
Study on Team Composition: Research Proposal

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- *Motivation*
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- Teams are used in many aspects of life
- In industry, teams are often used to create new processes, products, and to make improvements to existing infrastructure
- At the college level, student teams are created to try and teach students how to be contributing members of teams
- Student teams are often not meaningfully selected, leading to underperforming or incompatible teams
- Senior level engineering student teams are similar to novice engineering teams, and can be used as a model for industry teams^[1]

- Many factors related to team composition can affect teamwork
 - Gender^{[2], [3], [4]}
 - Ethnicity^[2]
 - Personality^{[5], [6]}
- Personality tests are often used to create a model for team composition^[7]
 - Myers-Briggs Personality Type Indicator (MBTI)
 - Minnesota Multiphasic Personality Inventory (MMPI)
 - Sixteen Personality Factor Questionnaire (16PF)
 - Five Factor Model (FFM)
- Myers-Briggs has been used extensively but is not a valid measure for team composition^[8]

- The Five-Factor Model has emerged as a prominent measure for personality^[9]
 - Model measures extraversion, agreeableness, conscientiousness, neuroticism, and openness
 - 50 Item International Personality Item Pool (IPIP) version of Big Five Markers survey
 - Each factor is measured on a scale of 0 to 50
- Limited research has been done using the Five Factor Model in team formation^[10]
- Females have higher levels of extraversion, openness, and conscientiousness^[15]

- Comprehensive Assessment of Team Member Effectiveness (CATME)^{[11], [12]}
 - Created to help students function effectively in teams, allow faculty to track team experiences
- CATME Peer Evaluation^{[11], [12]}
 - Students rate their experiences, evaluate their team contributions and their teammates' contributions
 - Holds students accountable for being contributing members of their teams
- Only professors and advisers can see comments and ratings recorded in CATME unless they are released to students

1. After controlling for gender, in which ways does the average group score on the Five Factors affect performance on a semester long project?
2. After controlling for gender, what factor(s) of the Five Factor Model predict peer team perception of the individual based on CATME ratings?

- **Ontological Stance**

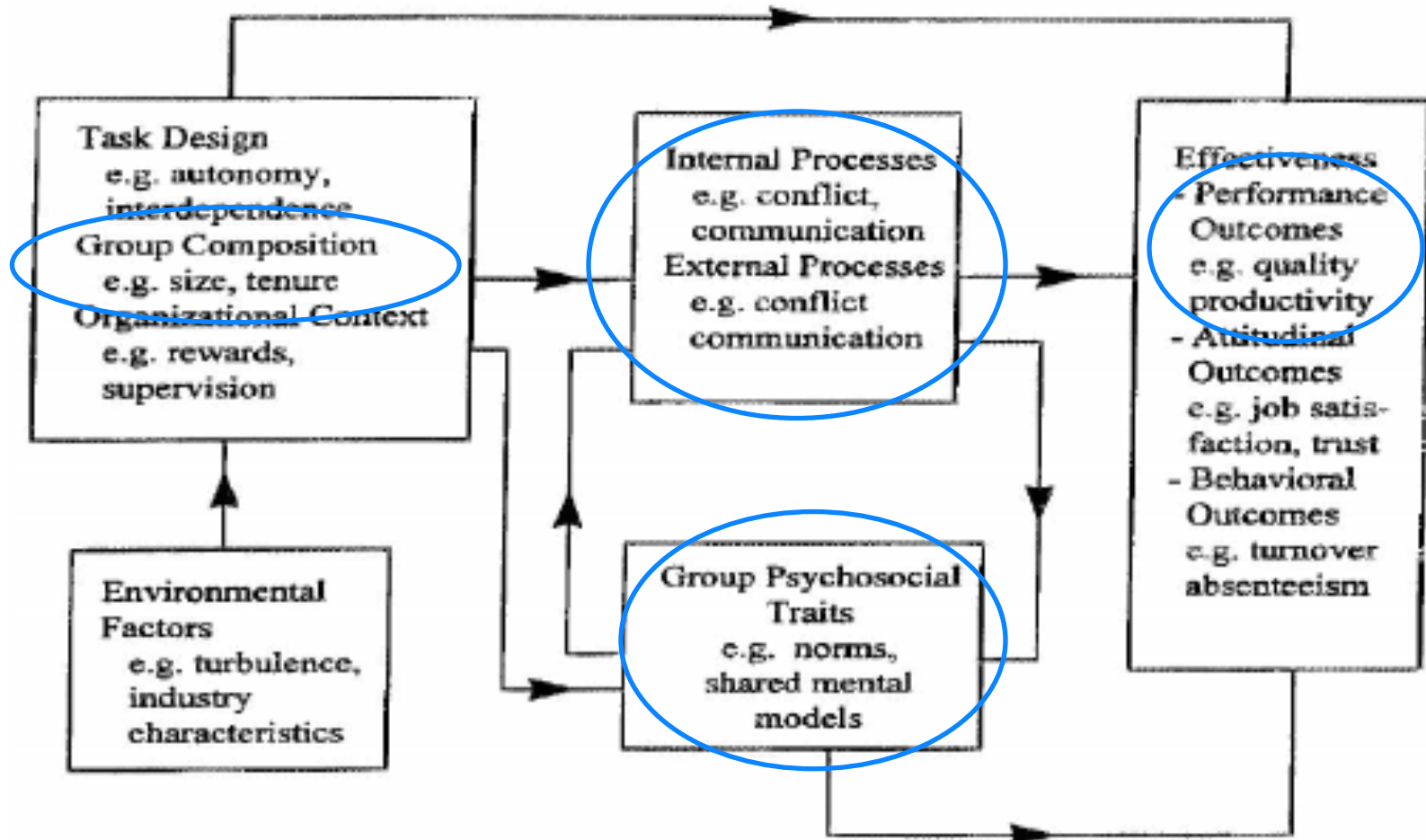
- Relativism: the researcher cannot remove themselves from the research
 - Being on engineering teams myself, I have my own opinions and views of how teams function

