

Innovation, Uncertainty, and their Dilemmas:

An Info-Gap Perspective

Yakov Ben-Haim
Yitzhak Moda'i Chair in Technology and Economics
Faculty of Mechanical Engineering
Technion-Israel Institute of Technology
Haifa, Israel

Improvement comes through innovation, but the new is less familiar and more uncertain than the standard approach or state-of-the-art. What promises to be better may be worse due to unknown mechanisms or interactions. Invention, discovery and improvement are possible because not everything is yet known, but adverse surprises are possible for the same reason. The *innovation dilemma* arises when one must choose between a new and potentially better alternative that is less fully understood than the conventional alternative.

One practical implication of uncertainty is that we must ask: What outcomes are required? What performance is necessary? Is the proposed design robust against uncertainty? We discuss the *info-gap robust-satisficing* response to these questions. This will also provide a quantification of the innovation dilemma, and a method for its resolution.

Another implication of uncertainty is that surprise can be favorable. One can design a system to exploit favorable opportunities. We discuss the *info-gap opportune-windfalling* approach.