

Visualizing Systems



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The Lab at The Office of Personnel Management

The Lab at OPM (The Lab) is a practice that fosters innovation through human-centered design.

Our goal is to teach human-centered design across the Federal Government and help deliver innovative solutions to address complex public and cross-sector challenges.

The Lab at The Office of Personnel Management

Our three main goals are to serve as leaders, doers, and teachers of human-centered design.

Some of our Federal partners include:



U.S. Department
of Veterans Affairs



and
more!

Warm up: Memory mapping

How did you get
from your home
to here?

10 minutes

Overview: Interests & Introductions

Tell us why you are here today. Share a bit about your experience with and/or interest in systems thinking.

1-2 minutes per person

“

“We are searching for some kind of harmony between two intangibles: a form which we have not yet designed and a context which we cannot properly describe.”

“Drawings help people to work out intricate relationships between parts.”

“...when you build a thing you cannot merely build that thing in isolation, but must repair the world around it, and within it, so that the larger world at that one place becomes more coherent, and more whole; and the thing which you make takes its place in the web of nature, as you make it.”

Christopher Alexander
— Architect & Design Theorist

Agenda

Warm Up: Memory Mapping

Understanding Systems: Types and Terminology

Visualizing Systems: Donella's Bathtub

Lunch (12:00)

Visualizing Systems: More Diagrams

Intervening in Systems: Leverage Points

Wrap Up

Understanding Systems: Types and Terminology



“

“A system is a set of elements or parts that is coherently organized and interconnected in a pattern or structure that produces a characteristic set of behaviors, often classified as its ‘function’ or ‘purpose.’ ”

Donella Meadows
— Environmental Scientist

**Types and
Terminology**

System basics

- **Purpose**
The goal of the system
- **Boundaries**
Where the system in question touches another system with distinct characteristics and behaviors
- **Stocks**
The accumulation of material or information in the system over time
- **Flows**
The movement of material or information through the system over time

System complexities

- **Behaviors at equilibrium**
What the system is doing when the inflows and outflows of stock are equal, and the stock level isn't changing over time
- **Balancing feedback loop**
A rule that causes stock to stabilize because it reverses, or “negative” direction
- **Reinforcing feedback loop**
A rule that causes stock to amplify or increase in a “positive” (additive) direction
- **Behavioral response to disruptions**
How the system responds to external changes

Technological systems

Definition of technological

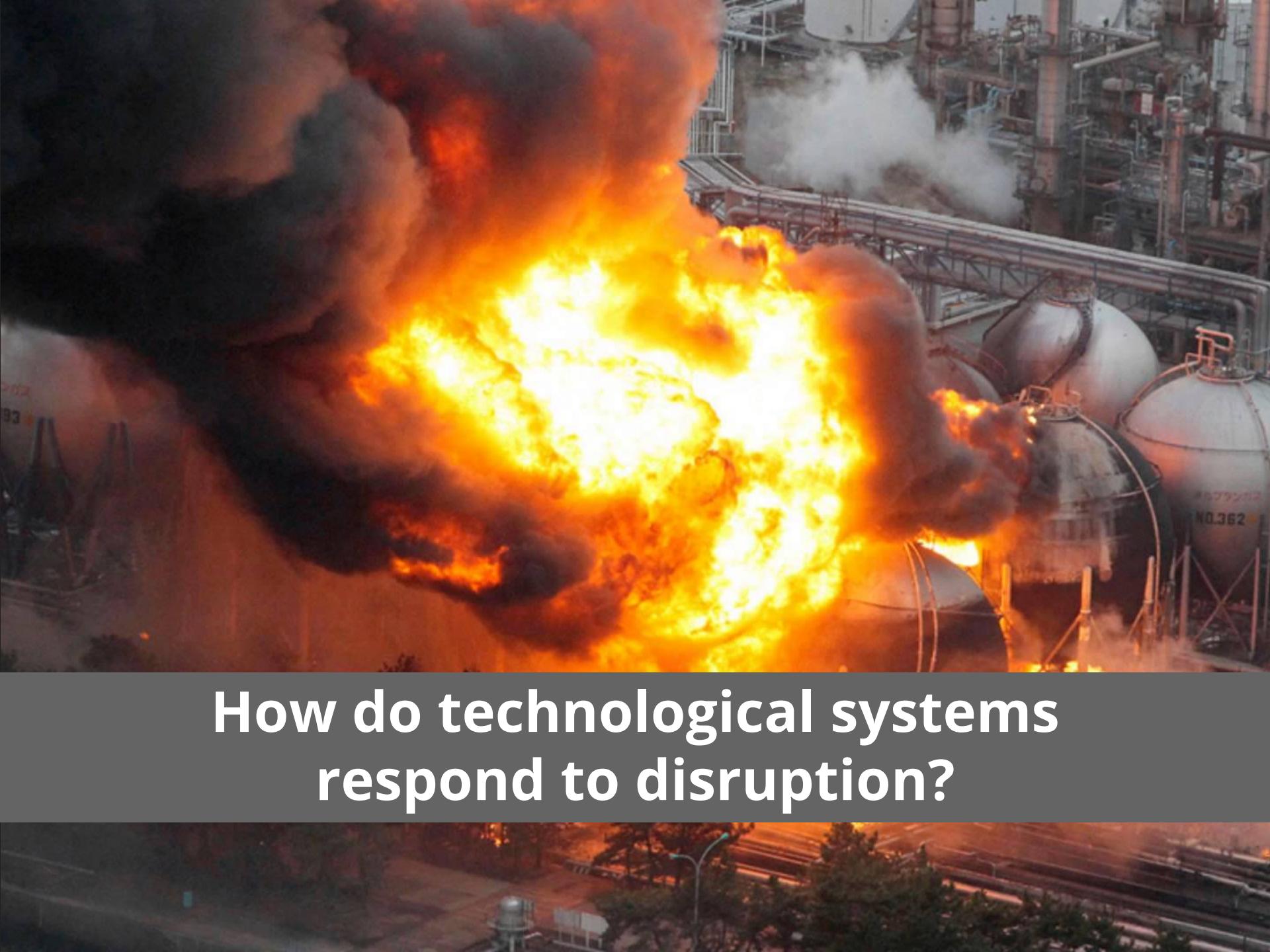
1

: of, relating to, or characterized by technology

2

: resulting from improvements in technical processes that increase productivity of machines and eliminates manual operations or operations done by older machines

— Merriam-Webster

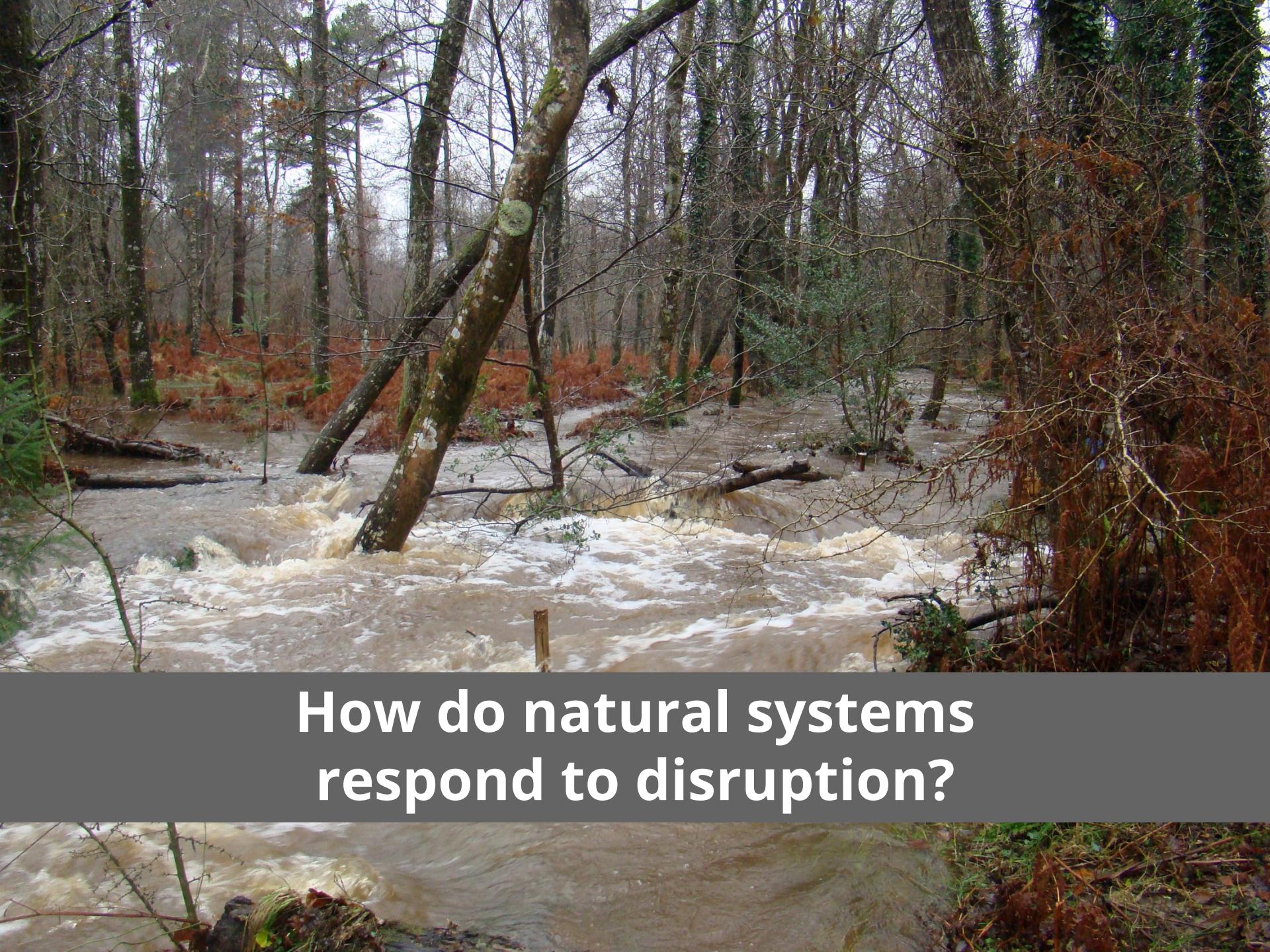


How do technological systems
respond to disruption?

Natural systems

: a biological classification based upon morphological and anatomical relationships and affinities considered in the light of phylogeny and embryology

— Merriam-Webster

A photograph of a flooded forest. The water is brown and turbulent, flowing rapidly through the trees. Fallen trees and branches are scattered throughout the water. The surrounding trees are mostly bare, with some green foliage visible. The overall scene is one of a natural disaster or severe flooding.

How do natural systems
respond to disruption?

Social system

1

: the patterned series of interrelationships existing between individuals, groups, and institutions and forming a coherent whole : social structure

2

: the formal organization of status and role that may develop among the members of a relatively small stable group (such as a family or club)

— Merriam-Webster



How do social systems respond to disruption?

Exercise: Describe a system...

...you encountered in the last week. What is its purpose? Where are its boundaries? What are its parts and behaviors?

In pairs: 10 minutes

“

“...there is a problem in discussing systems only with words. Words and sentences must, by necessity, come only one at a time in linear, logical order.

Systems happen all at once. They are connected not just in one direction, but in many direction simultaneously.

To discuss them properly, it is necessary somehow to use a language that shares some of the same properties as the phenomena under discussion.”

Types and Terminology

Donella Meadows
— Environmental Scientist

Exercise: Draw the system...

... you encountered in the last week. (What is its purpose? Where are its boundaries? What are its parts and behaviors?)

Individually: 10 minutes

Discussion: Is it a system?

Can you identify its parts?
Do they work *together* to produce behaviors? Do the behaviors persist over time?

