Iceberg Exercise: Summary

ICEBERG MODEL
DESIGNING COMPLEX SYSTEMS

The Iceberg Model is a systems thinking framework used to uncover the deeper structures driving visible events or behaviors. It visualizes a problem.

Events/ Behaviours
What are the visible outcomes

Patterns / Trends
What trends do we see over time?

Structures / System
What infrastructure, rules, power dynamics influence those patterns?

Mental Models / Beliefs
What underlying mindsets, assumptions, or cultural norms are driving those structures?

The Iceberg Model helps to move beyond surface symptoms to uncover the deeper root causes of complex issues. Instead of reacting to visible problems, it encourages exploring underlying structures or cultural assumptions driving them. It supports more strategic, long-term thinking by revealing how system elements are interconnected. It also fosters shared understanding by offering a common framework to interpret what's happening beneath the surface. By surfacing the mental models—beliefs, assumptions, and values—that shape systems, it enables fundamental transformation, not just policy tweaks. Finally, it gives language and structure to complexity, helping tell a clearer, more compelling story about why change is needed and deciding where to take action.

ICEBERG MODEL: SCIENTIFIC COMMUNICATION TODAY

Insights from the iceberg exercise that reveal the underlying dynamics of today's scientific communication.

Events/ Behaviours

- Gatekeeping with long delays from discovery to publication
- Limited credit for data, software, or failed experiments
- Rising volume of papers, but lack of discoverability
- Journal Impact Factor as dominant success metric
- Researchers burned out by review requests with no recognition or reward
- Static PDF-based format limits data sharing

Patterns / Trends

- Publish or perish culture dominates career advancement
- Journals maintain prestige by limiting acceptance, reinforcing exclusivity as a signal of quality
- Funders, hiring, and tenure decisions tied to publication count and brand association
- Preprints gaining traction, but inconsistently valued
- Peer review system strained and uncredited
- Citation and impact metrics favoured over real-world use or reuse
- Preprint adoption varies significantly by discipline

Structures / System

- Reward systems incentivize novelty over replication or reuse
- Publishing models prioritize journals as gatekeepers of credibility
- Infrastructure fragmented—data, software, and text are siloed
- Legacy publishers profit from maintaining exclusivity and prestige
- Github stars the new metric
- Fast Proxy
- Science is about individual gains, not collective progress
- Authorship and data sharing conventions do not adjust well for different disciplines

Mental Models / Beliefs

- "It's actually all about $ but we pretend it's not"
- Prestige = quality = impact
- Publishing = final product, not part of a knowledge process
- Data/software are secondary to the written article
- Openness threatens rigor or intellectual property
- "Feels motivating and fun to do good work, write code and curate data even if it's not incentivized"
- Perceived lack of power to affect change

ICEBERG MODEL: SCIENTIFIC COMMUNICATION OF TOMORROW

Highlights from the iceberg exercise illustrating a utopian future we see as ideal for scientific communication.

Events/ Behaviours

- Share final research in real-time with a click of a button
- Self plagiarism is not a thing
- Make research artifacts more modular
- Diverse outputs are rewarded and recognized
- A true network of knowledge
- Peer review is a transparent system of evaluation not gatekeeping mechanism
- 10 strangers don't determine a researchers career
- Research is inclusive and a public resource
- All of science is discoverable and easy to reuse
- Science is rewarded as a continuous iterative workflow

Patterns / Trends

- Reuse of text, code & data is encouraged
- Failed experiments and negative results are shared
- Collaborative environment to create and share work
- Leverage single source of truth
- Institutions act as if research is knowledge exchange
- Allow independent publication of datasets and code

