

### Innovation Generation Tools Definitions

1. Finding the right **question**: Good questions are ambitious and unbiased. Central problem statements are questions that have the greatest potential to generate surprising and useful answers have several characteristics—big and ambitious, unbiased by pre-existing beliefs, plausible, actionable, and useful.
2. **Observation**: Innovators must be acute and perceptive observers. Normal observation is anti-innovative.
3. **Analogy**: One of the most commonly used methods to promote innovation. Analogies are associations in which we find commonalities between things including similarities and differences.
4. Juggling **induction** and **deduction**: Inductive reasoning is the process of generalizing based on individual instances. Deductive reasoning starts from assumptions that are stated as axioms or givens, and these are used to reach a logic based conclusion. Whereas induction moves from observation to theory and deduction moves from theory to observation, innovation often combines the two.
5. Changing **point of view**: Each of us sees differently based on our perspective. Innovators change their point of view to modify approaches to intervention.
6. Broadening **prospective**: Innovators benefit from broadening our perspective. It greatly expands the range of novelty.
7. Dissecting the **problem**: Dissecting the problem leads to convergence. Divergent thinking is the spawning of a wide array of ideas in response to a problem. Although generating many novel ideas drives novelty, the testing of very specific ideas and components of ideas allows us to converge on a single best solution so as to assure scientific progress.
8. **Reversal**: Reversal works either by flipping assumptions or by realizing the import of a serendipitous twist. This is a potent trigger for innovation. Innovators grasp the implications of finding the reverse of what is expected.
9. **Recombination** and **rearrangement**: These tools help us to mix up elements, expand, dissect, and reverse our problem statement or its solutions. Innovators can rearrange and recombine parts from other ideas, inventions, or disciplines to gain originality.
10. Power of **groups**: Groups can be more intelligent, more efficient, and even more innovative than a single person. The power of numbers as well as the synergies among people with different types of expertise can accelerate discovery.

11. **Frame shifting:** Normal thinking involves using tried-and-true expectations to process new information and make inferences. Linguists call these expectations or assumptions *cognitive frames*. Frames are fundamentally constraining, so a shift in a frame can create a major innovation.

Ness, Roberta B. *Innovation Generation: How to Produce Creative and Useful Scientific Ideas*. Oxford University Press, 2012.