In pairs: 10 minutes

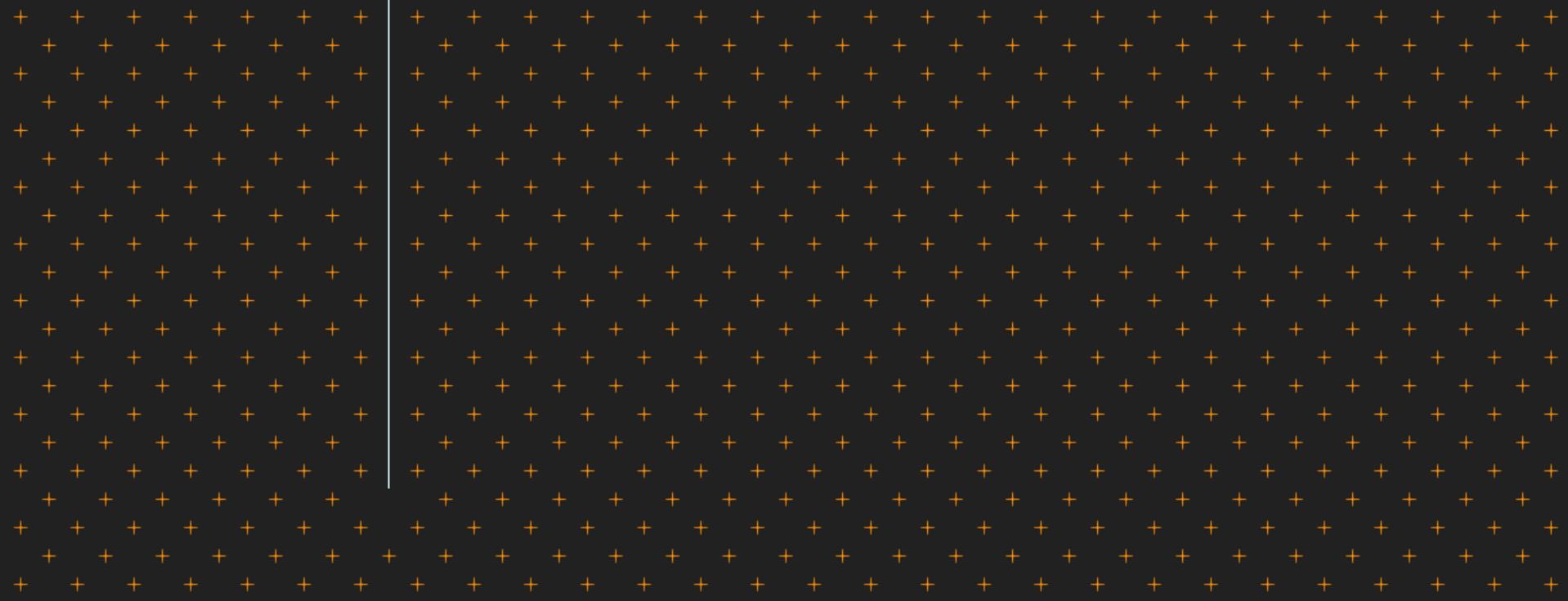
Reflection: Describing systems

How well does your description communicate? How well does your drawing communicate? How does one express dis/agreement with your ideas?

Group: 10 mins

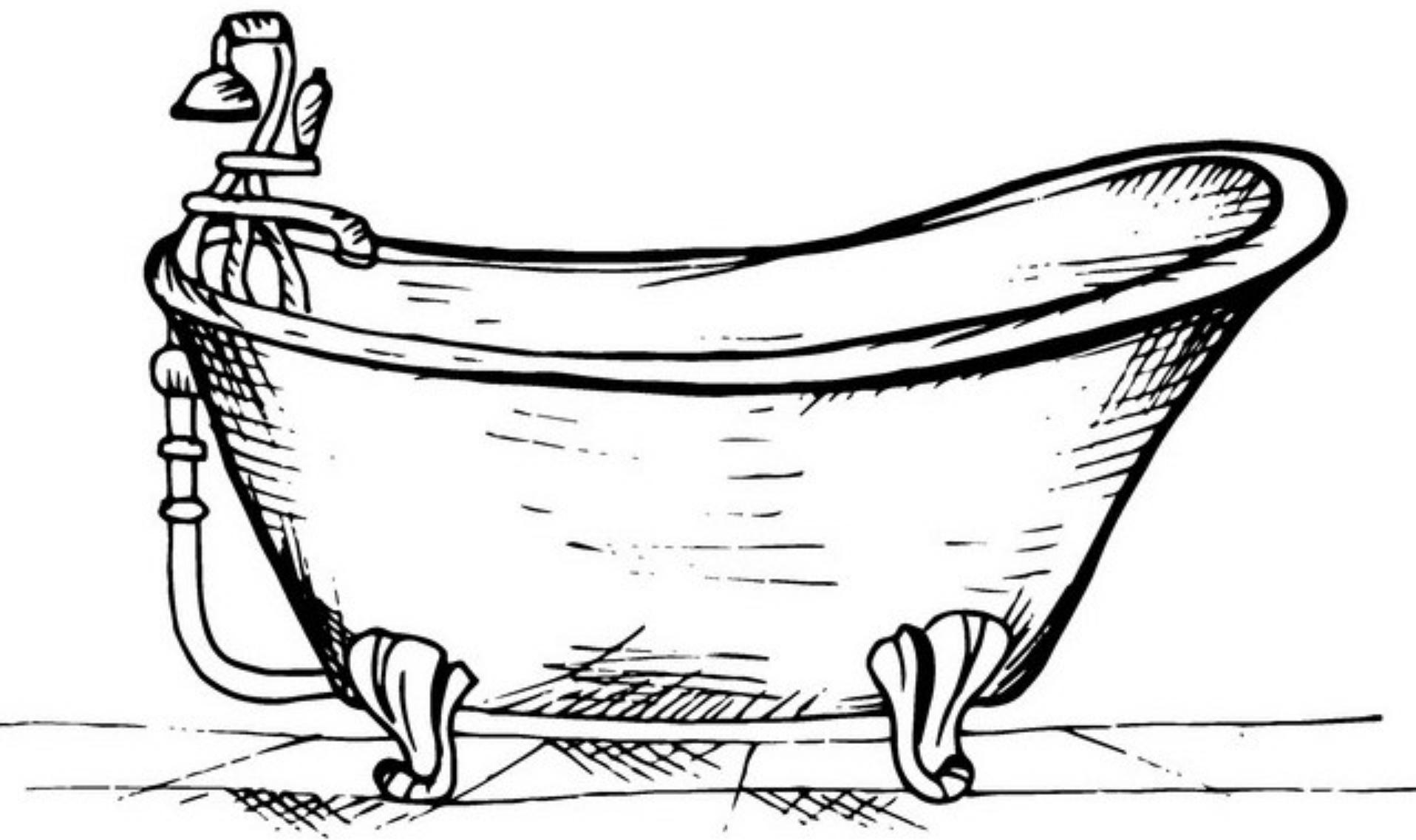
Break

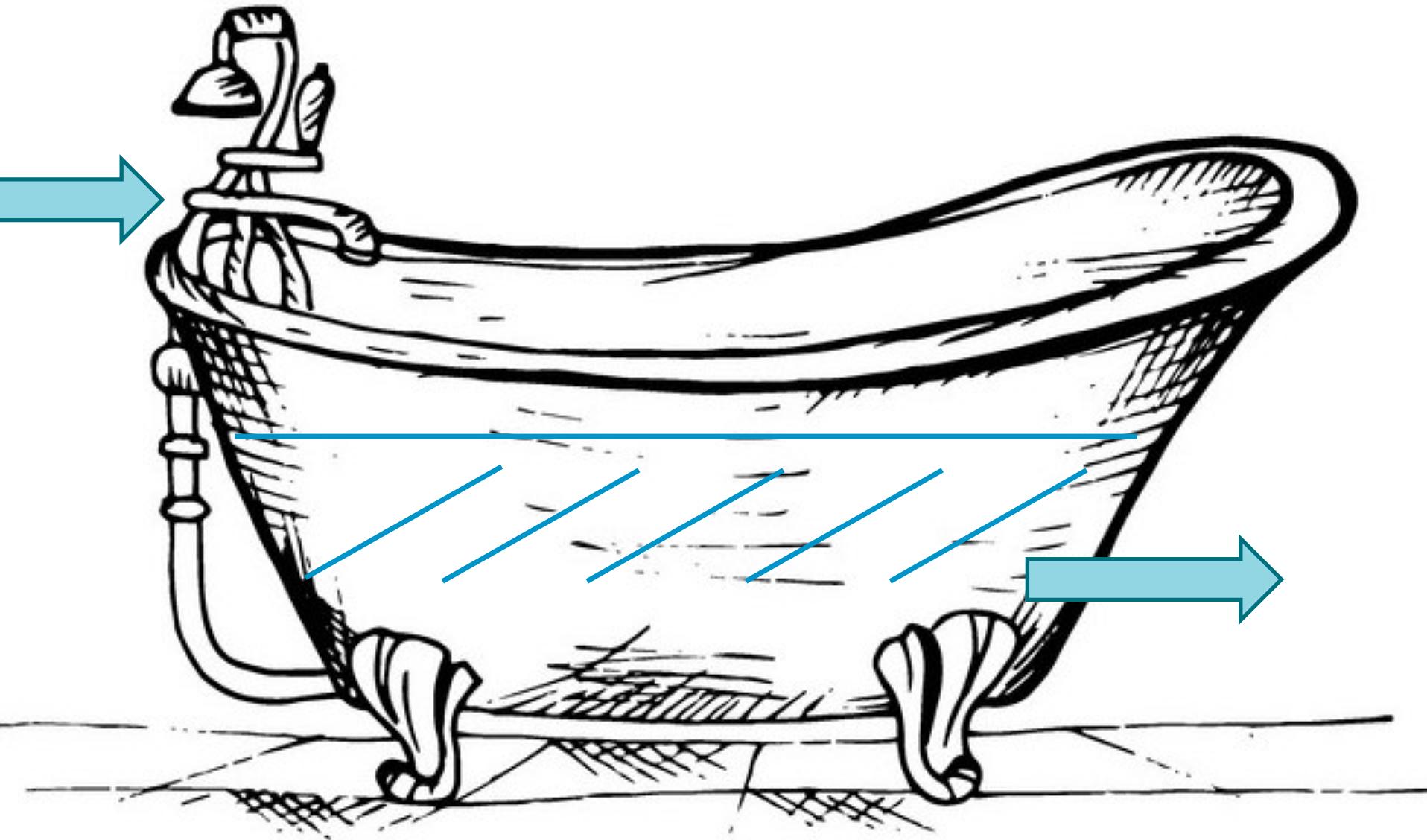
Visualizing Systems: Donella's Bathtub



Draw with us

- There are no slides for this section. Your drawings are your notes and the best way to learn this approach to system mapping.
- Don't get too hung up on the quality of your drawings. It's just a bathtub!





Exercise: Everyday Systems

Using the visual language of Donella's Bathtub, draw the system you met last week.

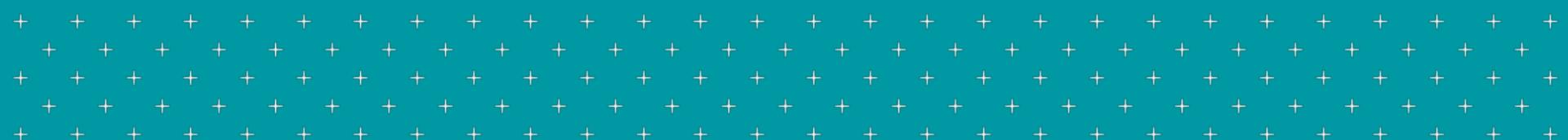
Individually: 20 minutes

Gallery Walk: Visualizing systems

Let's see what you've done!

10 minutes

Lunch



**Making the [] experience
more human-centered**

Exercise: Air-Travel Systems

Using the visual language
of Donella's Bathtub, draw
a specific system within your
[_____] journey map.

