DECISION MAKING UNDER UNCERTAINTY

Whether making small personal choices, or important public decisions, minor judgments without much awareness, or carefully thought-out ones, every day we face some level of uncertainty. Its role in our everyday life is increasing with the increasing complexity, interdependence and globalization of the modern world and our knowledge about it. The interest in the problem of uncertainty is growing in economics, social and applied science; in areas such as decision analysis, game theory, politics, consumer choice, environmental risks and natural hazards, epidemiology, engineering, etc. On one hand, the demands and weight of the problems we face are increasing. Too much risk in public decisions, or misleading forecasts, can have expensive and far-reaching consequences in both utilitarian and non-utilitarian terms. On the other hand, our knowledge of the world is increasing in complexity, and the amount of information we can relate to the decisions is constantly growing. The problems related to climate change, epidemiology, or earthquake prediction can illustrate this aspect well.

For important public and institutional decisions, various decision aids and techniques can somewhat mitigate this complexity. Expert systems, modeling and simulation systems can help to reduce uncertainties or to gain a better grasp of the situation. However, such techniques
are not always applicable or efficient. And even when these techniques are useful, some human evaluation of uncertainties and risks might be necessary. Major strategic and policy-making decisions rely heavily on expert opinion about the uncertainties involved. Subjectivity in such probabilistic estimations is an unavoidable attribute.

Generally, uncertainties are better understood and accounted for in science. Confidence intervals, error assumption as well as probabilistic reasoning are regular features of the scientific approach. However, the problem remains when scientists and experts try to communicate their uncertainties to the policy makers or to the public. For example, the “science – policy gap” problem in ecology was discussed in detail in Bradshaw and Borchers (2000). Policy makers and the public are often confused with the lack of consensus in scientific opinion, so even when an issue achieves better clarity and consensus in the scientific community, it does not immediately transfer to the public opinion.

In contrast to a scientific approach to uncertainty, most of the ordinary people generally tend to avoid uncertainties and complexities. Unambiguous answers based on heuristics, or compelling but deterministic and oversimplified narratives (e.g., those presented in the media) are often preferred to the more accurate probabilistic reasoning. Thus more information does not necessarily lead to better clarity and comprehensiveness in perception of uncertainties for non-experts. People feel even more confused receiving large amounts of contradictory information concerning personal or public goods (e.g., in financial, ecological or ethical terms) that can be brought about by their choices. Sometime simple heuristics seem to help with everyday small dilemmas such as opting for a new item in a restaurant menu or choosing to buy a lottery ticket. However, in many other situations our personal choices have far reaching consequences and should be taken more seriously. Especially issues concerning health and well-being such as dilemmas on child vaccination or opting for risky surgery require careful consideration of available information.

Here, a doctor’s or medical expert’s evaluation of risks plays a crucial role. These examples underline the importance of expert opinion and suggest that experts are required not only to understand uncertainty but should also be able to communicate it to the other experts, policy makers, and to the public.

RISK, UNCERTAINTY AND GAMES

Although too much uncertainty is undesirable, manageable uncertainty provides an opportunity to make creative and safe decisions. Practical skills in dealing with risk and uncertainty are often overlooked in standard education. This problem could be best addressed in an educational game where players explore uncertainties and make risky choices in the safe environment. Computer game can be a perfect tool for training practical skills in dealing with uncertainty. Dempsey et al. (2002) defines a game as “a set of activities involving one or more players. It has goals, constraints, payoffs, and consequences. A game is rule-guided and artificial in some respects. Finally, a game involves some aspect of competition, even if that competition is with oneself.” A rule-guided game with payoffs is very suitable for incorporating probability elicitation elements. Several researchers have advocated an approach to subjective probability elicitation consisting of five steps: motivating, structuring, conditioning, encoding, and verifying (Jenkinson, 2005). With their great potential for creating motivating and challenging environments, computer games provide an excellent setting to explore one’s subjective probabilities. Scoring systems with rewards and penalties built into the game can motivate, structure, and condition the user. Computer games have a further advantage in encoding users’ replies and feedback in visual, spatial, textual, verbal modes, as well as providing post-analysis of the elicitation process. While holding a story line and narrative, computer games need not follow a linear model. The narrative can be constructed by the player’s choices during
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