The Human Side of Quality – Intuition Versus Models

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Software engineering is a human-centric, design-intensive endeavor. The largest single factor in the success of software projects is the competence of the people doing the work. The fact that people are fallible and have systematic biases, however, is why good software processes are important. In this column I will summarize some of the research in the social sciences on intuition versus modeling that may suggest why a process focus is an effective approach to quality improvement.

Many studies in the social sciences demonstrate the power of even simple statistical models for combining information over the judgments of human experts. These studies compare the clinical method, where the decision-maker combines information in his or her head, with the actuarial method, where the human judge is eliminated and conclusions rest solely on empirically established relations between data and the condition or event of interest. In virtually all of the comparative studies in the social sciences, the actuarial method has equaled or surpassed the clinical method.

This is not an intuitively obvious result. Studies have demonstrated that:

• simple statistical models based on human judges are more often correct than the human judges they are based on
• even when human judges are provided the outputs of the model and allowed to use their discretion, relying uniformly on the actuarial conclusions provides greater overall accuracy than the human judge
• optimal weighting of variables, so long as the sign of the coefficients are correct, is not crucial to performing better than the human judge

This phenomenon can be explained in terms of inside and outside views. An inside view forecast is generated by focusing on the case at hand, by considering the plan and the obstacles to its completion, by constructing scenarios of future progress, and by extrapolating current trends. An outside view forecast focuses on the statistics of a class of cases chosen to be similar in relevant respects to the present one. The critical question in both cases is whether a to treat a particular problem as unique or as an instance of a class of similar problems. The inside view is overwhelmingly preferred in intuitive forecasting because it is viewed as a serious attempt to come to grips with the complexities of the unique case at hand. The outside view is rejected for relying on crude analogy from superficially similar instances.

The future of a long and complex undertaking is simply not foreseeable in detail. The outside view is a conservative approach, which will fail to predict extreme and exceptional events, but will do well with common ones; it is much more likely to yield a realistic estimate. Its main advantage is that it avoids the snares of scenario thinking. In scenario thinking, a sequence of events may be judged more probable than one of its components. Dawes gives the example of

• an alcoholic tennis star who drinks a fifth a day winning a major tournament versus
• an alcoholic tennis star who drinks a fifth a day, joins Alcoholics Anonymous, quits drinking, and wins a major tournament.

The probability of (winning) is higher than the probability of (joining AA) * (quitting drinking) * (winning), yet the sequence of events in the scenario sounds more plausible. A software planning equivalent could be

• making an aggressive commitment and bringing the contract in on time and on budget versus
• making the commitment, hiring highly competent people, providing powerful new tools and methods, and bringing the contract in on time and on budget.

Actuarial procedures do not necessarily work well, they just work better than the experts. Most people would rather remain ignorant of how bad their own judgment is than rely on “mechanical” techniques where they are all too aware of the limitations. Human beings have a unique capacity to observe and make
“atomic judgments,” but this is not the same as a unique capacity to predict on the basis of integration of observations. Human beings can build models, but when it comes to consistently performing better than the models they have produced, they are almost invariably unsuccessful – unless they “load the dice” by taking action that makes their predictions come true.

This first column summarizes only one of the interesting findings about human fallibility from the field of rational decision making. In future columns I plan to discuss other “soft” aspects of software process improvement, as well as more CMM-specific topics. For those interested in exploring rational decision making further, I recommend Robyn M. Dawes, *Rational Choice in an Uncertain World*, ISBN: 0155752154, Harcourt Brace Jovanovich College Publishers, Orlando, FL, 1988.