In groups: 20 minutes

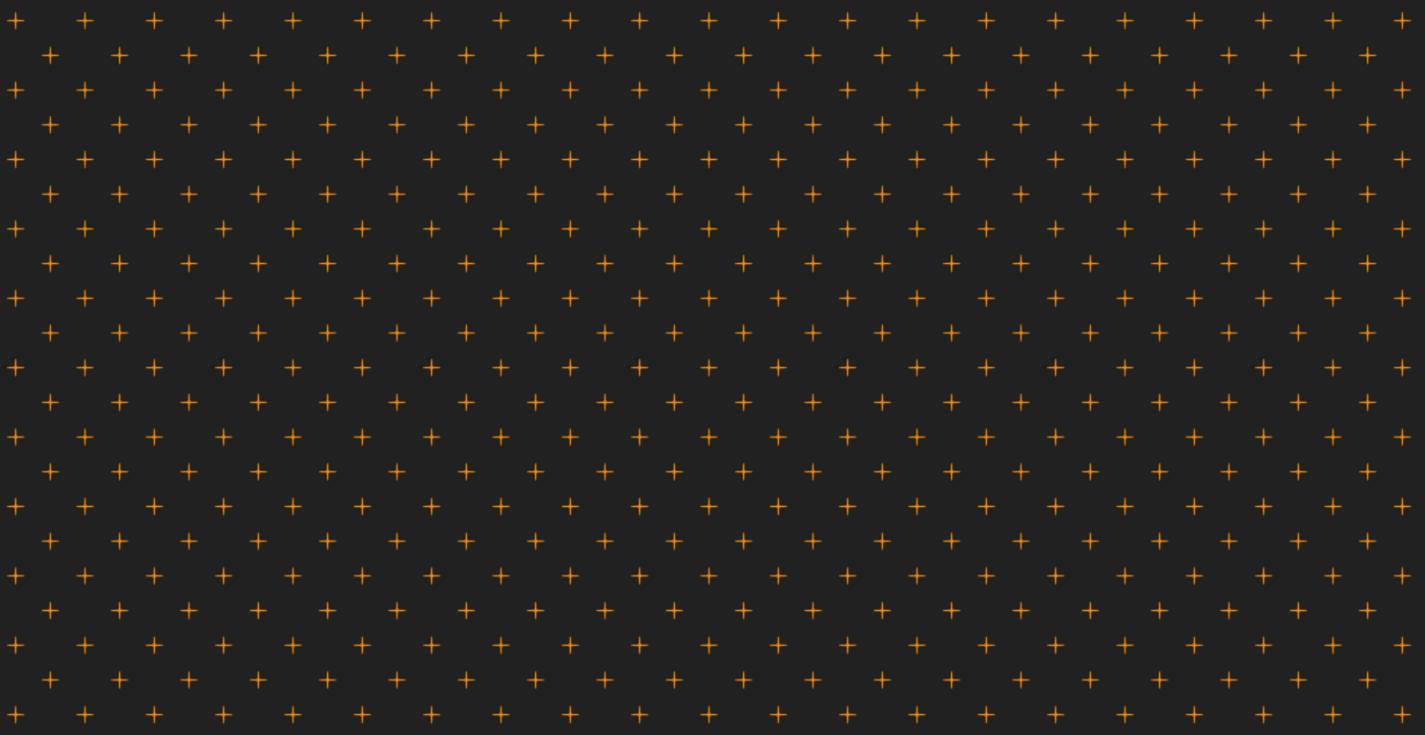
LAB[•]OPM

Gallery Walk: Air-Travel Systems

Let's see what you've done!

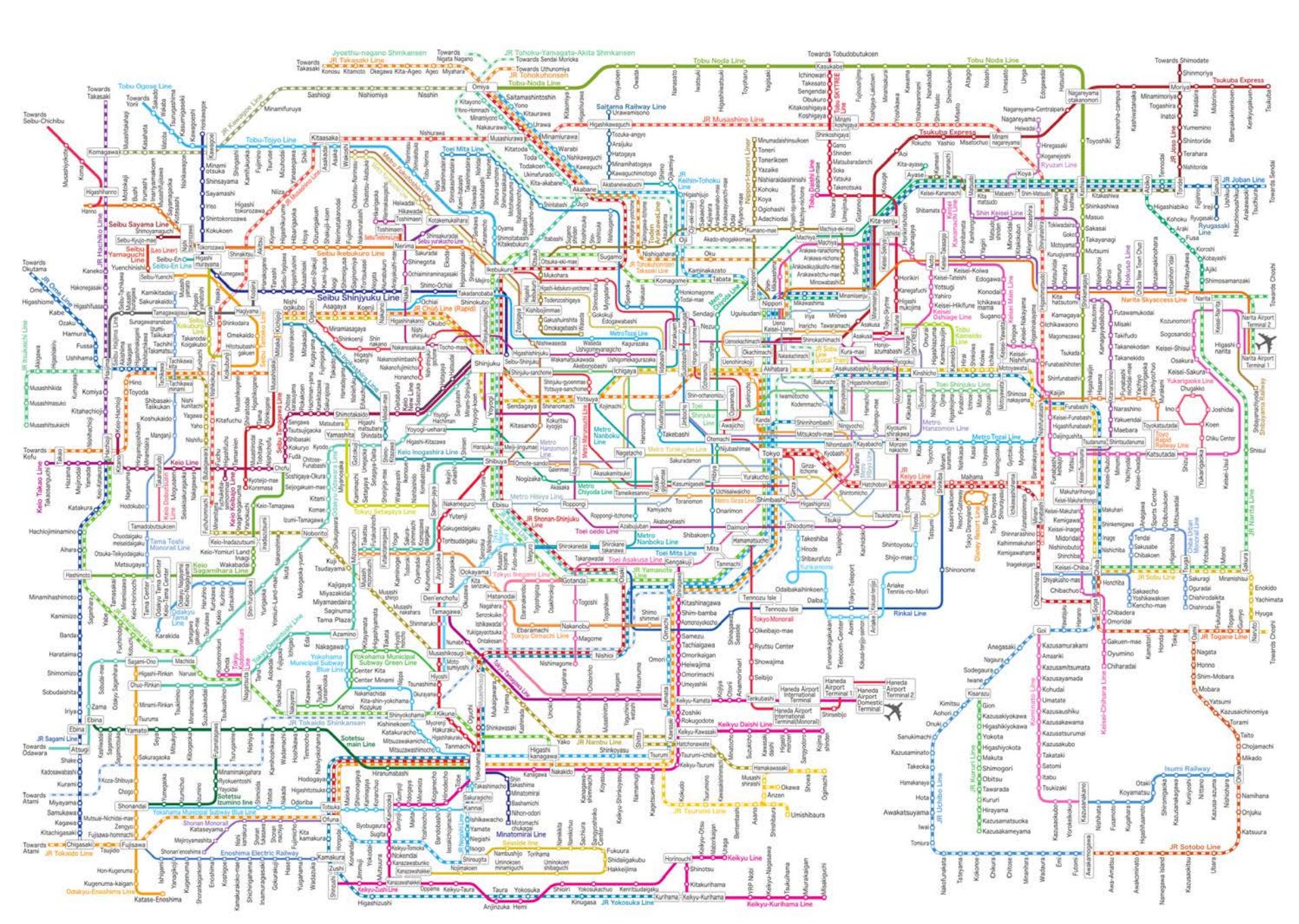
30 minutes

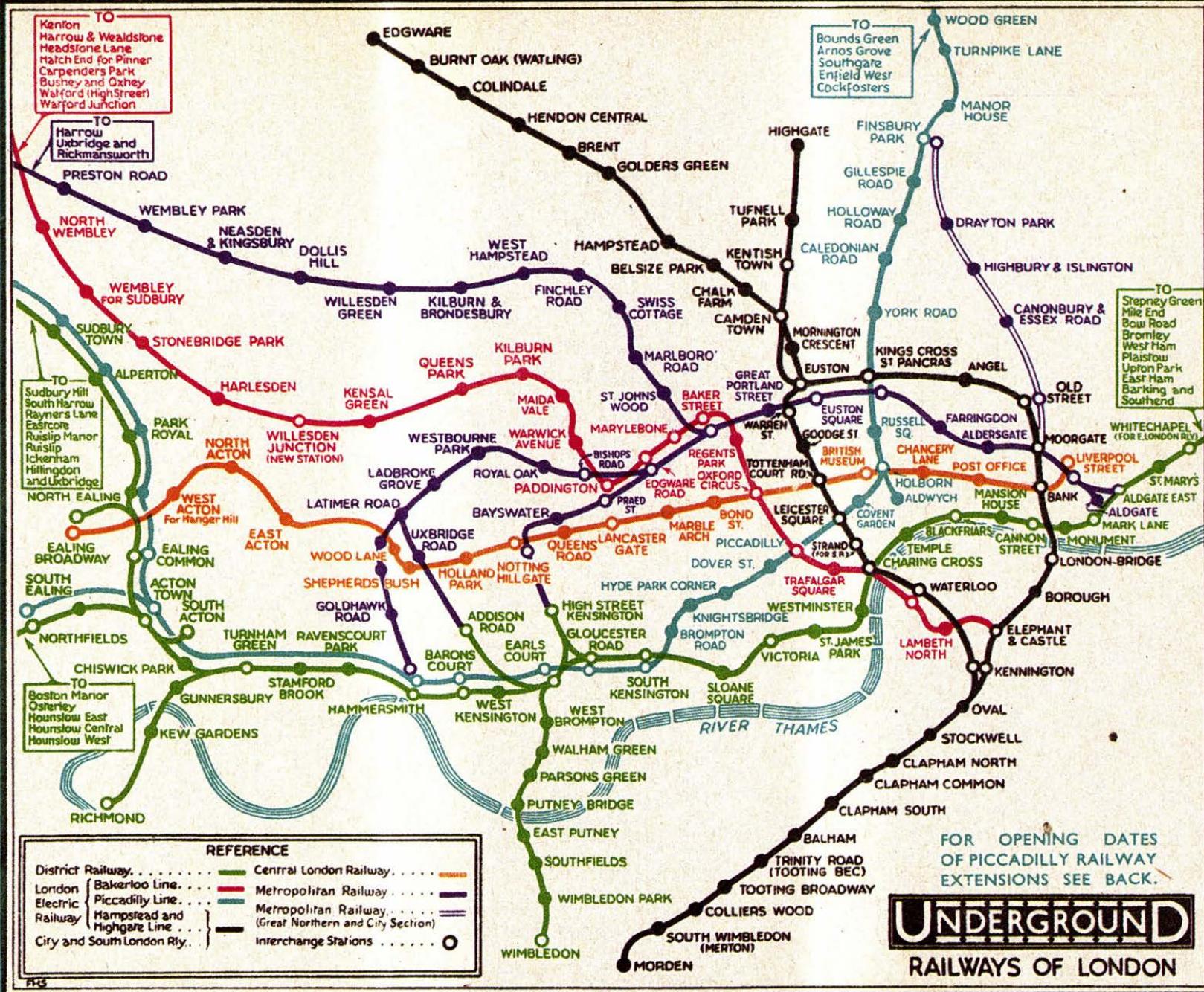
Visualizing Systems: More diagrams



More types

- **Structural diagrams**
demonstrate the function of the system:
purpose/goal, how it works. Includes schematic
and network diagrams.
- **Transactional / process diagrams**
illustrate the flow and/or change of information,
material, or energy in the system. Includes
ecosystem diagrams.
- **Conceptual diagrams**
model interactions, such as with interaction
design (IX), human-centered design (HCD),
service design

