Glossary of Key Terms

The following offers an overview and brief descriptions of key terms used within the rugged landscape literature (an → in front of a term indicates that this term is also included in the glossary).

Agent. An agent is an entity that → searches for a → solution to a → problem. Multiple agents may search simultaneously and their search processes may be interdependent in multiple ways (→ coevolution).

Broad search. The broader a → search process, the greater the number of potential solutions (in other words, the larger the part of the landscape that can be reached through the search process). Local search is narrow because it leads to → hill climbing and a → local peak. A broadening of the search process increases the expected → performance of the → peak (the solution ultimately reached by the search process).

Coevolution. When multiple → agents are interdependent, their search processes coevolve. The most relevant forms of coevolution in the → rugged landscape literature are → coupled search and → parallel search.

Cognitive representation. A cognitive representation is an → agent's representation of the features of a → problem and/or its → solution space. Cognitive representations facilitate the agent's → search process.

Complexity. Multiple definitions of complexity exist (see Gell-Mann (1997) for a brief, non-technical overview). Within the → rugged landscape literature, complexity is understood in terms of a → problem that has both a large number of choices and numerous → interdependencies among choices (Simon, 1962). The number of choices is represented by the parameter N and the degree of complexity by the parameter K. Specific complex

problem structures (e.g., → modular problems) can be represented by specifying the → interaction matrix. Complexity affects the landscape's → topology, such that a higher degree of → complexity leads to more peaks.

Coupled search. When each of two or more → agents only searches across a subset of all choices but their choices are interdependent, then their search processes are coupled. Due to these → interdependencies, coupled search processes lead to → sticking points instead of → local peaks. Coupled search is a form of → coevolution.

Distant search. The distance between two solutions is the number of choices in which they differ (this is called "Hamming distance"). A → local search process cannot immediately reach a solution with a Hamming distance of two or more from the current solution.

Evaluation. The process by which the → performance of one or more candidate solutions is examined and compared with the current solution is called evaluation. Evaluation may be subject to imperfections. A typical distinction is between online evaluation (using feedback generated from experiential search by "trying out" the candidate solution) and offline evaluation (using other means for evaluation, such as a → cognitive representation).

Exploration. This generic term denotes the → search for and identification of superior solutions that depart from and are different from currently known solutions (see March (1991) for an overview and application to the management literature). In the → rugged landscape model literature, exploration is associated with → broad search.

Hill climbing. See → local search.

Imitation. Imitation is the adoption of the values for a set of choices from another → agent from the same → population (and replacing one's own previous values for these choices).

Interaction matrix. An interaction matrix captures the → interdependencies among choices. See Rivkin and Siggelkow (2007) for an overview of interaction matrices that represent typical → problem structures.

Interdependence. Two choices are interdependent when the value of one choice affects the → performance of the value for the other choice. Interdependencies can be sequential (i.e., one choice affects another but not vice versa) or reciprocal (i.e., two choices affect each other). The set of interdependencies is specified via the → interaction matrix. In → coupled and →

parallel search processes, interdependencies among choices lead to interdependencies among → agents.

Local search. A local search process can identify superior solutions only in its "neighborhood." In other words, any candidate solution differs from the current solution in only one dimension. When local search is "hill climbing" (only solutions that are superior to the current solution are adopted), it moves towards a → local peak.

Local peak. See → peak.

Modularity. A specific → problem structure in which there are two or more subsets of choices ("modules") that exhibit strong → interdependencies among choices of the same subset, while there are only few or no interdependencies among choices that are part of different subsets. A modular problem with few interdependencies among modules is "near-decomposable" (Simon, 1962).

Near-decomposability. See → modularity.

Parallel search. When multiple → agents search across the same set of choices, then their search processes are parallel. If the agents are also interdependent, then their parallel search is a form of → coevolution.

Partitioning. Partitioning involves dividing the → problem into subsets in order to divide the → search process across multiple → agents (see → coupled search).

Peak. A → solution for which → performance cannot be improved through → local search. The solution with the highest performance constitutes the global peak. All other peaks are local peaks. Local peaks vary in their performance. A higher degree of → complexity leads to more peaks (that is, a more → rugged landscape).

Performance measures. This entails the mapping of the combination of choices (accounting for → interdependencies among choices and, potentially, other parameters) onto a measure of performance (e.g., "outcome," "pay-off," "success"). Performance measures can be multi-dimensional (i.e., the same set of choices may map onto multiple measures). There may be performance measures for a subset of choices (as is often the case in → coupled search, in which case a search process may lead to a → sticking point instead of a → local peak). The performance mapping determines the landscape's → topology, including the "height" of the various → peaks.

Population. A population is a set of → agents who → search across the same choices (→ parallel search). A population may represent, for example, multiple organizations that are in competition or multiple projects carried out within the same organization. Multiple populations may have → coupled search processes, which leads to → co-evolution.

Problem. A problem is a set of choices for which → agents search for a → solution.

Rugged landscape. A → solution space with many → peaks (see also → topology).

Search. Search is a process by which superior → solutions are discovered through a sequential process. A search process starts with an initial solution. At each step, one or more candidate solutions are → evaluated by comparing their → performance with the current solution.

Solution. A solution is a combination of values for each choice that maps onto a → performance measure. The solution space (landscape) is given by mapping all combinations onto performance outcomes (→ topology).

Sticking point. When the performance measures of → agents in a → coupled search process only take into account a subset of choices, the search process may lead to a sticking point instead of a → local peak.

Topology. The shape of the landscape or → solution space, including → peaks. See → performance measures.

References

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