Community of Interest (on Future Scientific Methodologies) Curated Unconference
How to get the most out of this workshop

On Monday Nov 2, the COI-FSM curated unconference (workshop) began. During the opening plenary we asked you to think big and consider what the world of DOE science and computing would look like in 30 years. We asked you not to constrain your thinking to short term tactical issues, but instead focus on the more strategic things.

We tried to give you a couple of examples that attempted to show you what that meant. Those examples are in the DOE-Welcome slide deck. However, reviewing the outcome from Day 1, listening to the feedback from the breakout group moderators, and feedback from you the attendees, the Organizing Committee decided that more detailed information is needed to help you participate in the rest of this meeting.

This email is our attempt to do that.

Let's use the airplane example as our guide to how you can best provide input over the next 4 breakout sessions.

Imagine that you are living in your home town and it is the fall of 1873. You have been intrigued by the idea that human flight is possible and you are invited to a conference to discuss the future of transportation in the United States.

It is the age of steam. Steam ships are just beginning to emerge and they share the oceans with sail. It takes weeks to months to travel between countries. Steam trains are common in the U.S. The infrastructure has tied the country together and it is now possible to move coast to coast in a week or 2. You decide that a faster and better mode of transportation will be the Airplane and building a workable version will take 30 years, but it's time to get started now.

On Day 1 of this conference, you and your peers sit down and begin hashing out the basic idea. You have Kites, Balloons, and Birds as examples. How do you turn those into something called an Airplane?

During the next session you were asked to come up with a list implications for how an airplane would change human society. A short list of positive implications is:

- People can travel long distances in a single day (international meetings)
- Packages and goods can move long distances (Oranges delivered to Alaska in winter)

You can come up with lots more. You are not constrained to what is plausible, or possible, so let your imagine run wild.

These are the things you should have accomplished on Day 1. If your group did not come up with a big idea and the implications of that idea, then spend some time today getting there.

Now that your group has an idea of a piece of technology, a scientific methodology, or whatever falls within your major topic area, the next step is to think about how you could identify if progress is being made as you march into the future. These are signposts or milestones that either must occur or provide some insight as to how much progress is being made. (as an analogy think about road signs on the Interstate highways telling you how far the next major city is). In our example some signposts would be.

- 20 year out (1883) the materials that will be used to build the airplane must be readily available
- 20 year out the skilled craftsman need to be in place to shape these materials into structures
- 10 year out (1893) the math required to define the coefficient of Lift and Drag need to be experimentally verified
- 5 years out (1898) the ability to build an engine with enough power and low weight needs to exist.

Note that this timeline may be off, but the point remains, some precursor events must occur and the timeline would be used to evaluate if the final goal is being achieved.

However, just having a long list of signposts does not mean much without understanding their order and how plausible they are. Saying a new type of metal that is light and strong needs to be developed using some kind of alchemy is not a very plausible option for building our airplane. So now we want you to go through the signpost list and put them in some kind of order. Also assign some kind of metric to them like basic research needed, applied research needed, technology exists today, or some numeric score.

For our airplane example we came up with the following.

- The airplane structure will be wood (spruce) with a fabric covering. It is highly probable that the material and knowledge needed to build the airplane exist now.
- Engine performance and weight needs to be improved, applied research
- Wind tunnel experiments and kite flying experiments produce different results, basic research needed.

The above tasks are what you will do today. Next Tuesday (Nov 10) will take us to the end of this adventure.

In this session we want to you explore how things could catastrophically fail or succeed beyond our wildest dreams.

Continuing on with our example In the first session we are going to ask you to explore the possible pitfalls and roadblocks that would prevent us from having a usable airplane. This could be something like:

- The engine is not powerful enough to push the plane forward fast enough to allow it to produce enough Lift.
- The shape of the propeller is wrong so it doesn't provide the right amount of thrust
- Inadequate funding prevents the PI from conducting experiments.

Again, we are not looking for any one thing, but a list of plausible pitfalls that so we could develop mitigation strategies.

Lastly in our example of building the world's first workable airplane, what would success look like? Not just the final product but some of the ancillary technologies, or devices that would also benefit from the R&D needed to build this airplane. For example:

- Success: we have an airplane that can take-off, land, and is controllable in flight
- Engines are used in cars as well as airplanes
- The postal services uses airplanes to ship mail around the country in days not months.

So there you have it. Hopefully this example helps fill in some of the gaps in your thinking and allows you to better participate in this curated unconference.