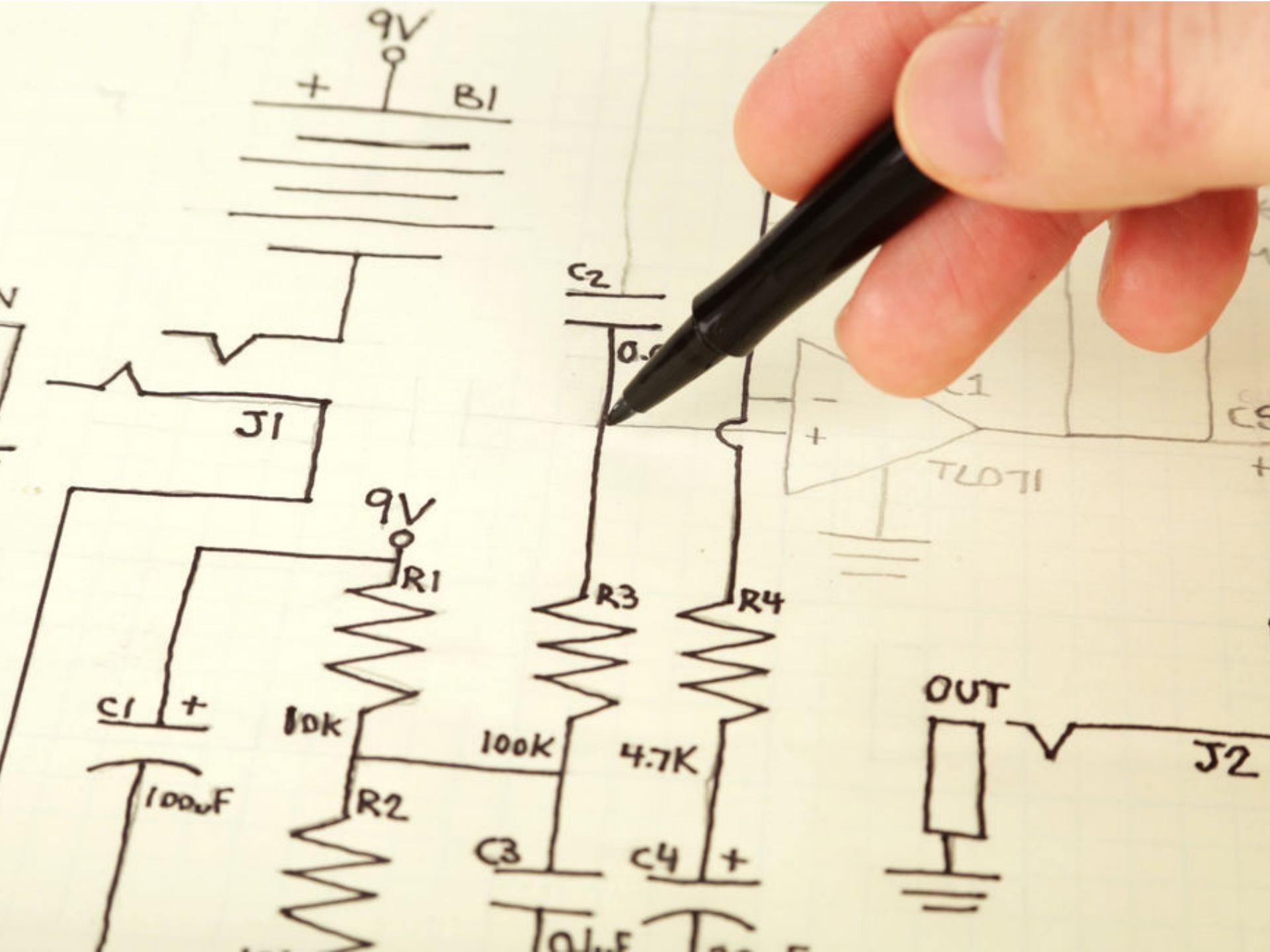




FOR OPENING DATES
OF PICCADILLY RAILWAY
EXTENSIONS SEE BACK.

UNDERGROUND

RAILWAYS OF LONDON

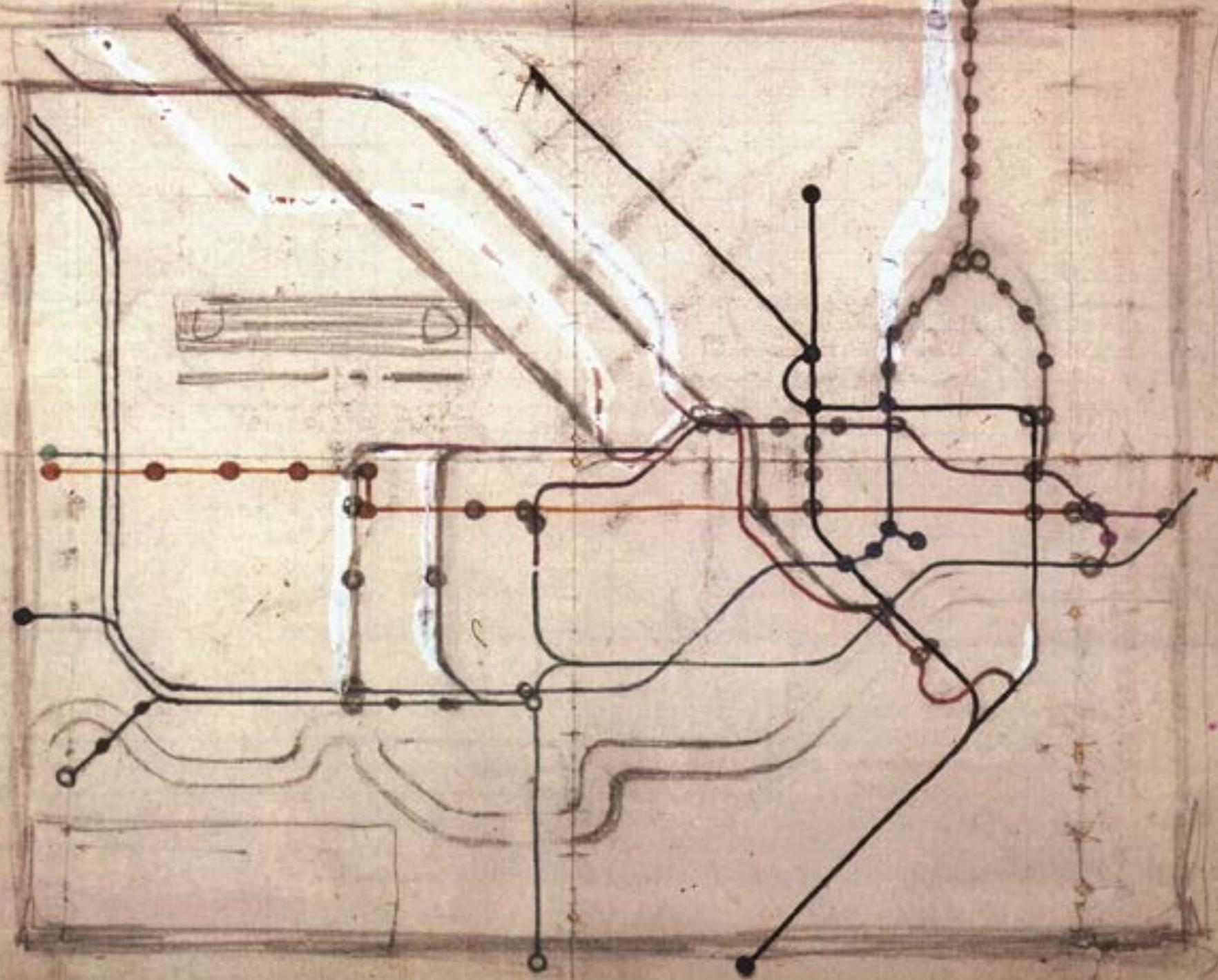


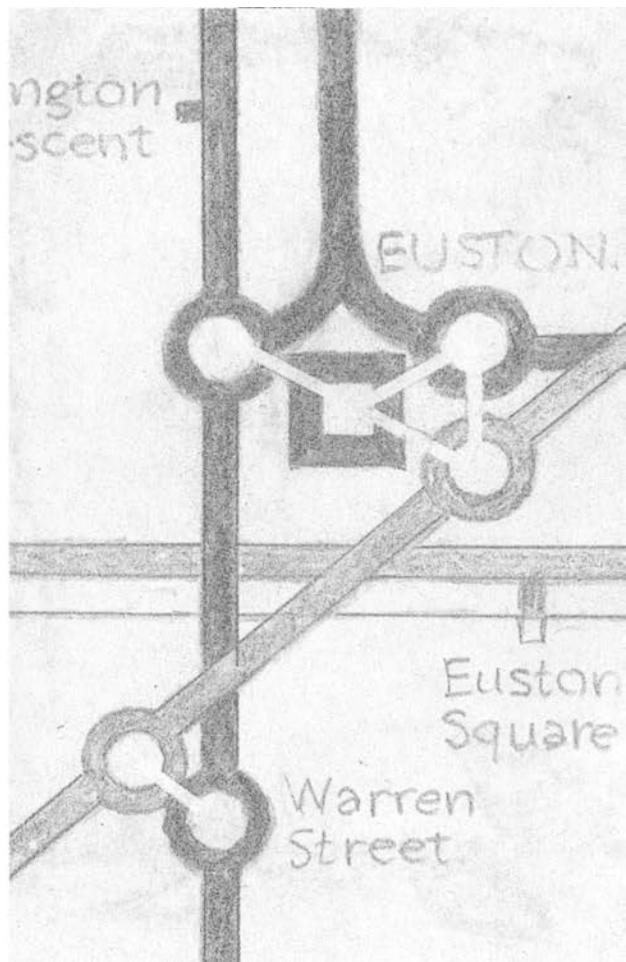
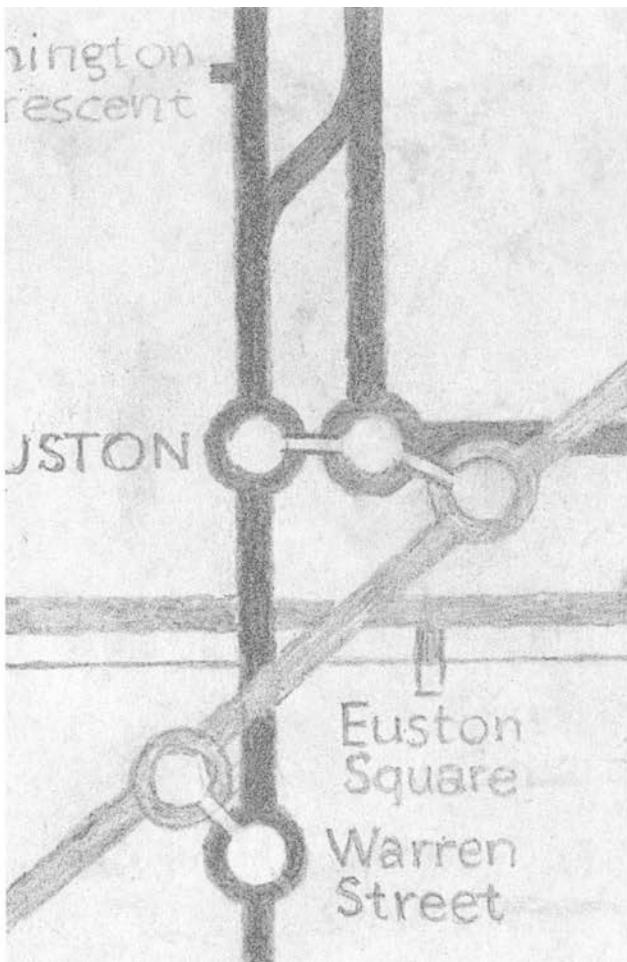
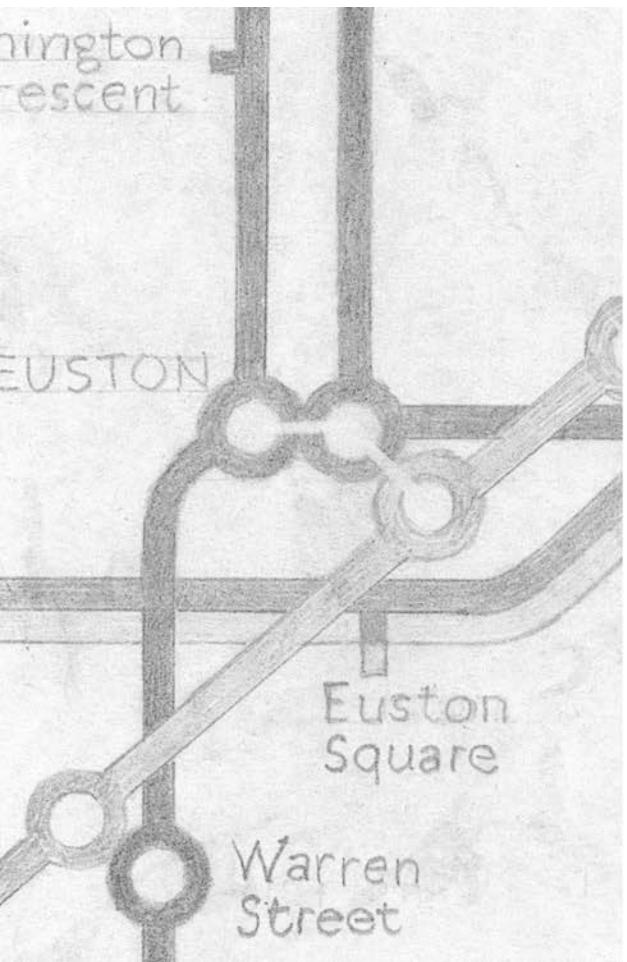
“

