

HEURISTIC PROBLEM SOLVING: THE NEXT ADVANCE IN OPERATIONS RESEARCH

Herbert A. Simon and Allen Newell, Carnegie Institute of Technology
OPERATIONS RESEARCH, January-February, 1958; pages 1-10.

A plea is made for operations research in the areas of judgmental decisions--those areas which cannot be readily reduced to systematic computational routines. So far, "there are no known formal techniques for finding answers to most of the important top-level management problems." In such "ill-structured" problems, "essential variables are not numerical, but symbolic or verbal.... the goal is vague and non-quantitative," and for many practical problems computational algorithms are not available. In fact, "the majority of decisions that executives face every day.... lie much closer to the ill-structured than to the well-structured end of the spectrum."

*"Ill-structured" problems
could be computer-solved*

Research is now beginning to dissolve "the mystery of how humans solve ill-structured problems. Moreover, we have begun to learn how to use computers to solve these problems.... We now know, at least in a limited area, not only how to program computers to perform such problem-solving activities successfully, we know also how to program computers to learn to do these things."

For example, a program has been written permitting a computer "to learn to distinguish between figures representing the letter O and figures representing A presented to it 'visually.'" Another program has been written giving the computer the ability to discover proofs for mathematical theorems in the "creative" and "intuitive" manner of the scientist. "The program is also being used to predict the behavior of humans when solving such problems."

Other research is being done in such human activities as language translation, chess playing, engineering design, musical composition, and pattern recognition. One computer is designing small standard electric motors from customer specifications to the final design.

However, "computers for heuristic problem solving will replace executives only when the costs per unit of problem-solving capacity are competitive with the costs for executives."