

## Is it complex or complicated ?

We often confuse the words “complex” and “complicated”.

Something that is **complicated** contains many interconnected parts which make it hard to figure out or explain, but with training and perseverance we can understand it. The French biologist and philosopher Henri Atlan explains that complication arises through **algorithmic complexity**. Such problems are difficult to solve but are well-defined and have a clear set of steps, a procedure or an algorithm to resolve them. The North American scholar Peter Senge uses the term **detail complexity** to describe such problems that are difficult to solve because they are so rich in detail. A jet engine is complicated but with time and patience we can understand and explain how it works.

On the other hand, situations where you lack information and have an incomplete understanding about how reality works involve what Atlan calls **natural complexity**. As such complex behavior arises through the interaction of multiple variables over time, Senge uses the term of **dynamic complexity**.

When facing natural or dynamic complexity both the problem and the solution have to be invented. A policy maker working to improve access to medical care is faced with this type of complexity.

To illustrate the difference between algorithmic and natural complexity imagine you are asked to perform two tasks with a pile of Lego bricks:

1. You must build the highest, most robust tower.
2. You must build the best toy for children

These two tasks imply two completely different challenges. The definition of the first task is objective, and procedures, methods and algorithms exist to work out the best way to perform the task. There must be some engineering rules or methods that you can follow to optimize the use of the bricks and make the tower as high as possible. The task is complicated, but it is well defined and we can learn to solve it.

Now think about the second task. How should you build the best toy for kids from the same pile of lego bricks? We may need to consider how much parents will be willing to pay for the toy, children’s taste in colors and types of toys, the ease of assembly, safety standards and so on. Perhaps the colors used influence the production costs, and the types of pieces affect the ease of assembly. Our task involves more than optimizing the use of the bricks, it also involves identifying the factors that influence our objectives using sometimes incomplete information and then constructing a solution that is not necessarily optimal to attain these objectives. This task is complex, and we need methods to help us properly understand it.

In our class, we will be focusing on situations of dynamic complexity.

## References

Atlan, H. (1979). *Entre le cristal et la fumée: Essai sur l'organisation du vivant*. Paris: Éditions du Seuil  
Lego illustration from Vasconcelos, F. C., and Ramirez, R. (2011). Complexity in business environments. *Journal of Business Research*, 64(3), 236-241.

Senge, P. M. (1990). *The fifth discipline: The art and practice of the learning organization*. New York: Doubleday/Currency.