*Erika S. Mesh – Previous Research*

I received my first taste of research during my second year as a Software Engineering (SE) undergraduate student at Rochester Institute of Technology (RIT). Dr. J. Fernando Naveda, the current chair of the RIT SE department, came to me with an opportunity to join an interdisciplinary research effort within RIT. I'll admit that I was skeptical about leaving a stable industry internship for a research project in its early phases, but Dr. Naveda convinced me I would enjoy and learn from the experience. Looking back, it was that first leap of faith that gave me the confidence to follow my passion and return to graduate school thirteen years later.

Thus, my first cooperative education position was designing and prototyping the Data Cycle System for the Stratospheric Observatory for Infrared Astronomy[1]. Over time, I also explored industrial and scientific software engineering via positions developing calibration software for Lucid Inc.'s Vivascope[2] and developing a testing infrastructure for BBN Technology's speech and language processing group[3]. As graduation approached, I couldn't pass up one last chance to be involved in an undergraduate research project. In late 2001, I convinced several of my classmates that a Multi-Dimensional Separation of Concerns (MDSOC)[4] project from the IBM T.J. Watson Research Center was too good to pass up and we spent the final six months of our undergraduate careers using Hyper/J to develop an integrated development environment for MDSOC projects. In addition to delivering a prototype, we presented the Hyper/J research team with a paper regarding our experiences.

Following graduation, I accepted a software engineering position working on the next generation of software-defined radios at Harris Corporation[5]. In addition to my engineering responsibilities, I became the SE process training coordinator for our group of 100+ engineers. I organized and, on occasion, delivered training classes on general and Harris-specific SE processes and practices. Training a group of engineers with diverse backgrounds was challenging and hugely rewarding. Contrary to all stereotypes, my colleagues were open-minded and willing to learn. While they didn't want "process for the sake of process", they were more than willing to try new techniques if it would aid our end goal: high quality radios that save lives. Although the needs and backgrounds are different, I see the same attitude in the scientists I work with today. There is an honest desire to do the very best they can.

In 2007, I joined PAETEC[6], a rapidly growing company that still used the SE processes they'd developed as a startup. During my time there, I trained my peers in formal requirements analysis techniques, introduced a culture of critical design analysis, and helped to institute an iterative software process that allowed for systematic and predictable software releases. I also spearheaded the conceptual design and project management of a new product by working directly with senior officers and non-technical users. I found that focusing on value-driven, gradual software process improvement created a smooth transition for both technical and non-technical stakeholders.

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[1] http://www.sofia.usra.edu/
[2] http://www.caliberid.com/vivascope1500-Applications.html
[3] http://www.bbn.com/technology/speech/
[4] http://www.research.ibm.com/hyperspace/MDSOC.htm
[5] http://rf.harris.com/
[6] http://www.paetec.com/

After four years of work at PAETEC, I was offered an incredible opportunity to pursue my M.S. in Software Engineering full-time and join the Laboratory for Environmental Computing and Decision Making[7] (LECDM) at RIT. Within LECDM, I have spent the last year working on the Geospatial Intermodal Freight Transportation[8] (GIFT) project. A geospatial information system (GIS) based analysis system, GIFT allows public policy analysts to study freight transportation in the context of the economic and environmental impact. An initial prototype of a web-enabled version of GIFT had been completed, and a more robust solution was in progress, but the project had stalled during integration. I analyzed the existing work, created structural and behavioral design documentation, and re-designed several interfaces to allow for smoother integration. The results of this work have been submitted to the annual ESRI User Conference (Mesh et al., 2013). As the year progressed, I led a growing team of B.S. and M.S. students and instituted a number of SE process improvements. These activities, combined with my coursework, quickly drew my attention to the unique challenges of scientific research projects.

Over the course of my M.S., I also completed a number of course related research projects that allowed me to explore a variety of research methods including software modeling, interviews and qualitative analysis of SE process artifacts, and formal modeling and metrics of software product evolution. All of this work, though exploratory in nature, gave me valuable insight into the research process. Leveraging this insight and my developing passion for scientific software, my M.S. capstone project focused on piloting a grounded theory (Corbin and Strauss, 1990) methodology for capturing characteristics of scientific software development and creating a scientific SE process maturity model.

While limited by a small sample size, my results demonstrate how qualitative SE process studies can be designed and executed in a systematic manner (Mesh, 2012). Similar to the experiences of Adolph et al. (2008), developing a comprehensive grounded theory methodology with minimal prior experience was challenging. While the intent was to stay true to the core principles of grounded theory, thorough documentation of how all research was conducted allowed for an understanding of where deviations occurred and for future improvements to the methodology.

Finally, in addition to specific techniques and concepts, my previous experiences have allowed me to refine and focus my critical thinking, organizational, and teaching skills. All of these will be critical in helping me to ensure that my future research is conducted and applied thoroughly and consistently.

## References


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[7] http://www.rit.edu/gccis/lecdm/

[8] http://www.rit.edu/gccis/lecdm/gift2.php