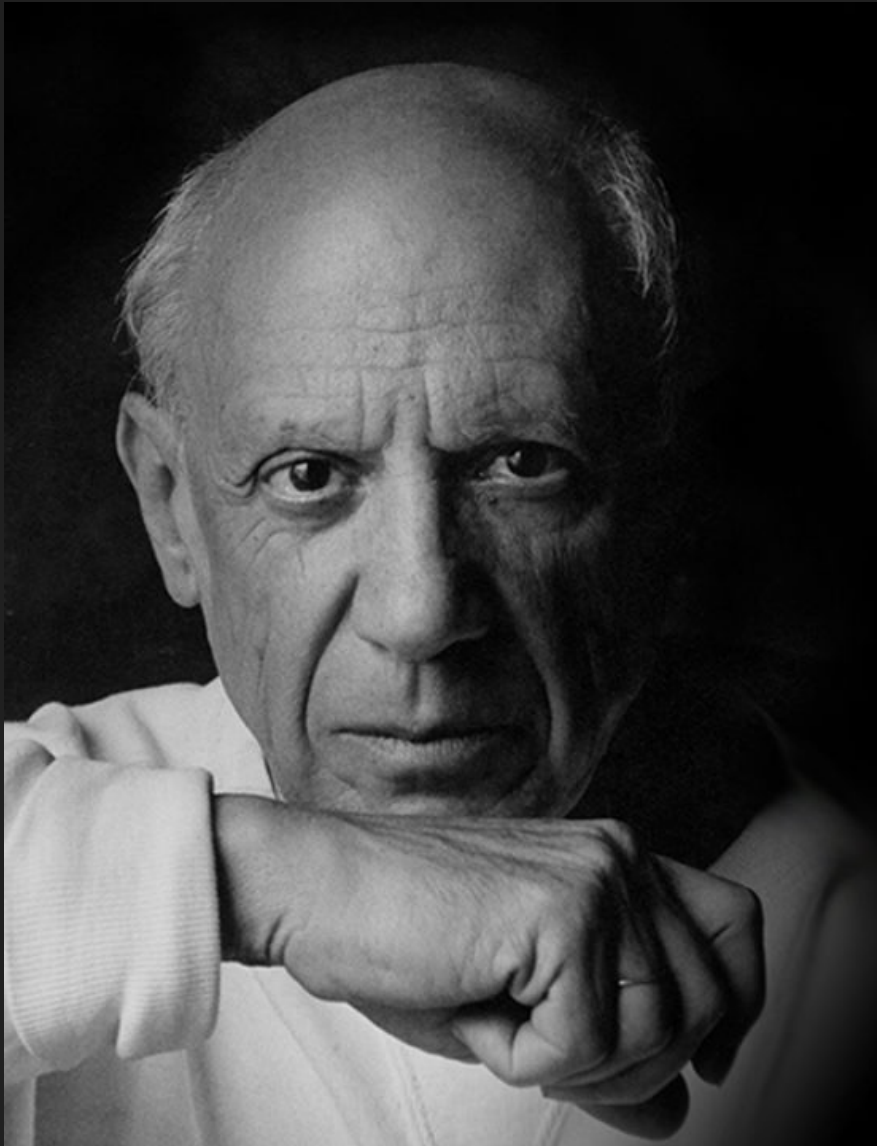
Goal is to practice encouraging the interviewee to keep talking as they complete the task

What are the nearest 15 restaurants?



BONUS ACTIVITY DIVERGENT THINKING





Every child is an artist.
The problem is to **remain** an
artist once they **grow up**.

- Pablo Picasso

Goalca