

Characteristics of Complex Adaptive Systems

Complex Adaptive Systems

- A complex adaptive system is a system made up of many individual parts or agents.
- The individual parts, or agents, in a complex adaptive system follow simple rules.
- There is no leader or individual who is coordinating the action of others.
- Through the interactions of the agents emergent patterns are generated.
- If elements of the system are altered, the system adapts or reacts.

Definitions:

Leaderless –

- Without a leader.

Emergent patterns -

- Patterns that form even though the agents were not “directed” to make a pattern.

Non-linear -

- System level data as seen in graphs and plots are not linear (do not form straight lines). Often feedback loops cause systems to display non-linearity.

Self-organizing –

- A system in which a pattern emerges as a result of the agents following simple rules without external control or a leader is called a “self-organizing” system.

Feedback loop –

- A closed system that contains a circular process in which the system’s output is returned or “fed back” to the system as input.

Adaptive –

- Reacts to changes.

Chaotic behavior of a system –

- Small changes in initial conditions can generate large changes in the system’s outcome.

Stochastic -

- Governed by chance. The behavior of a complex adaptive system can be inherently stochastic as elements of the system, the agents, can have randomness in their movement, and thus, in their interactions.