Weekly Status Report – Niles Guo July 15, 2017

This week's activity:

1. Met with Rebecca to go over her most recent research on CADS, and received additional literature to read through.
2. Researched through list of literatures on concurrent design teams, specifically around JPL's utilization of the process, but also in other organizations such as European Space Agency's Concurrent Design Facility, and the process in general.
3. Reached out to Bradley Stein of RAND (who was my Masters capstone project advisor) to understand their use of Robust Decision Making. He pointed me to several cases studies conducted by RAND using this method.
4. Investigated ASU's Decision Theater, and found several case studies using the facility that I'm currently reading through.
5. Started to read through literature on natural gas development, and how they can be modeled using Earth System Models.

Issues

1. While there is plenty of literature on the application of concurrent design on specific case studies in the aerospace and automotive industries, most of them are focused on the process and organization of a concurrent design team. With one exception, none of them went into the tools (what was the modeling software? How did each subsystem communicate with each other? Etc.) they used for the teams. The only exception is one paper that delved into the excel-based tool used by JPL's Team X, however it was published in 2003, and while the design principles still apply, there is new technology that is now available.

   Potential Solution: While I continue to look up more journal articles to find information on this, it might be worthwhile to use Jay's past JPL connection to see if I can get some insights on the current tools they are using. I'm assuming they've moved beyond excel spreadsheets on a network share, and the ESA's setup of their concurrent design facility shows that they have embraced new technology, so it will be great to see/know the tools they are using.

Next week's activity:

1. Meet with Rebecca again to go over her case study using CADS, specifically around the details of how she setup the CADS environment to tackle the problem.
2. Continue to read through the list of literatures that I currently have on my to-read list.
3. Prepare for Energy Impact Summit in Columbus in the following week.

Journal Article Review

Araz, O. M., Jehn, M., Lant, T., & Fowler, J. W. (2012). A new method of exercising pandemic preparedness through an interactive simulation and visualization. *Journal of medical systems*, *36*(3), 1475-1483.

This is one of the case studies performed by the Decision Theater at Arizona State University, and is another application of concurrent design concept, as applied to emergency management (in this case, pandemic preparedness). The exercise included several hypothetical pandemic influenza campaigns (outside of US, inside of US, outbreak near ASU community, and outbreak in ASU community), and required the participants (which included local health officials, university leadership, emergency response personnel) to make iterative policy decisions.

Unlike traditional table-top exercises, this utilized the immediate output of simulation results based on the decisions made by the players, and projected in an open-layout to all participants. The players were encouraged to discuss freely with each other, and find gaps in the responses to the scenario. The result showed that not only the participants were able to identify the correct policy responses to each scenario, they also found critical gaps in the university's response plan. Survey results showed that the participants felt the decision theater helped them to make better decisions through a collaborative process.

Looking closer to our research, this paper not only showed the promise of a CADS framework outside of the traditional aerospace and mechanical design application, but also provided valuable design validations in future exercises. Large system-level visualization should be made available in any CADS workshop, as they create a more realistic decision making environments. The underlying model does not need to be overly complex for an exercise such as this to be effective, instead it should aim to be as responsive and near real time as possible. Finally, as suspected, co-location of experts does improve communication, and where not possible, communication tools will be very important to ensure the team works well with each other.