Structures / System

- Better management and mentorship is provided with workplace training
- Reward system for the diversity of work beyond publishing papers (mentoring, reviewing, data, code and protocols)
- Basic infrastructure is well funded
- Science is for the betterment of all not one.
- Knowledge is not commercialized
- Create tools to track broader impact metrics
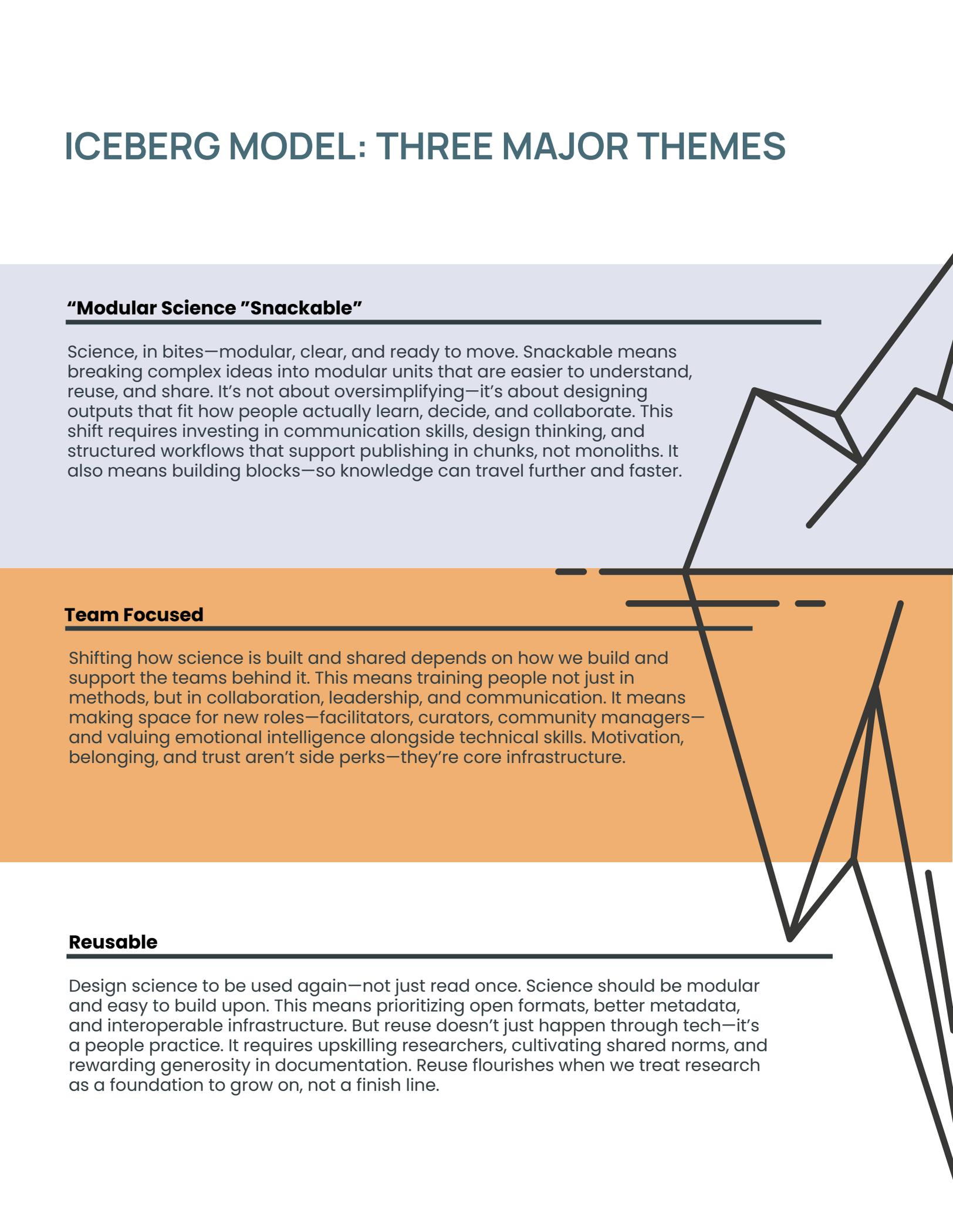- Develop standards across different initiatives

