

Collective problem-solving with heterogenous agents*

Luigi MARENGO

DSGSS, University of Teramo

marengo@unite.it

Abstract

Are economic and social institutions and organizations surrogates of human rationality? Do they provide some form of correction to human mistakes, misjudgments and biases, or, on the contrary, they exacerbate such errors and/or are themselves sources thereof. This question has been repeatedly addressed and thoroughly investigated by scholars of economics and other social sciences in information processing and resource allocation environments. We propose instead a preliminary investigation of this question in a problem-solving model. We consider a collection of agents with limited problem-solving capabilities, where the limitations arise both because they have a limited and possibly biased representation of the problem's state space and because they apply simple and sub-optimal problem-solving heuristics.

We show that the organizational structure and the rules of interaction among agents play a fundamental role in determining the collective properties and we investigate the performance of a set of prototypical organizational structures traditionally studied by economic theory: from teams sharing the same objectives, to more complex coordinating institutions where coordination is ensured by division of labor and by incentive schemes which direct individual decisions.

All in all we show that, given enough heterogeneity among individual problem-solvers, a collection of problem-solvers with imperfect and biased representations and simple trial-and-error heuristics can indeed display the behavior of a sophisticated problem-solver and even outperform it. However this crucially depend upon the organizational structure, and finding an appropriate organizational design for solving a given problem can be itself a problem of a higher complexity. We provide some preliminary findings on the problem-solving performance of some prototypical organizational structure traditionally studied by organizational economists.

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