**“If you’re going underground,
why do you need to bother
about geography? It’s not so
important. Connections are the
thing.”**

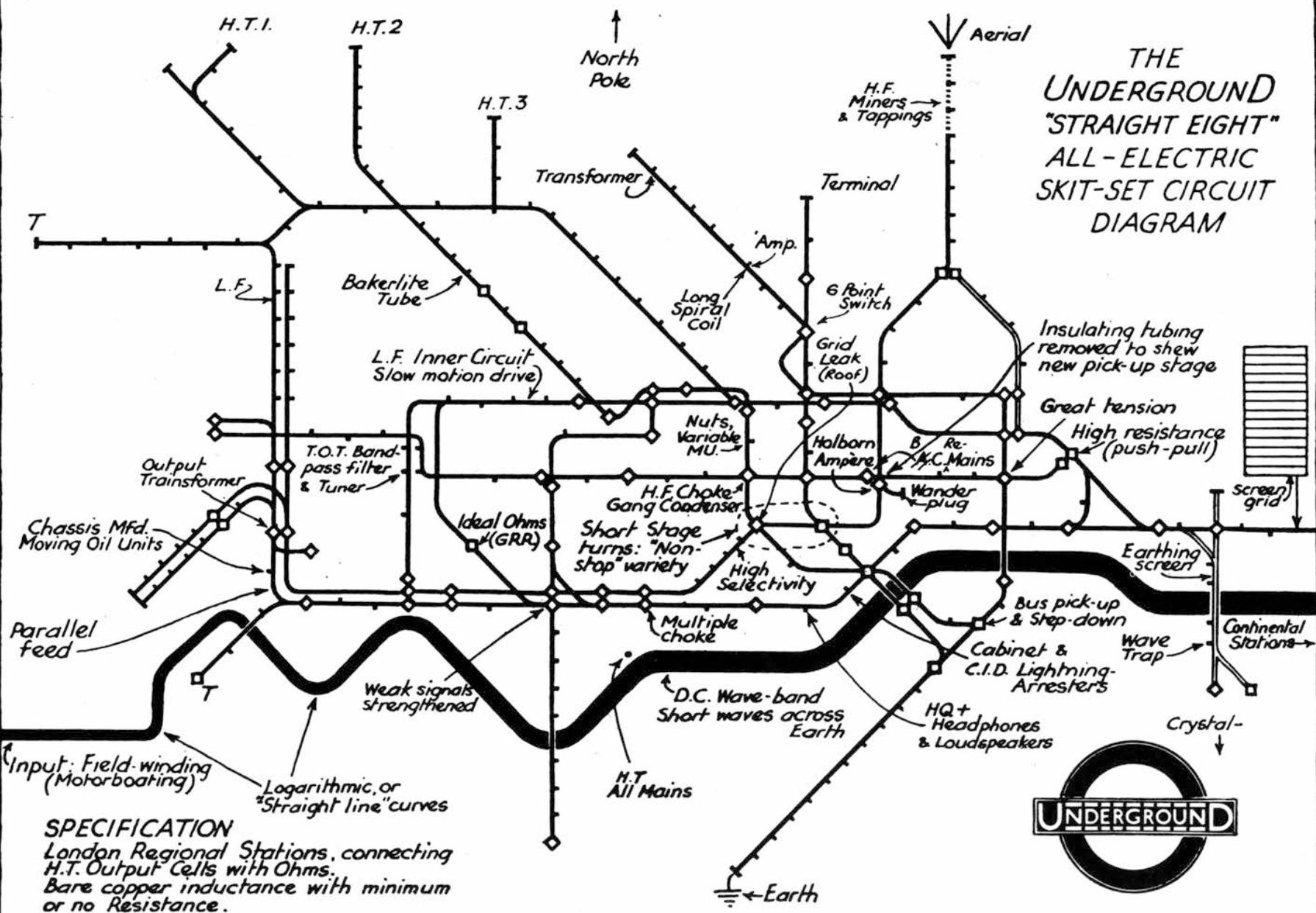
Henry Beck

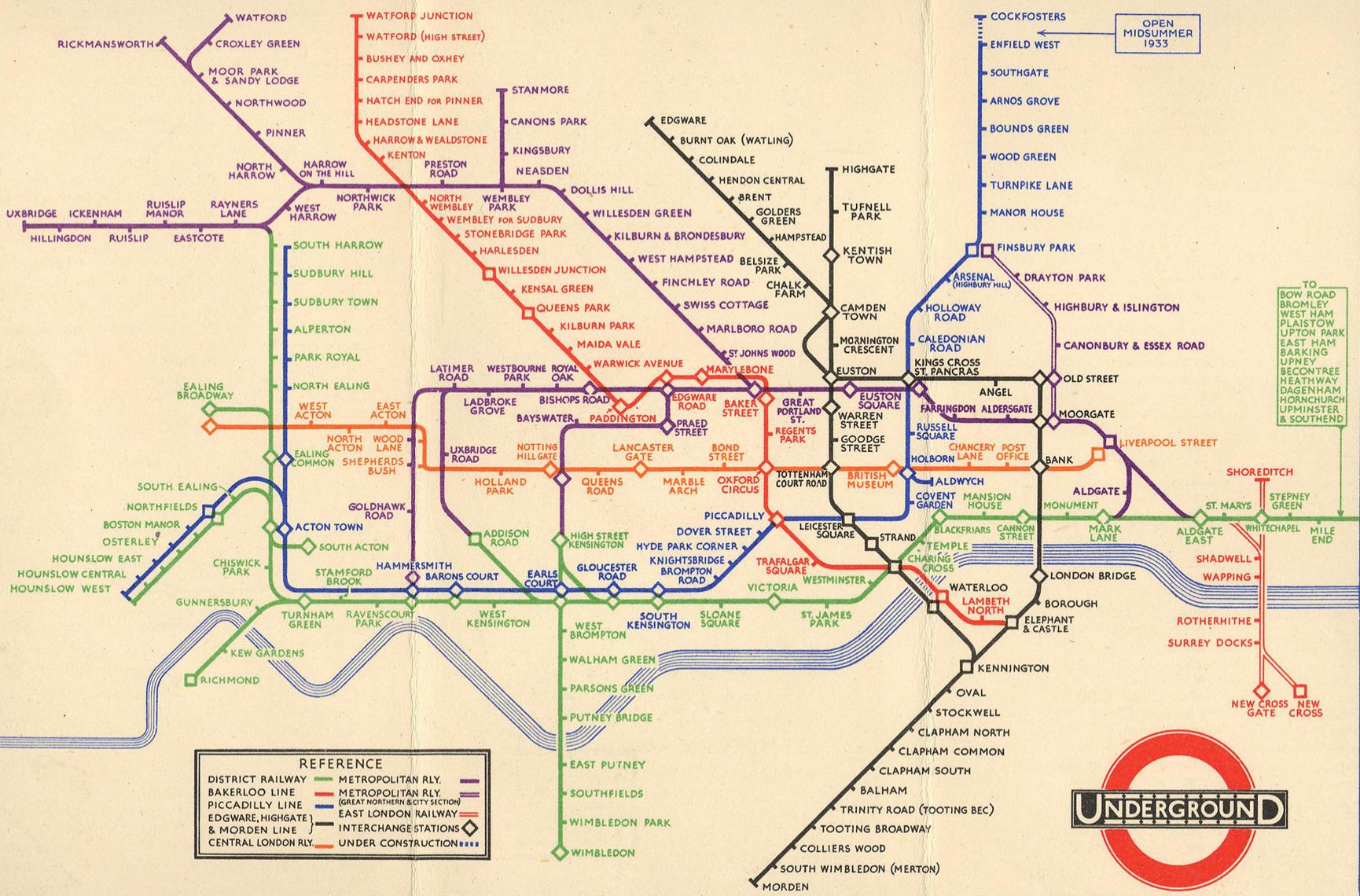
– Train Signals Engineer & Designer



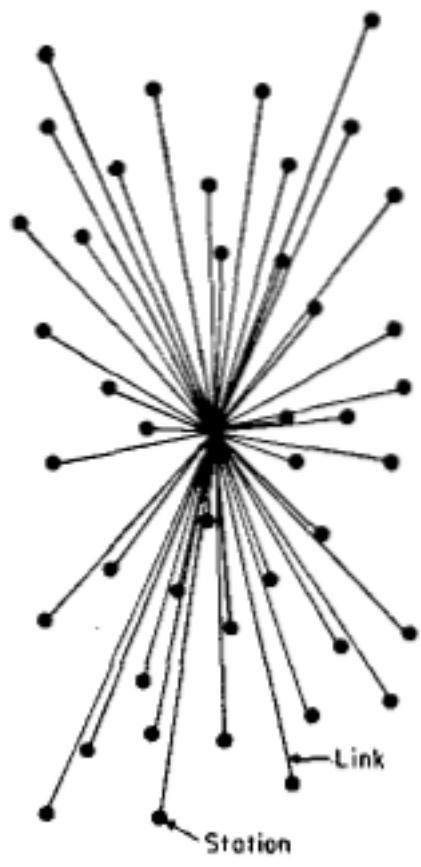


THE
UNDERGROUND
"STRAIGHT EIGHT"
ALL-ELECTRIC
SKIT-SET CIRCUIT
DIAGRAM

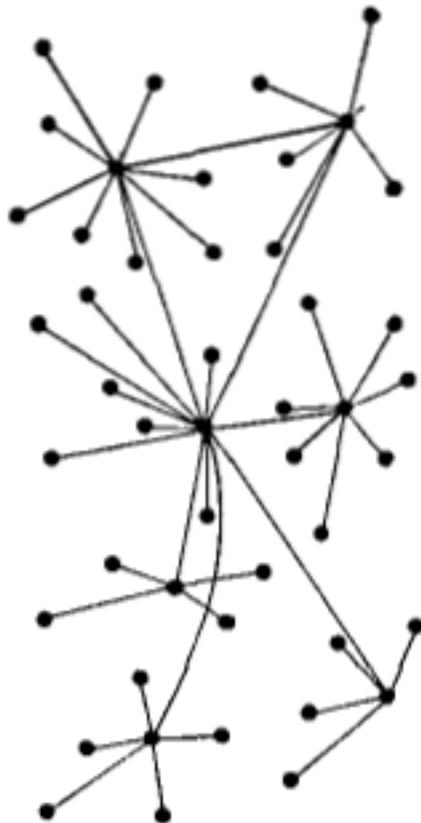




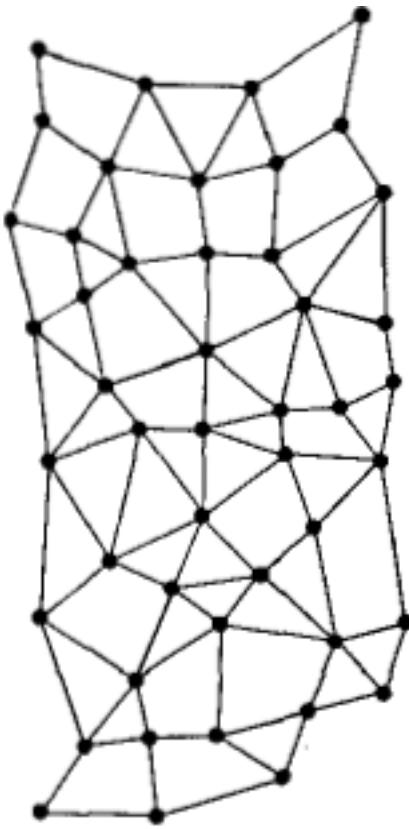
UNDERGROUND



(a)