- **Epistemological Stance**

- Constructivism: knowledge is constructed through interactions with others and the world
 - Teamwork and the success of a team is based on interactions between members
 - Researcher can study this flow of knowledge using metrics
 - Researcher and research cannot be separated

- **Theoretical Perspective**

- Pragmatism: the actions and beliefs of the students can be studied and conclusions are based on the experiences of the researcher



[13]

- Mechanical Engineering 4010 & 4020
 - Team design project oriented courses required for graduation
- ME4010
 - Teams of 6-7 students ~30-40 teams
 - Customer is local elementary or middle school
 - Project is focused on constructing a STEM demo for use in the classroom
- ME4020
 - Teams of 4-5 students ~30-40 teams
 - Customer is local company
 - Project comes from a real industry problem that needs to be solved
- Both courses use random team assignment

- CATME will be administered every two weeks as is currently implemented in 4010 & 4020
 - CATME is used to help advisors become aware of problems within teams not apparent through weekly interactions with students
- 50 Item IPIP version of Big Five Markers
 - Administered using a google form
 - Demographic information will be collected as well
- Performance will be measured as individual grades and team industry sponsor evaluation
- Students who do not take the survey will all be put on one team

Pilot Study

Full Study

April & Early May	May	Summer	Fall 2017
Administer FFM survey	Analyze FFM with performance	Run full experiment during summer session of 4020	Change experimental methods based on pilot study results
Collect qualitative data from industry sponsor	Code qualitative data and create another survey for summer	Follow up with students in focus groups or interviews	Run full experiment

- Mixed Method: Concurrent Triangulation
 - Quantitative data
 - Peer evaluation every two weeks
 - Five Factor Model survey administered at the beginning of the semester
 - Final grade received in the course
 - Industry sponsor evaluation
 - Qualitative data
 - CATME comments as part of peer evaluation every two weeks
 - Industry sponsor comments at the end of the semester
 - Survey administered at the end of the semester asking questions about teamwork

- Mixed Method: Concurrent Triangulation
- Changes from pilot study might include
 - Purposeful selection of teams based on results from pilot study
 - Survey with questions tested for content during pilot study
 - Interviews of high and/or low performing teams at the end of the semester

- Coding will be utilized for all qualitative analysis to look for themes
 - Open coding to look at every relevant instance identified in interviews and focus groups
 - Focused coding of interviews and focus groups to identify teamwork themes, both positive and negative
 - Focused coding of the sponsor feedback to look at positive and negative feedback on the projects
- Using codes new surveys will be made for the full length study
- Coding will be done by only one person to increase reliability
- Memo's and bracketing will be utilized to identify researcher bias

- Hierarchical Linear Modeling (HLM)^[14]
 - Form of ordinary least squares used to analyze variance in outcome variables (performance, CATME ratings) with predictor variables of varying hierarchical levels (five factors)
 - More effective at accounting for variance with variables at different levels than a simple linear regression
 - HLM will be used to try and predict peer perception from the five factors on the individual level
 - Assumptions will be tested prior to test

- CATME has been independently tested for reliability among student teams^[11]
- 50 Item IPIP Big Five Markers has been tested for reliability among a diverse group aged 16 and up^[9]
- Surveys will be the same for all students at a given stage of the study
- Due to the many different evaluators of performance, low inter-rater reliability of grades-identified as a limitation of the study

- CATME has been independently tested for validity among student teams^[11]
- 50 Item IPIP Big Five Markers has not been tested for student engineers or engineering teams-identified as a limitation of the study
- Bracketing and memo's will be used to help minimize researcher bias

- Non-Response Bias
- Number of teams and different team compositions
- Limited to mechanical engineering population at Clemson University and might not be applicable outside of specific population
- Performance evaluators, inter-rater reliability on individual and group measures

Questions?

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- [12] Loughry, M. L., Ohland, M. W., Moore, D. D., 2007, "Development of a theory-based assessment of team member effectiveness," *Educational and Psychological Measurement*, **67**, pp. 505-524.
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- Team performance related to the Five Factor Model has been studied very little
- Using this new method we can define another way to create teams meaningfully
- CATME helps teammates keep each other accountable
- Combining these metrics has not been done to try and create higher performing teams