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# Two Successful Final Doctoral Defenses


*Dr. Mohammed Qaradaghi (center) with Professors Francis, Deason, and Shittu, and Govinda Timilsina of the World Bank*

*November 05, 2016*

Two members of the EEM family successfully defended their doctoral defenses during the Summer and Fall 2016 semesters.

**Dr. Mohammed Qaradaghi** defended the final results of his research on “Investigation of Multi-Criteria Decision Consistency: A Triplex Approach to Optimal Oilfield Portfolio Investment Decisions” on June 6. **Dr. Amy Cox** defended her final dissertation on the topic “Functional Gain and Change Mechanisms in Post-Production Complex Systems” on September 9.

In his research Mohammed looked at the fact that complexity of the capital intensive oil and gas portfolio investments is continuously growing. It is manifested in the constant increase in the type, number and degree of risks and uncertainties, which consequently leads to more challenging decision making problems. A typical complex decision making problem in petroleum exploration and production is the selection and prioritization of oilfields/projects in a portfolio investment. To help improve decision making in such a complex environment, Mohammed combined three multicriteria decision making (MCDM) methods into a single decision making tool that can support optimal oilfield portfolio investment decisions. Mohamed also developed a two-dimensional consistency test to verify the output coherence or prioritization stability of the MCDM methods in comparison with an intuitive approach. Nine scenarios representing all possible outcomes of the internal and external consistency tests were proposed to reach a conclusion. His methodology was applied to a case study of six major oilfields in

Iraq to generate percentage shares of each oilfield of a total production target that is in line with Iraq's aspiration to increase oil production. The results are intended to be applicable to other E&P portfolio investment prioritization scenarios by taking the specific contextual characteristics into consideration.

Amy's research was motivated by the need for functional change of complex systems in post-production. Through an initial empirical study, Amy's research found pathways to functional change with minimal change to form, thus avoiding the high risk of material change propagation that has been a concern of both the systems engineering and engineering change literature. Her study also revealed the relative importance of system users in the post-production change environment. Through a follow-on study of user innovation in this environment, Amy's research was able to reveal pathways for change which are underexplored in both the user innovation and Design for Changeability literature. While not yet a final solution to the motivating problem, her research revealed levers for change which system users are adept at exploiting. Key amongst the changes employed by user designers is their unconstrained use of themselves (human change) to realize system function and their exploitation of the expansive operational states (operational change) afforded by complex systems. User driven change poses an important source of post-production functional change. Amy's research unpacked user change and sets the stage for further exploration of this source of system changeability.

In the image below Dr. Amy Cox addresses her examining committee.

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