

# The Fourth International Workshop on Artificial Intelligence in Economics and Management

*Phillip Ein-Dor*

■ The Fourth International Workshop on Artificial Intelligence in Economics and Management was held in Tel-Aviv, Israel, from 8 to 10 January 1996. This article discusses the main themes presented at the workshop, including the need for multiple methods in any system designed to solve real-world problems, the differences in the effectiveness of AI versus classic analytic techniques, and the use of AI techniques to customize products.

The Fourth International Workshop on Artificial Intelligence in Economics and Management (AIEM4) was held in Tel-Aviv, Israel, from 8 to 10 January 1996, with participants from 13 countries. The main themes that emerged during the workshop were (1) the need to use multiple methods in any system designed to solve major real-world problems, (2) a continuing interest in comparing the effectiveness of AI solutions with classic analytic techniques, and (3) a growing use of AI techniques to customize products to suit individual consumers.

As a matter of course, almost every presentation at the workshop touched on AI techniques in one way or another. However, a group of papers at the workshop had AI techniques as their main focus. Two of these papers dealt with the relative effectiveness of different methods and two with the development of new or existing techniques. P. P. M. Pompe and A. J. Feelders (both of

University of Twente) compared the effectiveness of machine learning, neural networks, and statistical methods; they found that neural nets provided better results on their data than the other methods. M. Leshno and Y. Spector (both of the Hebrew University of Jerusalem) focused on training set size for neural nets and compared them to statistical methods with the same result; that is, neural nets provided better classification than the statistical methods. N. Levin and J. Zahavi (both of Tel-Aviv University) found that genetic algorithms performed even better than a linear programming model on their problem. Thus, their conclusion was that AI techniques might provide better results than rigid analytic methods for a variety of problems. Two additional papers focused on the Prolog representation of business objects within the three-tier client-server architecture (D. G. Schwartz, Bar-Ilan University) and on the application of image theory to the design of agents and societies of agents (Schwartz and D. Te'eni [Bar-Ilan University]).

Service to customers in the financial area was another focus of the workshop. Lange et al. described a system for customizing investment instruments for individual customers instead of confronting them with a set of standard instruments. The paper by P. Lenca (Télécom Bretagne and Crédit Mutuel de Bretagne) proposed a methodology for acquiring the knowledge of bank customer advisers for incorporation in decision

support systems and knowledge-based systems.

Business applications represent a broad spectrum of issues dealt with in a variety of ways at the workshop. Y. Reich (Tel-Aviv University) proposed a representation for integrating quality-function deployment tools with AI methods. The paper by M. Benaroch (Syracuse University) suggested the use of knowledge-based tools for mass customization of service products; it dealt in general terms with the same problem that Lange et al. addressed in the specific context of investment instruments. Levin and Zahavi reported on the use of a genetic algorithm for optimizing citrus crop harvest and, as reported earlier, a comparison of the results with those of a linear programming model. Finally, on this theme, M. Grundstein (Framatome, France) reported on a knowledge-based system for acquiring company-strategic knowledge and making it available for decision makers.

Each of the papers addressing the theme of economic applications addressed a different area or level of economic analysis. At the macroeconomic level, Deinichenko et al. presented an expert system that utilizes fuzzy knowledge to analyze economic development. K. Cichocki (Polish Academy of Sciences) and T. Szapiro (Warsaw School of Economics) noted the lack of models appropriate to the analysis of economies in transition, such as those of Eastern Europe, and suggested a method for modeling such conditions in a single country. K. Kaufman and R. Michalski (both of George Mason University) described a system to discover knowledge in large databases; theirs is a general approach, demonstrated here for discerning patterns in the economic and demographic data of developing economies. The paper by Edmonds and S. Moss (Manchester Metropolitan University) described a method for modeling the decisions of microeconomic agents as incremental search for good models, and Edmonds, Moss, and Wallis presented a language for implementing such models.

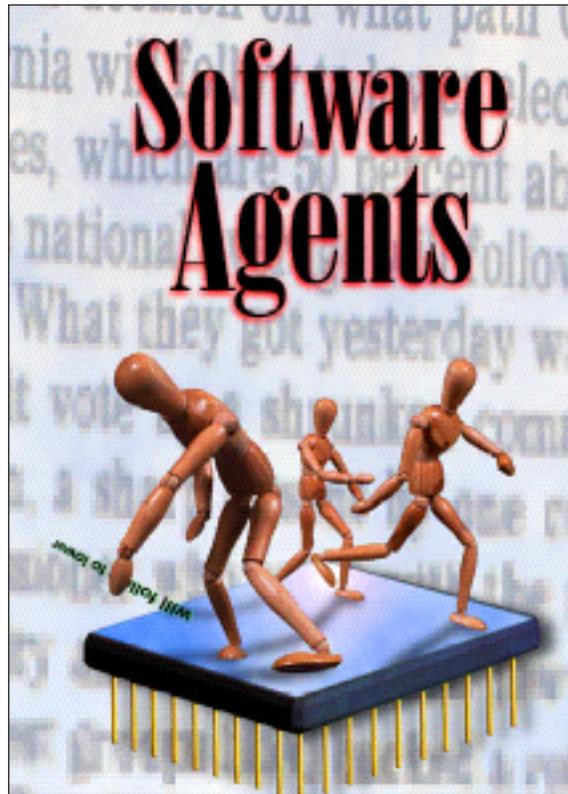
The last theme of the workshop

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concerns the perennial cognitive and qualitative issues associated with AI. R. Berndsen (De Nederlandsche Bank, The Netherlands) addressed this issue by describing a method for deriving causal, qualitative explanations of quantitative models. L. M. Botelho (ISCTE, Portugal) and Coelho discussed the implementation of a model for explaining the motivations of decision makers to search for and ignore information. The paper by L. Dannhauser (Technikon Northern Transvaal, South Africa) consisted of a discussion of applications of AI to training and education.

In summary, it appears that much interesting and high-quality work, both theoretical and practical, is being done on the application of AI to economics, business, and management. We can look forward confidently to continuing progress in this field in the near future.

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Future software will not merely respond to requests for information but will anticipate the user's needs and actively seek ways to support the user. Such software will also manage cooperation among distributed programs. To describe the many roles of this software, researchers use the term *agent*.

The essays in *Software Agents*, by leading researchers and developers of agent-based systems, address both the state of the art of agent technology and its likely evolution in the near future.

The introductory chapters in Part I present the views of proponents and a critic of software agents. The chapters in Part II describe how agents are used to enhance learning and provide intelligent assistance to users in situations where traditional direct-manipulation interfaces alone are insufficient. The chapters in Part III discuss agent-to-agent communication and the use of agents to provide intelligent interoperability in distributed systems and the internet.

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