Abstract Analog Thinking

Idea In Short

Some analogies compare things that look alike, and others compare systems that work alike. Abstract analog thinking belongs to the second group. It looks for a relational logic in one field, such as a flow, a feedback loop, or a bottleneck, and maps that logic onto a problem in another field. Dedre Gentner's structure-mapping theory gives the idea a precise form, and organization scholars have shown how metaphors shape the way managers see their firms. This article explains how to build analogies that carry real logic, how to check them, and how to avoid the common trap of confusing a vivid image with a sound argument.

Managers use analogies all the time. They say a project is a marathon, a market is an ecosystem, or a team is a family. Most of these comparisons are loose, and they work as decoration. A more disciplined version treats the analogy as a map between two systems, in which each relationship in the source corresponds to a relationship in the target. This is abstract analog thinking, and it lets people borrow tested logic from one discipline when they work in another.

The theory behind the map

Dedre Gentner developed the best-known account of how analogies work. A summary from the research group that built a computer model of her theory says the basic idea is that an analogy maps knowledge from one domain, the base, into another, the target, in a way that conveys that a system of relations holding among the base objects also holds among the target objects.1 The definition moves attention from the things to the relations among them.

The same summary describes the systematicity principle, which it calls a structural expression of a tacit preference for coherence and deductive power in interpreting analogy. A good analogy is not a pile of separate matches. It is a connected system of relations, so that one correspondence supports another. If you can map the cause of a pressure to the effect it creates, and also map the way the effect feeds back on the cause, the analogy

carries more weight than if you map only one link.

Gentner first presented the theory in the early 1980s, and it appeared in Cognitive Science in 1983.2 It has shaped decades of work on learning and reasoning, and it gives managers a practical test for any proposed analogy.

Relations matter, appearances do not

A common reference on the theory explains how it separates analogy from plain similarity. The theory recognizes that base and target can differ in ways that do not weaken the analogy. For example, a battery can be seen as being like a reservoir despite differences in shape, size, color, and substance, because what carries over is the pattern of relations and not the object attributes.3 The same source notes that Gentner won the 2016 David E. Rumelhart Prize for this work.

The battery and reservoir comparison is useful for business because it shows what to look for. In both, something is stored, can be drawn down, and can be refilled, and the rate of flow depends on the level. Nobody needs to know the chemistry of a battery to reason about a reservoir this way. The logic of stocks and flows applies to cash reserves, employee attention, inventory, and customer goodwill.

Take customer goodwill. Think of it as a reservoir. Good service fills it slowly, a single failure drains it quickly, and the level affects how much trouble customers tolerate. The analogy suggests concrete questions: what are the inflows, what are the leaks, and how low can the level drop before customers leave? None of these questions comes from the surface features of customers.

Metaphor in organizations

Organizational scholars have studied how metaphors shape management thinking. A paper in Organization Studies explains the basic mechanism: properties of a familiar source are used to apprehend and understand a more abstract target, through a carrying over across distinct elements. The authors observe that metaphors are omnipresent in organization studies and in managerial practice, and they give examples such as describing an organization as a prison.4

An encyclopedia entry adds that metaphors influence the way we describe, analyze, and theorize organizations. It explains that when people assert an organization is like a machine, the comparison, substitution, and interaction between the two images combine to generate a new understanding.5 The entry also credits Gibson Burrell and Gareth Morgan with showing the significance of metaphor in the field.

These findings carry a warning. A metaphor does not merely describe, since it also directs attention. A leader who sees a firm as a machine looks for faulty parts, and one who sees it as an organism looks for health and adaptation. Abstract analog thinking asks you to choose the source deliberately, and to state which relations you intend to carry over.

A procedure for building an abstract analogy

First, describe your problem in relational terms. Replace names with roles, such as "a scarce resource," "a flow that depends on a level," or "two parties that each respond to the other." Write four to six statements of the form "A affects B in this way." This step is the hardest, and it forces you to look beneath the details.

Second, search for fields that contain the same set of relations. Physics, biology, ecology, traffic engineering, and epidemiology are rich sources, because they study systems with feedback, flows, and thresholds. Ask people from those fields to describe their standard models, and see which ones match your list.

Third, build the map. Write the source relations in one column and the corresponding target relations in another. Mark each match as confirmed, plausible, or broken. Fourth, run inferences. If the source model predicts a threshold or a delay, ask whether the target should show the same, and look for evidence.

Choosing a source discipline

The choice of source determines which questions you will ask, so make it on purpose. A useful source has a well-understood model, a vocabulary that other people can learn quickly, and a structure that resembles your problem in at least three relations. A source that fits only one relation will give you a slogan and not a method.

Ask also whether the source field has a record of failures. Fields that have tested their

models against data, such as epidemiology or traffic engineering, usually know where their models break, and those boundaries tell you where your analogy is likely to break too. When possible, invite someone from the source field to review the map. Their objections often reveal the hidden assumptions that make the model work in its home domain, and your target may not share them.

A hypothetical example

Consider a hypothetical online marketplace that wants to understand how quickly a new feature will spread among sellers. The team describes the problem in relations: each adopter exposes others, exposure leads to adoption with some probability, and adopters eventually stop promoting the feature. These relations match a simple model of how an infection spreads through a population.

The map suggests questions. What is the equivalent of the contact rate, and how long does promotion last? Is there a threshold below which the feature fails to spread? Which parts of the epidemic model break? Seller adoption depends on profit, not only on exposure, so the team marks that relation as broken and adds a new variable. The example is invented, yet it shows how the process keeps the useful logic and drops the rest.

Cautions

Abstract analogies can give false confidence. A map that fits on paper may fail in practice because a key relation differs. For this reason, treat inferences from the analogy as hypotheses, and test them with data from the target field.

Vivid metaphors can also take over a conversation. People remember a striking image, and they may forget the list of mismatches. Keep the mapping table visible, and revisit it whenever a decision rests on the analogy.

Finally, avoid disrespect toward the source field. Borrowing a model from biology or physics requires understanding where it applies. Consult specialists, read the original work, and be honest about what you do not know.

- 1Structure-mapping: a computational model of analogy and similarity
- 2Structure-mapping: a theoretical framework for analogy and similarity

- 3Structure-mapping theory
- 4Metaphor and organization studies: going beyond resonance to further theory and practice
- 5Metaphor and organization

Summary

Abstract analog thinking moves the logic of one discipline into another through metaphor. Gentner's work shows that a good analogy preserves a system of relations while ignoring surface differences, and organizational research shows that metaphors both reveal and hide features of a business. The craft lies in stating the relations explicitly, testing each one in the target, and discarding the parts that fail. Leaders who practice this can borrow tools from physics, biology, or engineering without borrowing their errors. Take one problem you face, write it as a set of relations among roles, find a field with the same set, and list every place where the match breaks.