MATEing: Exploring the Wedding Tradespace

It is well proven that Nathan Diller and Adam Ross's framework for evaluating space system design choices (Multi Attribute Tradespace Exploration—MATE), provides key insights to designers regarding the complicated tradeoffs between performance and cost. Through the MATE method, one can better understand the tradespace of potential architectures, avoiding the pitfalls of focusing too early on a small number of possible points designs.

The question remains open whether MATE's success is unique to the world of space systems or has applicability in a broader context. There are surely other scenarios in which a decision maker (or decision makers) is/are inundated by system choices that admit no easily analysis through which to see potential tradeoffs. A wedding is just such a scenario…

Motivation for using the MATE method

Having settled (hmmm…I'd better not use the word "settled" if I show this to Dori) on a design for WIFE, which serves as the critical component of the WEDDING system, the rest of the WEDDING system characteristics can be defined. Though to some (male) decision makers (this one included) this appears to be a straightforward decision, there are, in fact, high stakes involved. Accordingly, one cannot be careful enough in making an informed and correct decision as to the WEDDING system layout. MATE offers a rigorous way to analyze the potential tradespace of WEDDING architectures, and will serve to inform the decision-maker's detailed design work.

Selecting a decision-maker to analyze user preferences

There is really only one person (who happens to also be the primary system component) qualified (as well as empowered), to make judgments regarding the utility of various system configurations. Accordingly, WIFE was chosen for the interview process. Although there is another important system component and decision-maker (HUSBAND), for whom one would like to capture preferences, it turns out the weighting factors between these two decision makers are such that the latter's preferences are pitifully insignificant anyway.

Scoping

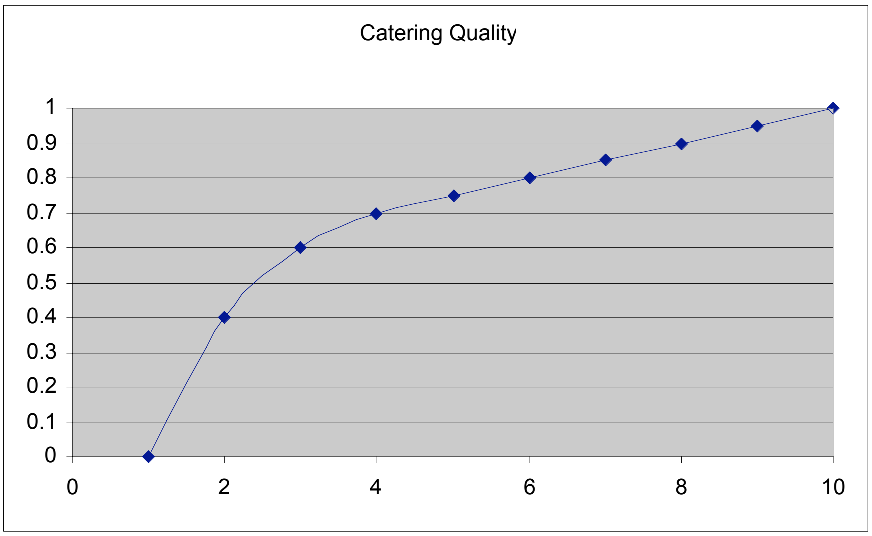
Although there are some interesting utility gains that can be made by swapping out the primary system components, for the purposes of this study, these were taken to be design constants. Much of the remaining texture of the tradespace was ignored in favor of ease of modeling. Three system parameters remained as "design knobs:"

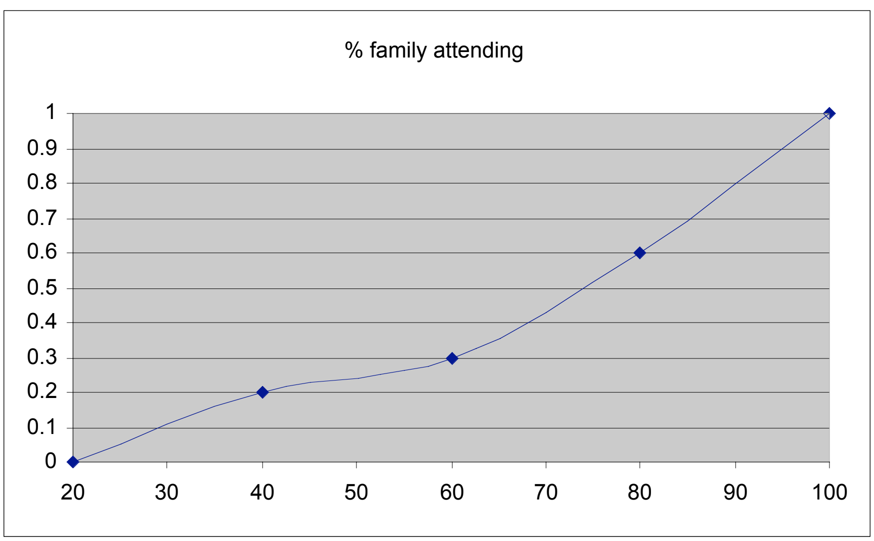
1. Location: (New Orleans, Colorado Springs, Denver, Birmingham, Boston, and Maryville)
2. Caterer Quality: (arbitrarily chosen to be 1-5)
3. Date: (May 30 2003, Dec 28 2002, Jan 10 2003, June 14 2003, June 21 2003, Aug 2003)