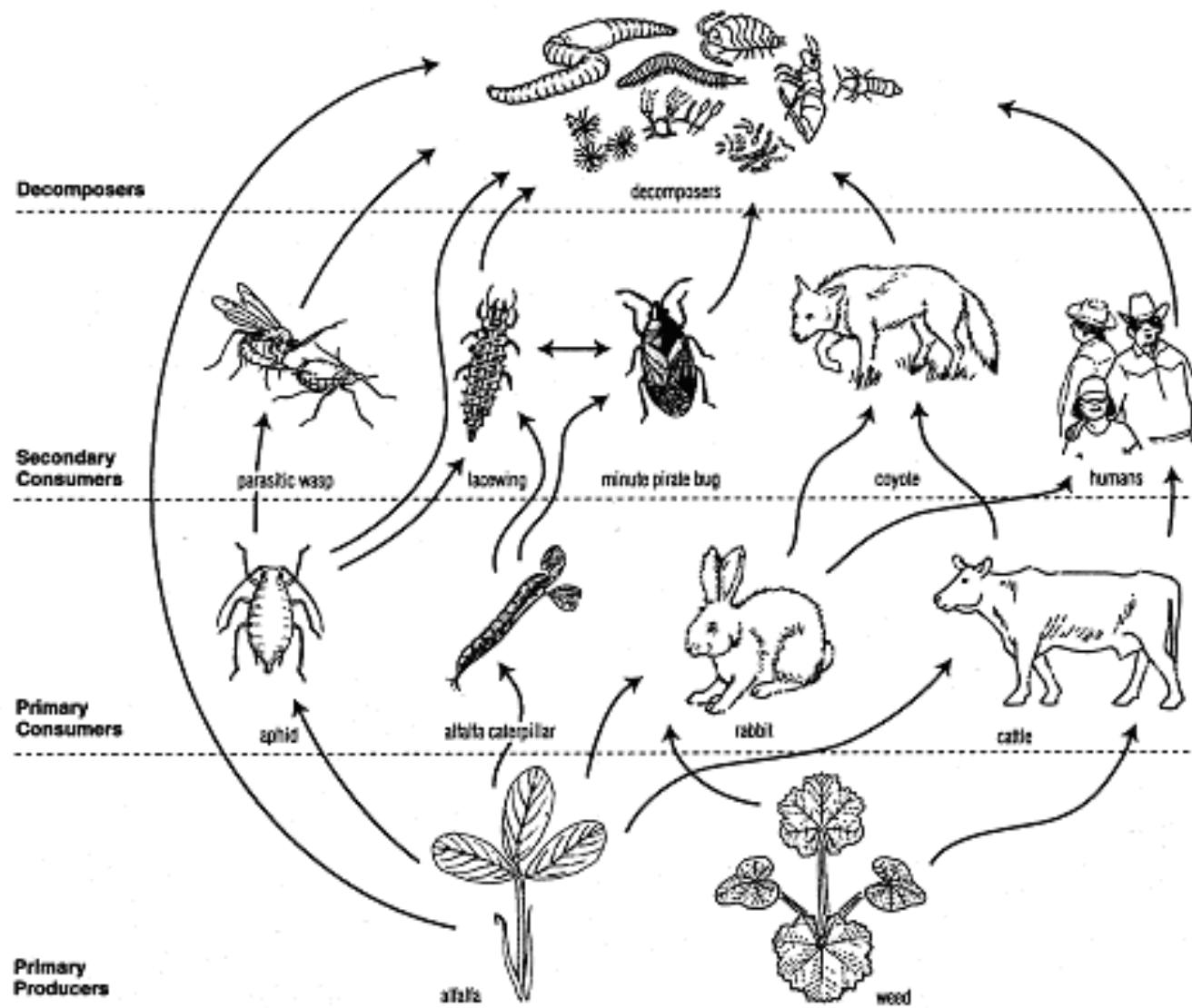
(b)



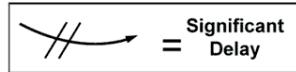
(c)

Fig. 1—(a) Centralized. (b) Decentralized. (c) Distributed networks.

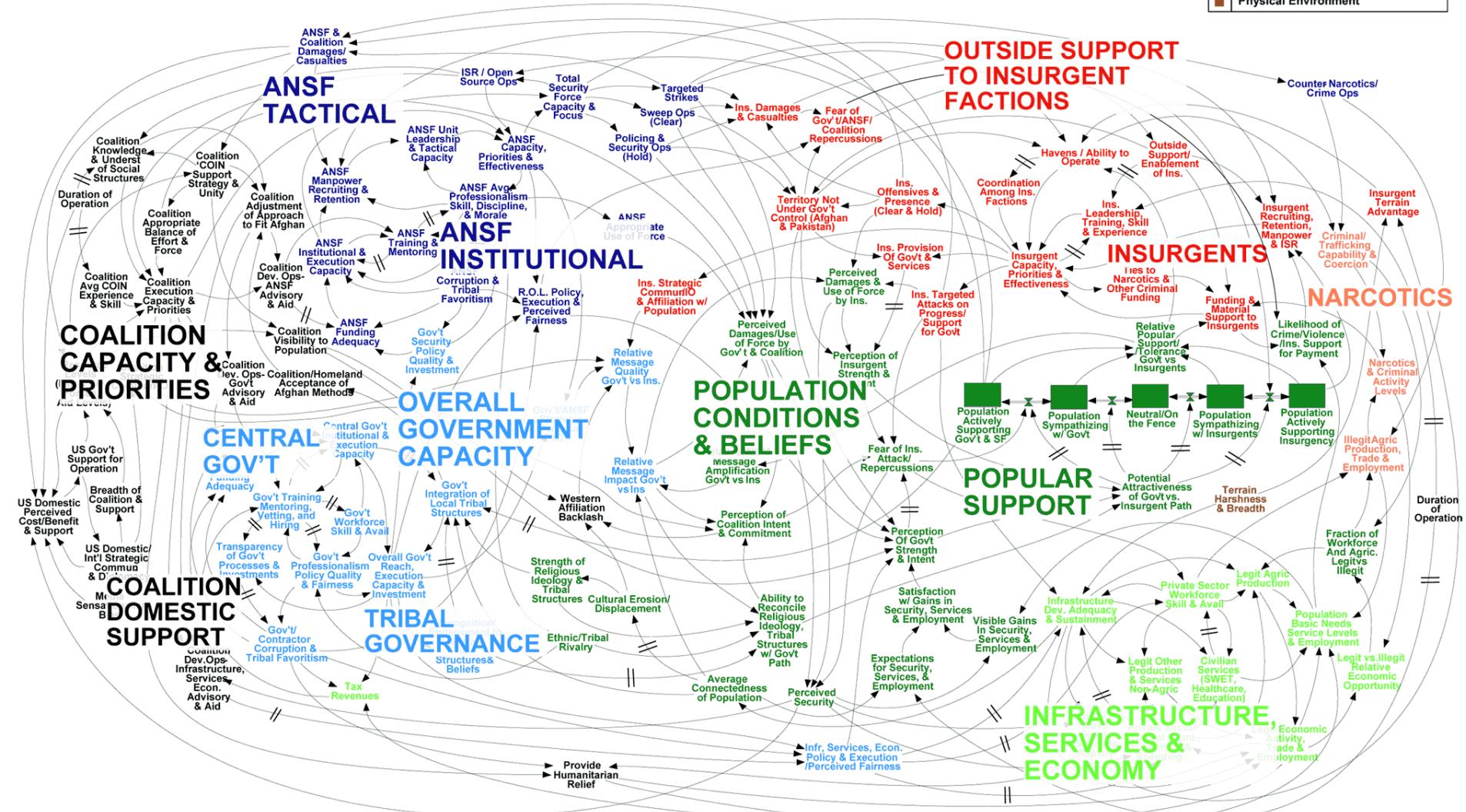
ECOLOGICAL PRINCIPLES AS THEY APPLY TO PEST MANAGEMENT



Afghanistan Stability / COIN Dynamics

 = Significant Delay

Population/Popular Support
Infrastructure, Economy, & Services
Government
Afghanistan Security Forces
Insurgents
Crime and Narcotics
Coalition Forces & Actions
Physical Environment



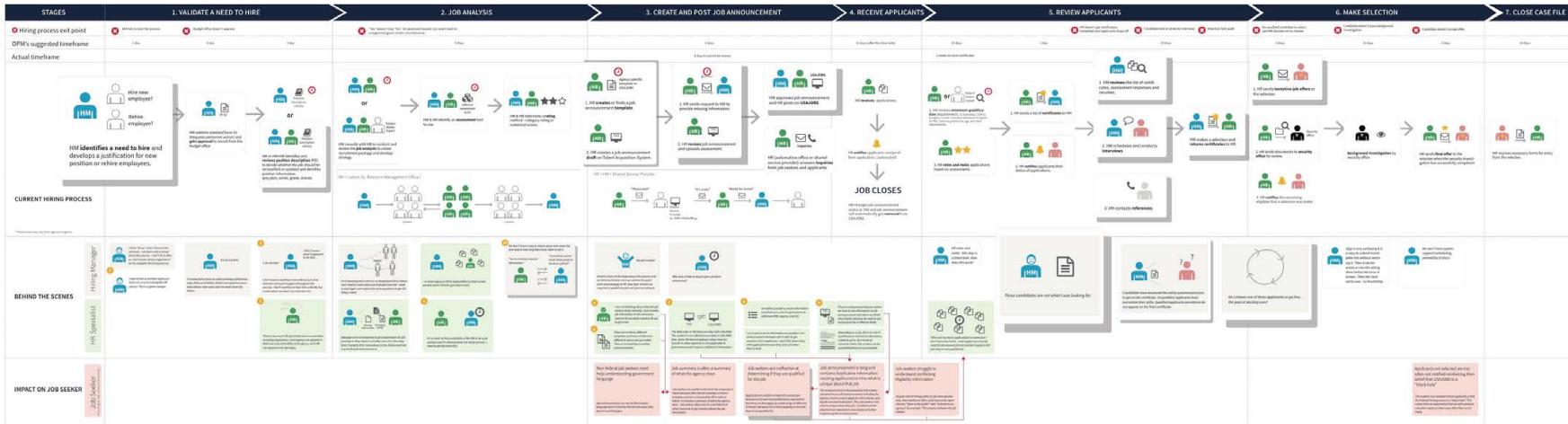
WORKING DRAFT – V3

Federal Hiring Process Hiring Manager & HR Specialist's Experiences V2.1

Key Insights

- Hiring Manager's lack of knowledge about the hiring process causes them to take the lead of most hiring processes. They are often the ones who initiate the process, even if they are not the ones responsible for it.
- HR specialists are often seen as the "gatekeepers" of the hiring process, which can lead to frustration and inefficiencies in the hiring process.
- There is a formal measurement of the specialist's specific performance, but there is no formal measurement of the roles they play in the process. This may lead to a lack of accountability for their actions.
- Many hiring managers are aware that they are the leaders in the hiring process, but they do not always know what the best practices are for managing the process.
- Most job announcements are not written, and reviewed with a lack of attention to detail. This leads to potential legal issues and regulations, which impacts the ability for the hiring manager to hire the right person.
- Some job announcements make it look easier and more efficient, but there are many different templates and some are not user-friendly. This can lead to confusion and frustration for job seekers, and it can cause them to not trust the hiring process.
- The TGS and OASRS templates are often used, but they are not always the best fit for the agency. It is important for the hiring manager to understand the requirements of the job and the qualifications of the applicants before finalizing the announcement.
- Legal requirements for job announcements can vary by agency, so it is important for the hiring manager to understand the specific requirements for their agency.
- USASJOBS and Talent Acquisition Systems are a great job site, but they can be overwhelming for job seekers. It is important for HR specialists to ensure that the site is user-friendly and provides a clear and organized view of the opportunities available to them.

