Decision Support: From Mathematical Modeling to Serious Games

Ghada El Khayat,
Ph.D. Information Systems and Computers Department, Chairperson
Faculty of Commerce, Alexandria University, Alexandria, Egypt
ghadaek@gmail.com

Abstract

This talk starts by presenting a historical overview of the Decision Support body of knowledge providing definitions, formalisms, tools and trends. This starts from Operations Research tools, passing by Expert Systems, Case Based Reasoning (CBR) and reaching to Data-Based Decision Making Tools as well as Serious Games. Common problems tackled by different approaches over time were presented. Operations Research tools addressed different problems including Production Scheduling, Inventory Control, Production Mix, Maintenance Management, Assignment as well as the famous Diet Problem. As for expert systems, applications were in fields of chemistry, medicine, geology and computer systems, among others. CBR is a Decision-Making by Analogy methodology where new problems are solved based on the solutions of similar past problems. This was used in areas of travel, government and troubleshooting among others. CBR is used today coupled with case mining and ontology learning tools.

Data abundance, data diversity and data heterogeneity characterize today's data and provide lots of opportunities for analysis and support of decision making. All forms of applications are envisageable. Data analytics to support decision making is very common today in fields of medicine, marketing, logistics, transportation, education and policy making among others. Tools to support decision-making continue to evolve. Today they include Serious Games that were primarily used for education and training as well as for therapeutic purposes. Using these games in decision making is continuing to grow. They were used in fields of project management and recruitment among others.

This spectrum of tools and methods allowed proposing a taxonomy identifying Decision Support tools as belonging to one of five categories: 1)Model-Based Decision Making, 2)Expert Opinion-Based Decision Making, 3)Case-Based Decision Making, 4)Data-Based Decision Making and 5)Serious Games-Based Decision Making, and categories will certainly continue to increase. Each category features specific characteristics and raises a number of questions: a) Are we dealing with alternative solutions or with a solution space? b) What data capturing technologies are needed in order to be able to get the data to work on and come up with good results? c) Is the objective guiding the solution clear or are we trying to identify patterns? d) Does one decision making category work on its own to provide solutions to problems or hybrid approaches are needed?

In this talk, the speaker presents lots of her contributions in the field of decision making employing the different methodologies and tools. Operations Research tools were used in contributions addressing production and marketing applications. Expert systems were used in banking applications and Data Mining and Analytics were used for applications in banking and in the courier industry. Contributions using Serious Games for decision making were presented in applications in education; dealing with children with learning disabilities and for assessing and assigning students to academic programs.