
SERC Doctoral Student Forum-
Brief Presentation- Request for Opportunities for
Research Observation of Design Reviews

December 2, 2015

Robert Braunger, UAH Doctoral Student

1. Bottom Line Up Front

- We are asking for:
 - Access to design reviews (e.g., SRR, PDR, CDR) on DoD or NASA programs, and access to interview participating engineers
 - Referral to a contractor to access reviews at that level
- I am conducting empirical research at Univ. of Alabama in Huntsville (Advisor: Dr. Paul Collopy) on design practices in complex government-managed programs

2. Preliminary Research Intent

- Our focus is on empirical analysis of formal design reviews, trying to understand

Q1: Why do people think that they do design reviews?

Q2: Why should people do design reviews?

- The organizational focus level is at several levels- from the program systems engineering leads to individual engineers
- We would like to examine 3-5 cases of design reviews at different organizations in complex programs at DoD or NASA
- Initial research design has three areas of evidence for each design review / organization case study (per Yin, 2009)
 1. Observe design review in context of organization and program
 2. Examine program documentation related to review
 3. Interview small number (3-8) of design review participants for a short period (under an hour)

3. Relevance / Payoff

- **Empirical research is needed in systems engineering to advance the state of the art (Valerdi and Davidz, 2009). An evidence base and “methodological theory” is lacking for standards and practices (Sparrius, 2011; Brown, 2009)**
- There has been significant normative/prescriptive work on review standards
 - OSD and Industry recently supported and published in May 2015 a major update of review guidance (IEEE Std 15288.2-2014; IEEE Standard for Technical Reviews and Audits on Defense Programs) to replace MIL-STD-1521B (1985)
- There is almost no descriptive / empirical academic research on what is done at reviews and what engineers value
 - Example 1: G. Huet dissertation at Univ. of Bath (2006): observed one Airbus subcontractor engine pump review- and two “in-class” student design reviews
 - Example 2: R. Bennett thesis at AFIT (1987): surveyed 60 USAF officer PM’s on if they agreed with MIL-STD-1521 guidance- we assess as inconclusive results
 - Example 3: Japanese industry consortium and Stanford researchers (Ichida, 1996; Chao et al 2001) surveyed over 2000 Japanese and US companies on design review; stated were unable to find “why” they did reviews
- Reviews cost significant resources– but guidance states many reasons
 - Many state: control effort, Improve quality, inform key decisions, assess technical maturity, identify issues for resourcing, communicating, training, configuration mgmt., ...
 - This research attempts to go beyond *de facto* “methods” to “theorizing on methodology”- What do practitioners think matters and why? What is done at “good reviews” and why?

4. Protection of Participants

- Researcher (R. Braunger) and advisor (P. Collopy) have been participants in reviews with over 30 years of collective experience
 - Have current clearance and have worked in DoD programs
 - We understand programs' legitimate desire to safeguard classified / FOUO program information and understand processes for proper release
- For attending reviews and accessing program documents-
 - We can brief leadership to request attending reviews and request access
 - Programs will approve release of any materials into academic side (i.e. internal review for release per standard processes)
- For interviews with engineers
 - Per standard academic institutional review board processes, we will obtain informed consent of any interviewees. In developing interviews, we will strive to maximize the anonymity of individuals subject to research needs.
 - All requested interviewees will be free to decline to participate and will get a follow-up on the use of their input and views
- Focus is access to methods and views, not critique, and not the technical substance of the reviews

5. Contact Information

- Researcher and doctoral student, Univ. of Alabama in Huntsville:
Robert Braunger:
rmb0009@uah.edu , (301) 356-7986
- Research advisor and Chair, Systems Engineering Dept.:
Dr. Paul Collopy, Univ. of Alabama in Huntsville:
pdc0056@uah.edu, (256) 824-6749
- Committee member/ advisor on research methods:
Dr. Zoe Szajnfarber, George Washington Univ.
zsajnfa@gwu.edu

We are asking for:

- **Access to design reviews (e.g., SRR, PDR, CDR) in a few current DoD programs, and access to interview a few participant engineers**
- **Alternatively, support / reference to a subordinate organization that is having a review**

Any SERC member help in accessing reviews in programs is appreciated

References

1. Yin, Robert K. *Case Study Research: Design and Methods*. Fourth Edition. Vol. 5. Applied Social Research Methods Series. SAGE Publications, Inc., 2009.
2. Valerdi, Ricardo, and Heidi L. Davidz. “Empirical Research in Systems Engineering: Challenges and Opportunities of a New Frontier.” *Systems Engineering* 12, no. 2 (2009): 169–81.
3. Sparrius, Ad. “Transforming Systems Engineering from a Cargocult to a Rigorous Evidence-Based Profession: Empirical Research into the Foundations of ISO 15288 and ISO 26702.” In *INCOSE International Symposium*, 21:1092–1104. Denver, CO: Wiley Online Library, 2011.
4. Brown, Samantha F. “Naivety in Systems Engineering Research: Are We Putting the Methodological Cart before the Philosophical Horse.” In *Online Proceedings, Seventh Annual Conference on Systems Engineering Research*. Loughborough, UK, 2009.
5. IEEE. *IEEE Std 15288.2-2014; IEEE Standard for Technical Reviews and Audits on Defense Programs*. IEEE, 2015.
6. USAF. *MIL-STD-1521B Technical Reviews and Audits for Systems, Equipments, and Computer Software*. DTIC, 1985.
7. Gregory Huet. “Design Transaction Monitoring: Understanding Design Reviews for Extended Knowledge Capture.” University of Bath (United Kingdom), 2006.
8. Bennett, Rodney. “Preliminary and Critical Design Review Procedures and Effectiveness.” Air Force Institute of Technology, 1987.
9. Ichida, Takashi. *Product Design Review: A Methodology for Error-Free Product Development*. Productivity Press, 1996.
10. Chao, Lawrence P., K. Beiter, and Kosuke Ishii. “Design Process Error-Proofing: International Industry Survey and Research Roadmap.” In *Proceedings of the ASME DETC: DFM*. Pittsburgh, PA, 2001.