Legend
 Hiring Manager HR Specialist
 Impact Outcome
USASJOBS **LAB** **OASRS**

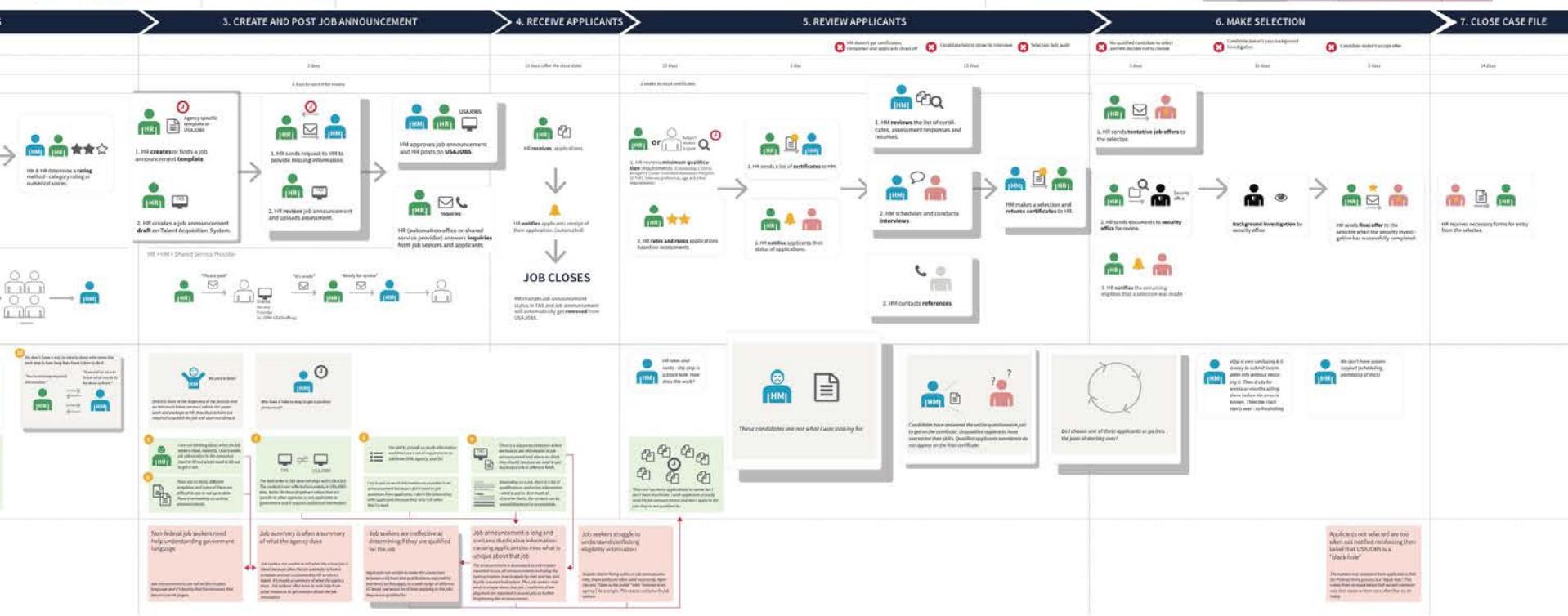


Federal Hiring Process
Hiring Manager & HR Specialist's
Experiences V2.1

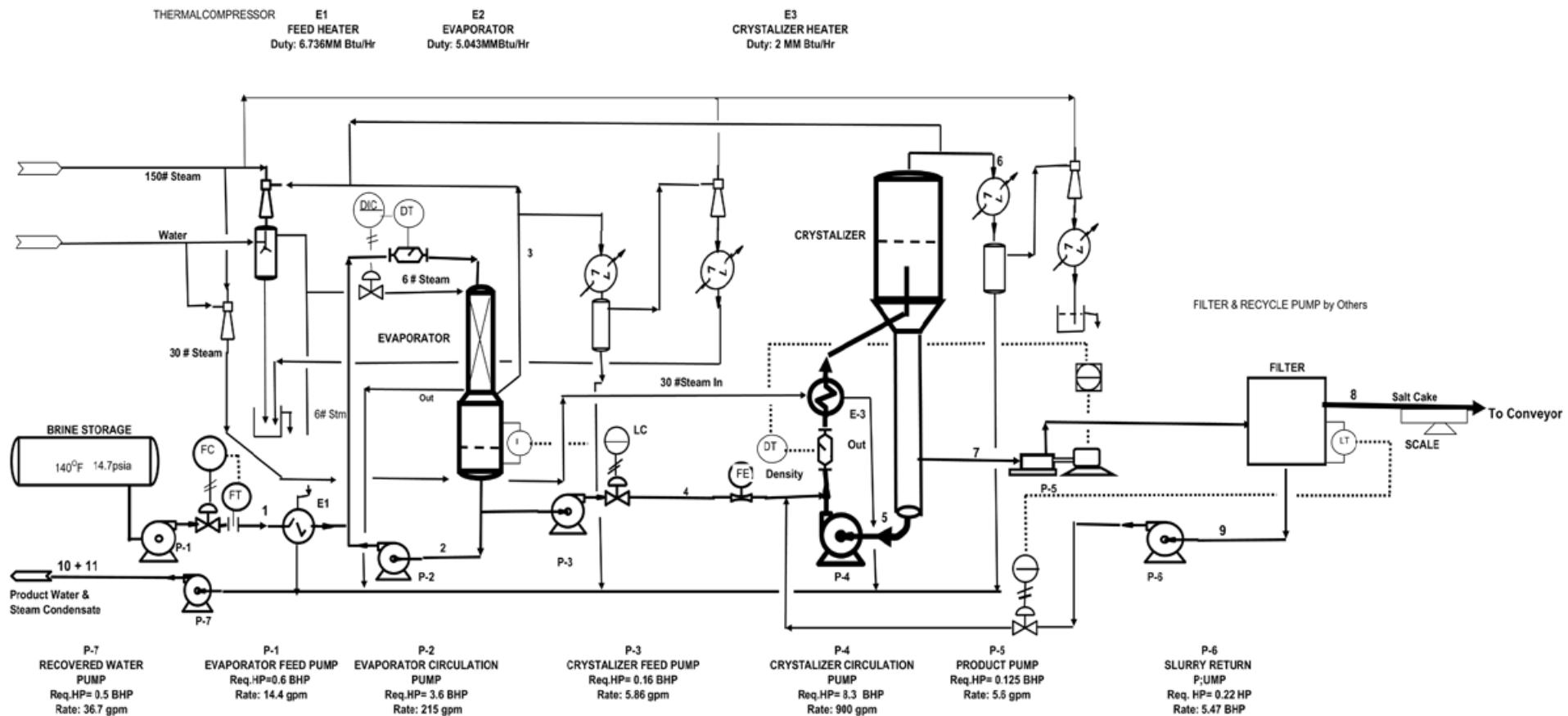
Key Insight

- 1 Hiring Manager's lack of knowledge about how [and hydration will] the hiring process causes them to take the path of least resistance. They may not even consider the consequences or a decision not to hire. This can be mitigated if they have a "supercharged" HR person. Someone who is very knowledgeable about the hiring process and their own best practices.
 - 2 Many hiring Managers and Recruiters are unclear of one another's role, so there is a decreased effectiveness and efficiency in the hiring process.
 - 3 There is no formal training of HR Specialist's specific hiring process knowledge and abilities, which creates confusion about what is and is not acceptable in the process. This may lead to agency and proneness.
 - 4 Many Hiring Managers are unaware they are thelynchpin in a successful hiring process and agencies are unaware of the practices that would motivate them to change their behavior with regard to the hiring process.
 - 5 Most job announcements are not well written and reviewed with a senior in mind. Instead the announcement is more focused on regulations, which impedes the ability for the government to attract qualified candidates.
 - 6 Good job announcement templates make HR's job easier and more efficient, but there are many different templates and variations of them. It is important to have a template that provides helpful information for job-seekers and can cause them to trust the announcement.
 - 7 The TAK and USAJOBS templates and placards don't align with the needs of the job and instead communicate the job seeker, making it harder to find and successfully apply for the right job.
 - 8 Legal requirements limit job announcement content by putting restrictions on what can be included. This limits the amount of information which causes applicants to skip or misinterpret information.
 - 9 Because the effectiveness of QPA is not measured formally, QPA is unclear about what elements of the document work well and don't work well.
 - 10 USAJOBS and Take Action System documents as a poor job announcement template. It is a long, static, wordy, planning and HR specialists need to email to communicate and spend a significant amount of time figuring where to name to advise.

Legend

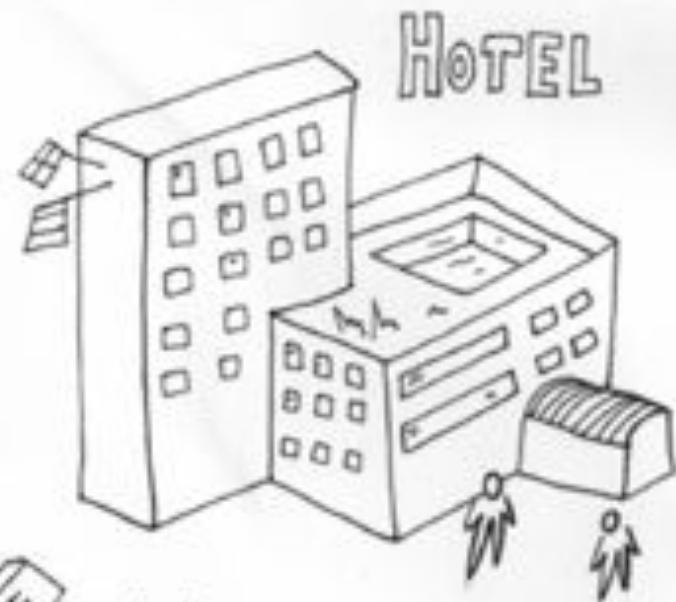


PFD (Process Flow Diagram) for: CRYSTALLIZER /EVAPORATOR applied to production of Sodium Chloride Crystals





- Library material
- Website
- Delivery system



\$\$\$ potential business model



- Increased visitors to the library
- User generated recommendations

OPPORTUNITY
INTERACTION



HOTEL GUEST

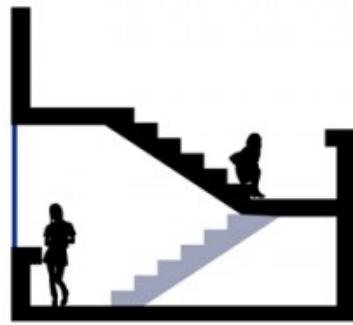
- Direct access to books, music and DVD's
- Personalised hotel experience