Mental Models / Beliefs

- Expertise is valued
- "We do the science which motivates us"
- Individuals feel empowered to contribute to communities
- Institutions are reflective and confident in their purpose
- I need to share my failed attempts to help others
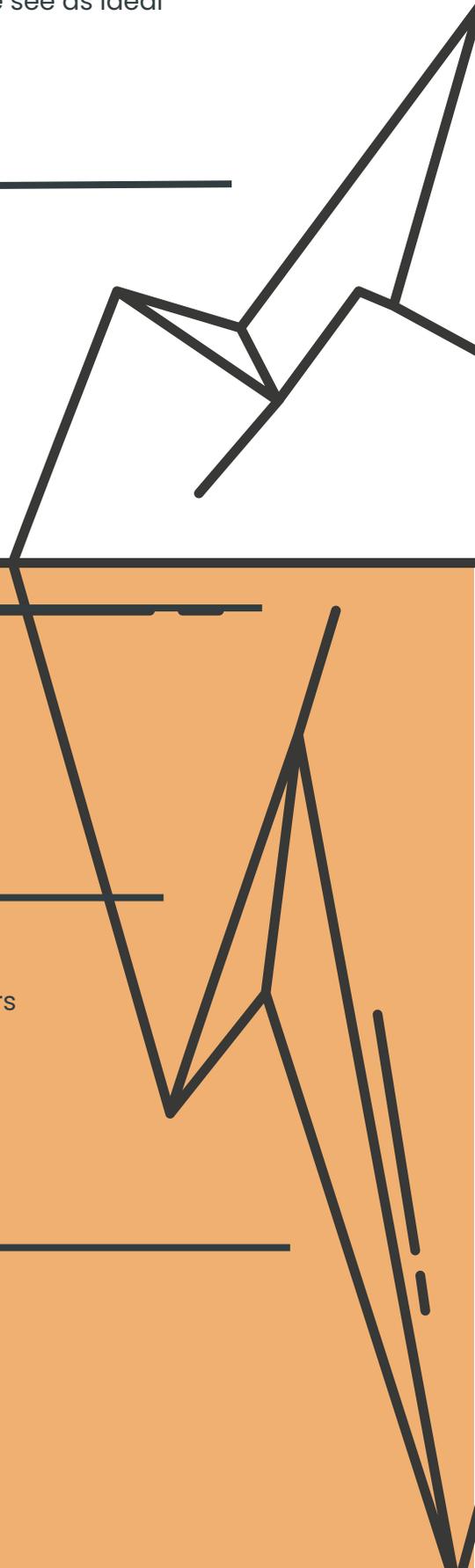
ICEBERG MODEL: THREE MAJOR THEMES

"Modular Science "Snackable"

Science, in bites—modular, clear, and ready to move. Snackable means breaking complex ideas into modular units that are easier to understand, reuse, and share. It's not about oversimplifying—it's about designing outputs that fit how people actually learn, decide, and collaborate. This shift requires investing in communication skills, design thinking, and structured workflows that support publishing in chunks, not monoliths. It also means building blocks—so knowledge can travel further and faster.

Team Focused

Shifting how science is built and shared depends on how we build and support the teams behind it. This means training people not just in methods, but in collaboration, leadership, and communication. It means making space for new roles—facilitators, curators, community managers— and valuing emotional intelligence alongside technical skills. Motivation, belonging, and trust aren't side perks—they're core infrastructure.

Reusable

Design science to be used again—not just read once. Science should be modular and easy to build upon. This means prioritizing open formats, better metadata, and interoperable infrastructure. But reuse doesn't just happen through tech—it's a people practice. It requires upskilling researchers, cultivating shared norms, and rewarding generosity in documentation. Reuse flourishes when we treat research as a foundation to grow on, not a finish line.

ICEBERG MODEL: EXERCISE INSTRUCTIONS

In your groups of six, you'll complete two Icebergs:

1. First, map the current state of today's scientific communication system.
   a. Use the Iceberg model to go beyond what's visible — and identify the deeper patterns, structures, and mindsets that shape the system.
2. Next, create a future state Iceberg for a utopian version of scientific communication.
   a. For this one, focus on the tip of the iceberg — the events and behaviours you would hope to see if we got it right.
3. Then, reflect on both Icebergs and discuss:
   a. What 1–2 things in today's system are holding you back from reaching that future?

What pattern, structure, or mental model would you prioritize to change — and why?

TIps:
Use post-it notes to build your Icebergs — you'll be able to move things around as your conversation evolves.

You have 45 minutes for this activity. With a share back to the larger group.

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