



# 13<sup>th</sup> Face-to-Face DBD Open Workshop Meeting

NSF 2002  
Design, Service and Manufacturing Grantees and  
Research Conference

*Monday, January 7<sup>th</sup>, 2002*  
*Caribe Hilton*  
*San Juan, Puerto Rico*

## Summary of Questions and Discussions Sessions

Is creativity part of a Decision-Based Design process? Is creating design options a decision making process and can decision theory be used in the creation process? There is a separation of the process of creation and evaluation. You do not need to use utilities to create alternatives, although you could. However, when you are trying to reduce the number of alternatives, you need to use utilities to order the alternatives.

How can decision theory principles be used in the creation process? Customer values, a concept at the heart of DBD, should be used to guide the creation process however. Various dimensions of values should be used to guide a generation process to generate many good alternatives that are better than what currently exists instead of simply generating as many alternatives as possible.

How do values and utilities interact in the design and evaluation process? Values should focus concept generation, but not quantify the generation process in some extent. That is, unless a complete utility function is already defined that can focus concept generation in the most important value dimensions. Values should be used to guide the generation process and utilities should be used to order the concepts generated.

How can preferences be effectively aggregated? Preferences can indeed be aggregated in a number of ways. Arrow's inputs are rank orders, which means that under rank order assumptions, no group preference exists. However, under conditions of uncertainty (or conditions of rating instead of ranking), you avoid Arrow's paradoxes. When you have cardinal utilities as opposed to ordinal utilities, you can avoid the problems associated with Arrow's Theorem and can effectively rank order alternatives.

What should be the theoretic framework for distributed decision making in engineering design? When agent utilities are known, there are operating conditions when rationality, convergence, and optimality conditions are met in a distributed design process. These conditions can be simulated and fundamental concepts from utility theory and negotiation theory can be used to predict when distributed design process will be rational, will converge, or will be optimal in some respect.