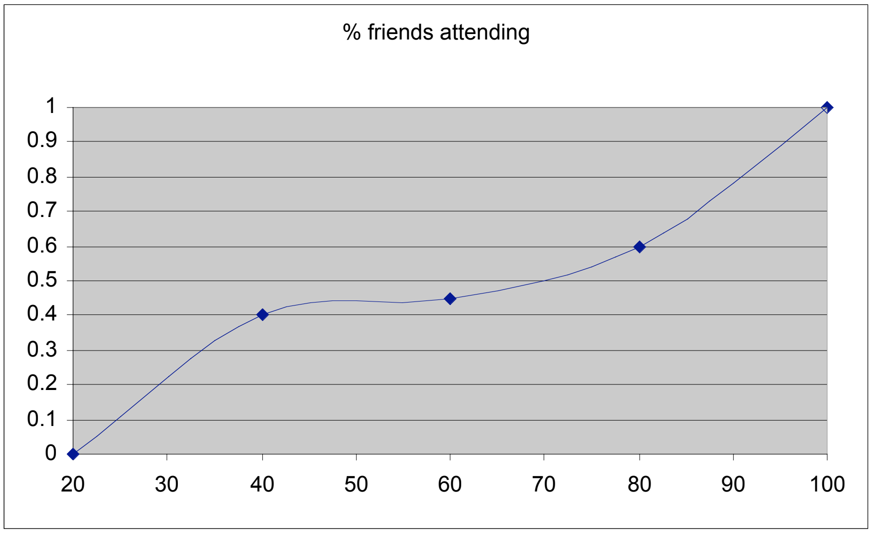
These three design parameters were modeled in their effect on both cost and the four attributes on which WIFE was interviewed. The attributes are as follows:

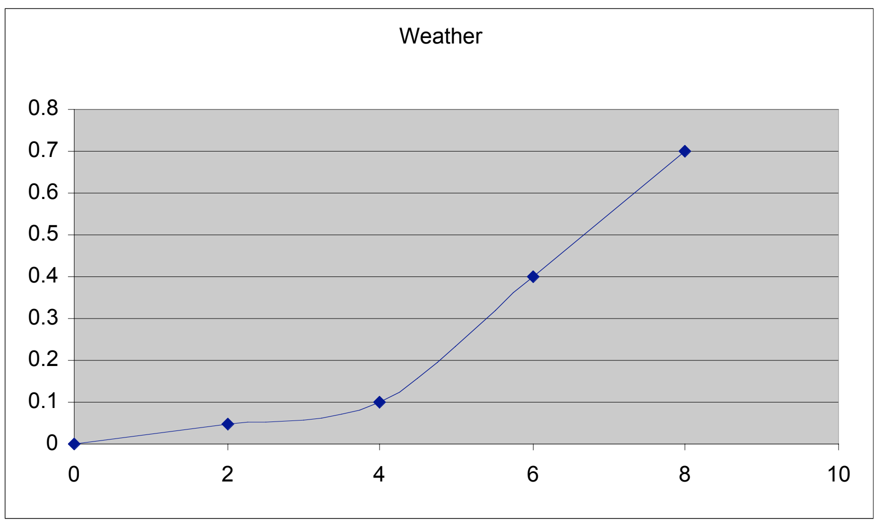
1. Catering Quality: 1-5 [unitless]
2. % Family Attending: 20-100 [%]
3. % Friends Attending: 20-100 [%]
4. Weather Quality: 0-10 [unitless]

WIFE's preferences for these attributes were measured through intense study and personal contact. Utility curves and weighting factors are show below:









K values:

