Bridging the Water Negotiation Gap between Engineers and Decision Makers

Ernest Thiessen[1] and Paul Miniato[2], June 21, 2013

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Water resource professionals have long recognized that a gap exists between engineers and decision makers. Engineers use careful and comprehensive methodologies to create cost-benefit studies for proposed water resource projects. Decision makers require detailed reports on the consequences of alternative approaches. Because decision makers seldom have time to read the details, engineers must put forth study results in a compelling manner—for example, through visually interesting presentations that must summarize complex analyses accurately and effectively. Even so, the necessary information is seldom at the negotiators' fingertips when the time comes for decision making in complex negotiations.

Decision makers know that there are always non-engineering issues at stake. All too often, these issues are missing from the engineering reports and the trade-offs are far from obvious. Even if decision makers are able to comprehend all of the pertinent information relative to their own preferences, the optimal solution depends on the preferences of all decision makers. Since the preferences of one decision maker are unknown to other decision makers, negotiations can falter or collapse. At best, they usually produce a non-optimal outcome.

In extreme scenarios, countries go so far as to threaten war over water conflict. CNN's Christiane Amanpour referred to such a water conflict between Egypt and Ethiopia in her report entitled "Water War in Egypt?" after her interview this month with Egyptian PM Hesham Kandil. Egypt was the first country to use large quantities of the Nile's water and is presently dependent on the Nile for most of its water needs. Ethiopia now

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[3] Related information can be found on The eNegotiation channel on YouTube

wants to build a dam upstream and Egypt is concerned about the consequences of such a decision.

There are two challenges facing engineers and decision-makers in these situations. The first is to get to a good understanding of the consequences of development alternatives. The second is to ensure a process that all parties believe will lead to good decisions based on that understanding. There have recently been significant advances both in theory and in the associated technology to address these concerns.

Theory

For a long time, mainstream economics held that "perfect atomistic competition" would always direct self-interest to advance the common good. In a paper he wrote in 1949, John Nash went beyond that. Nash postulated that, without cooperation, decision makers naturally fall short of the efficiency frontier, at a point which economists now call the Nash Equilibrium. He went on to derive a solution to this bargaining problem, i.e., how to reach a fair and optimal solution. The algorithm that represents his solution is known as the Nash Product or more precisely as "maximize the utility-gains product"[4].

In 1989, Professor Daniel Pete Loucks at Cornell University presented a challenge to his PhD student, Ernest M. Thiessen: "bridging the gap between engineers and decision makers". Thiessen's resulting dissertation research predicted that decision makers in certain complex two-party negotiations would fall 16% short of the efficiency frontier. When Thiessen published his dissertation, it contained his own solution for generating fair and optimal solutions, called "maximize the minimum gain". This algorithm generates a solution that maximizes the satisfaction for the party that gains the least, relative to an agreed baseline or reference alternative. A practical implementation of this algorithm has required further complex formulas for normalizing the representation of each party's satisfaction in order to produce an unbiased result.

A remaining problem was how to get negotiators to the baseline in the first place. Visual Blind Bidding was the last piece of the puzzle needed for a comprehensive practical solution for the age-old problem of moving people from competition to cooperation. This methodology is now implemented in the Smartsettle eNegotiation system and works in any type of negotiation, whether a simple single-issue conflict between two individuals or a complex multivariate negotiation between multiple nations.

[4] Jayantanuja Bandyopadhyaya, *General Theory of International Relations* (New Delhi: Allied Publishers, 1993), 181.

Technological Advances

Bridging the gap between engineers and decision makers is not easy, but is much more feasible today than it has ever been in the past. eNegotiation tools now exist[5] that make it possible for engineers and opposing decision makers to work together to:

- model the entire problem in advance so that decision makers are able to compare different alternatives being considered in real time during negotiations,
- reach an acceptable solution, even when a fair outcome is not obvious, and
- uncover significant hidden value in a practical and timely manner.

Intelligent and effective eNegotiation processes are now available to help promote communication and cooperation between engineers and among decision makers. This makes the implementation of good decisions more likely. The technical means understood by engineers can now fully inform negotiations guided by policy-makers representing the normative ends of their constituencies. Processes that facilitate the kind of cooperation that Nash was talking about can lead to fair and optimal agreements, even when there is less than perfect trust at the outset. Moreover, a history of successful negotiated settlements can lead to greater trust between the parties over time. Collaborative negotiation processes – and the prospects of negotiated settlements that approach the efficiency frontier – reduce the likelihood of conflict emerging in the first place. And that is definitely a goal worth striving for.

[5] A detailed example of the application of software embodying the principles described in this paper to a hypothetical four-party multi-national negotiation concerning a shared watershed has been published as "Chapter 16, ODR and eNegotiation", by Ernest Thiessen, Paul Miniato and Bruce Hiebert in "Online Dispute Resolution: Theory and Practice, A Treatise on Technology and Dispute Resolution" (January 2012) edited by Mohamed S. Abdel Wahab, Ethan Katsh, and Daniel Rainey. Interested readers may request a demonstration or arrange to experiment with this or other water treaty simulations. Contact either of the authors through the Smartsettle website for further information.