-All the information about Danish culture on the library website



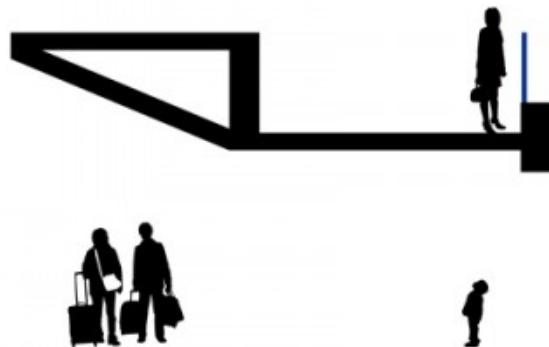
A Bench / LED info



B Cafe Filter Stair



C Cafe Filter / Solari Departure Board



D Passthrough / Bridge walk



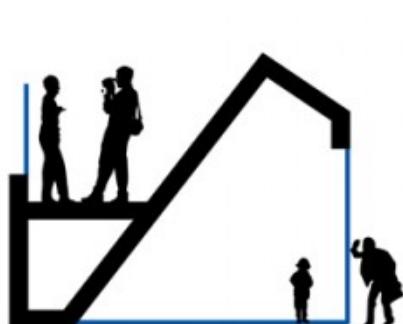
E TfL Kiosk / Loveseat / Bridge walk



F Plaza Seating / Vendor



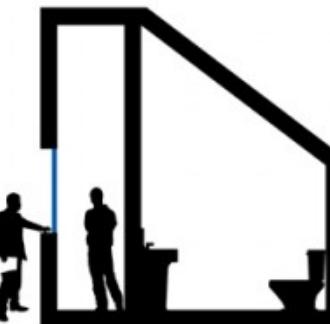
G Stair to LBN Exhibit and Bridge



H LBN Exhibit / Vendor



J LBN Exhibit / Vendor



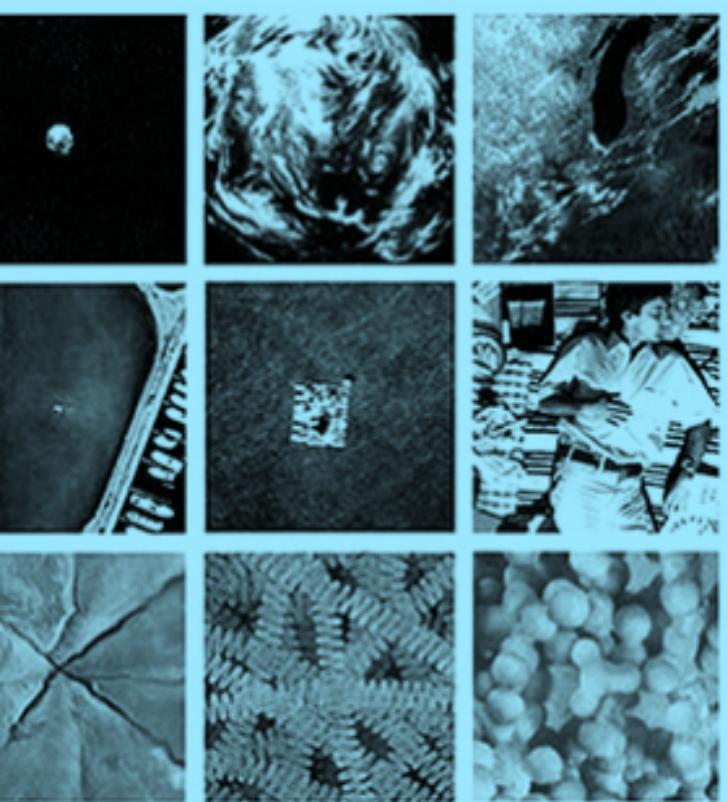
K WC

Discussion: Diagramming

What diagram types could help communicate your system's purpose, parts, flows, and/or behaviors?

Group discussion

Visualizing Systems Scalar Thinking



Charles & Ray Eames
– Powers of Ten

How does the nature or paradigm of your problem (and its possible solutions) change when examined at different scales?

Ex: Urban transportation issue?

10^1 : The automobile
 10^2 : Other traffic
 10^3 : Neighborhood
 10^4 : Local economy
 10^5 : Public transit

10^6 : Suburban life
 10^7 : Infrastructure
 10^8 : Public health
 10^9 : National security
 10^{10} : Climate change

Exercise: System Map as Diagnostic Tool

Create a system map using
one type of diagram.

In groups: 20 minutes

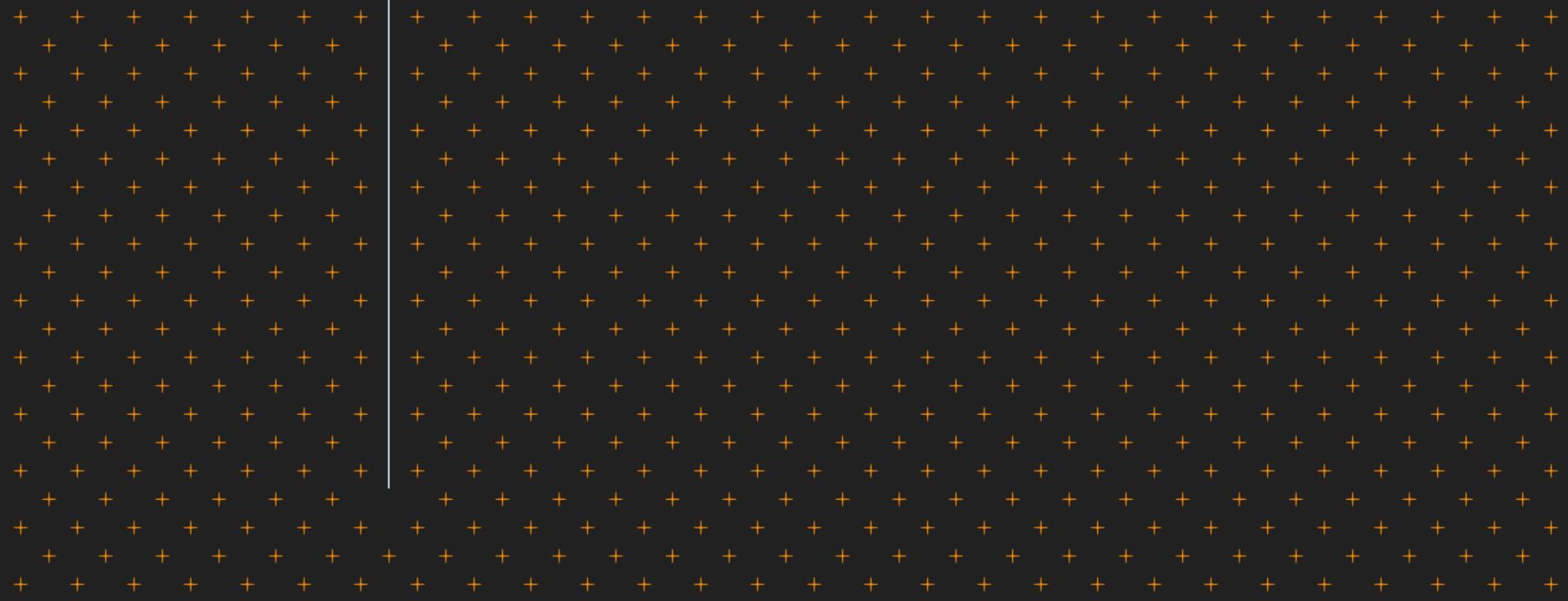
Exercise: System Map as Diagnostic Tool

Use your Air Travel System Map to identify 1-3 problem areas.

In groups: 20 minutes

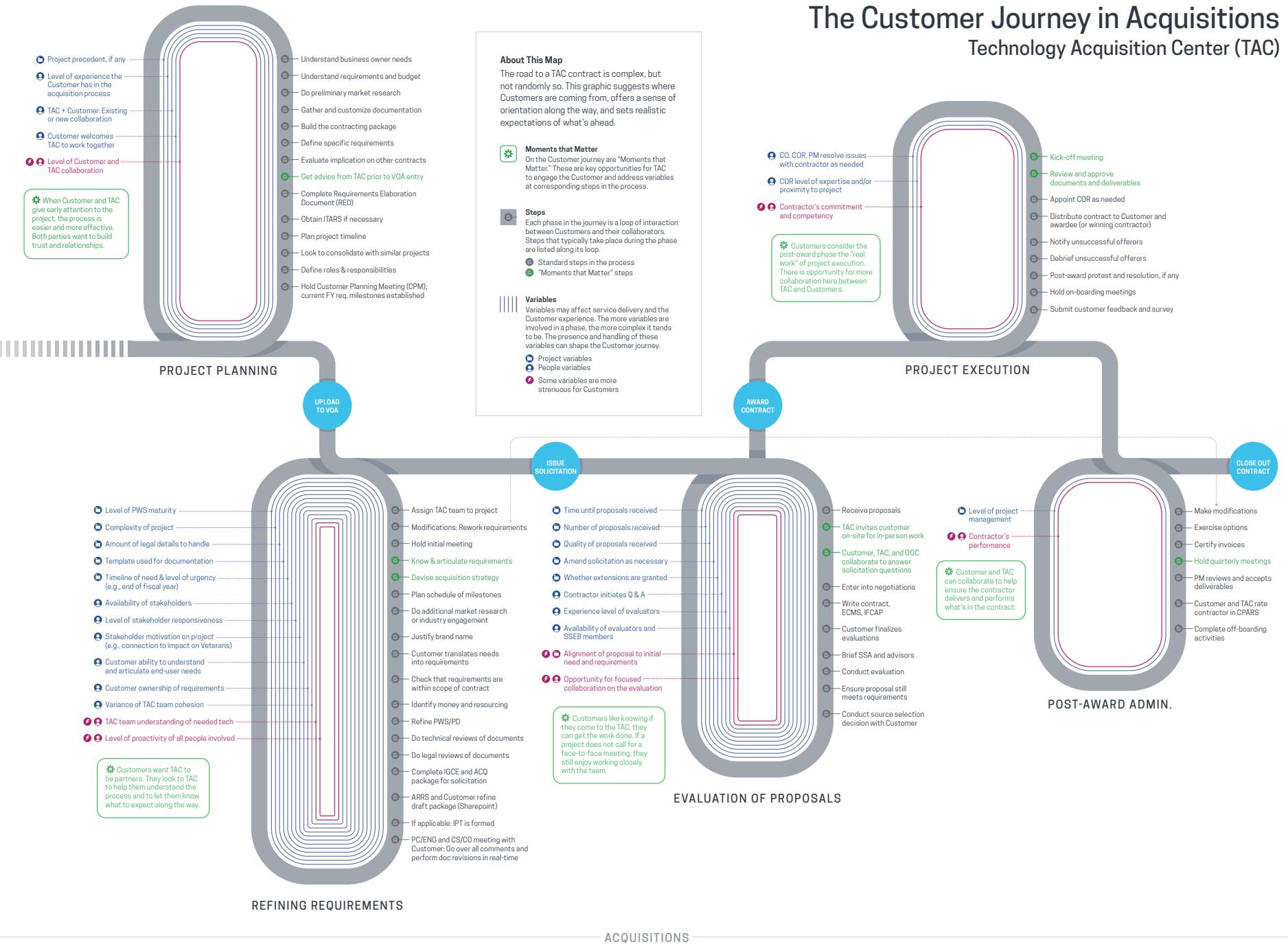
Break

Intervening in Systems: Leverage Points



The Customer Journey in Acquisitions

Technology Acquisition Center (TAC)



“

“Growth has costs as well as benefits, and we typically don’t count the costs—among which are poverty and hunger, environmental destruction, and so on—the whole list of problems we are trying to solve with growth! What is needed is much slower growth, very different kinds of growth, and in some cases no growth or negative growth.

The world’s leaders are correctly fixated on economic growth as the answer to virtually all problems, but they’re pushing with all their might in the wrong direction.”

Donella Meadows
— Environmental Scientist

Leverage Points

“

“People know intuitively where leverage points are,...[however] everyone is trying very hard to push...*in the wrong direction!*”

Jay Forrester

— Computer Engineer & Systems Scientist

System Interventions

- How can a system map be used to frame problems and identify corresponding leverage points?
- Determine where a potential leverage point falls on the scale of effectiveness. Is this the impact you want to have?
- Consider your organization's level of commitment, available resources, and timelines. Can you achieve the desired effect with those parameters in place?
- What aspects of the system can you change? How does that affect the possibilities around leverage points?

12 Leverage Points

12 | Numbers

11 | Buffers

10 | Stock-and-Flow Structures

09 | Delays

08 | Balancing Feedback Loops

07 | Reinforcing Feedback Loops

06 | Information Flows

05 | Rules

04 | Self-Organization

03 | Goals

02 | Paradigms

01 | Transcending Paradigms

Leverage Points 12 - 09

12 | Numbers

11 | Buffers

10 | Stock-and-Flow Structures

09 | Delays

Leverage Points 08 - 05

08 | Balancing Feedback Loops

07 | Reinforcing Feedback Loops

06 | Information Flows

05 | Rules

Leverage Points 04 - 01

04 | Self-Organization

03 | Goals

02 | Paradigms

01 | Transcending Paradigms

Exercise: System Map as Intervention Tool

Use your Air Travel System Map to identify 1-3 corresponding leverage points and opportunities for intervention.

In groups: 20 minutes

Gallery Walk: System Map as Diagnostic Tool

What problems and opportunities did you find?
What was your process for identifying these? What did you propose?

30 minutes

Wrap up Reflection

What thoughts, questions,
and ideas arose today?
What are your expectations
for visualizing systems in
your own work?

Conclusions: Feedback Survey

Please fill one out!

THANK YOU!

5-10 minutes individually