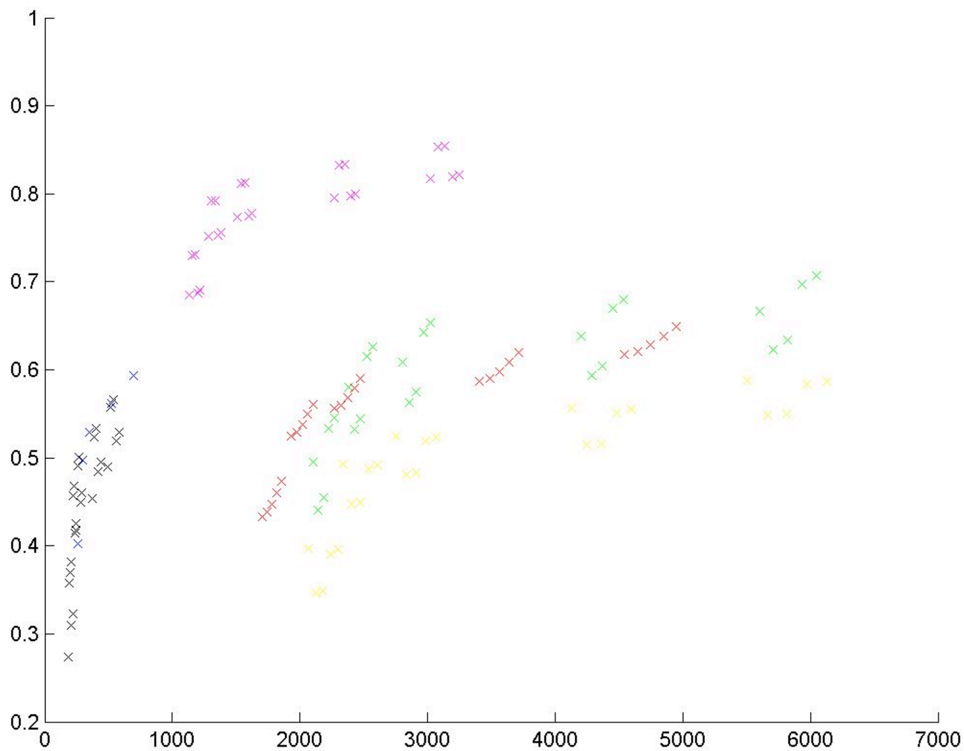
% Friends attending	0.4
% Family attending	0.6
Quality of catering	0.4
Weather quality	0.1

<u>Tradespace Enumeration and Modeling:</u>

Since there are a small number of design variables, we can afford to include all 150 possible combinations in the tradespace analysis. The modeling was simple and straightforward. Each architecture was read from a database and its attribute level calculated. There was limited interaction between the various design parameters (for instance, the location and the date interacted to produce the weather quality). With these attribute values calculated, both the cost and the multi-attribute utility of each could be found. These values were stored along with the original design characteristics.

Results

The results are show below, color coded by city. There is a visible pareto-optimal front, as well as some identifiable (though as of yet unexamined) smaller structure. The primary driver was location, as can be seen by the color-coding.



KEY: New Orleans, Maryville, Birmingham, Colorado Springs, Boston, Denver

Analysis:

This tradespace view yields a few major insights:

1. *Some cities should not be considered*: In HUSBAND and WIFEs initial decision process, (conducted before this analysis) they selected among various cities, considering the strengths and weaknesses of each. From this process, they chose a first and second choice—New Orleans and Colorado Springs. However, it is now obvious that no matter what the detailed design, Colorado Springs cannot possibly be a pareto-optimal design choice.

2. *Choosing the pareto-optimal:* the system architecture finally selected by WIFE appears in the New Orleans section of the pareto-optimal font. This shows that selecting a point design can sometimes be just as effective as a more detailed study.

3. *Choosing among the pareto-optimal*: WIFE's system architecture falls on the extreme right hand side of the front. This show's WIFE's uncanny knack of choosing the most expensive of all possible options.

Further Study:

This is, of course, only a short look at what MATE can do for your everyday life. There are a whole host of extensions to this line of research that would be most interesting. For instance, how does one deal with other users with strong preferences, like MOTHER-IN-LAW or MY WALLET? There are also issues surrounding uncertainty in the primary components. For example, should dates within nine months be given higher utilities? (For further research on this line, please see Diller and Diller, 2002—just kidding). Finally, can MATE be applied to even more everyday (but still important) decisions like "What am I going to eat for dinner?"