



## Ph.D. DISSERTATION DEFENSE

**Candidate:** Alkim Z. Avsar  
**Degree:** Doctor of Philosophy  
**School/Department:** School of Systems and Enterprises  
**Date:** Thursday, August 3rd, 2023  
**Time/Location:** 12:00 PM (ET) - <https://stevens.zoom.us/j/8218337580>  
**Title:** Intervention in Collaborative System Design to Increase Efficiency by Focusing on Social Factors  
**Chairperson:** Dr. Paul T. Grogan, School of Systems and Enterprises  
**Committee Members:** Dr. Onur Asan, School of Systems and Enterprises  
Dr. Ting Liao, School of Systems and Enterprises  
Dr. Jordan Suchow, School of Business

## ABSTRACT

Collaborative systems include multiple actors working together to achieve a complex goal that cannot be achievable by a single actor and possess operational and managerial interdependence. Collaborative systems problems have high levels of uncertainty due to self-interested actors and limited availability of information. Risk arises from both technical and social sources making actor interactions critical. This dissertation investigates how social factors (perceived control and risk), problem context (social and technical complexity levels), and actor strategies affect outcomes in collaborative systems by introducing five studies. The first study investigates how risk attitudes affect design and strategy decisions in collaborative systems through the lens of game theory. Results show that outcomes of collaborative design problems change based on the risk attitudes of both actors. The second study evaluates a questionnaire-based risk attitude assessment method to quantify individual risk attitudes for strategic, multi-actor design decisions. Results support that risk in the engineering domain is contextual. Incorporating risk attitudes inferred from observations provides more accurate risk attitudes for actors than risk attitudes elicited from the questionnaire. The third study investigates the effects of perception of control on team performance outcomes by using the Locus of Control (LOC) personality trait. Results suggest that team performance depends on team composition and task complexity. Discussion hypothesizes that differences in planning time and feedback effects of poor perceived performance affect internal LOC individuals more strongly than external. Results suggest that structuring the task context can improve outcomes for susceptible teams. The fourth study investigates design processes and actor strategies. Discussion of results suggests smaller and more frequent actions provide more rapid feedback about each action to improve communication and understanding between pairs, leading to more efficient design processes. The final study evaluates an intervention to re-design the collaborative systems by adding a system mediator to ensure all actors have essential technical and social information before making a strategic decision. The study shows that an intervention in the design of the collaborative system by providing further technical and social information to the actors increases the overall efficiency of the system outcomes.