



# Profile Analytics as a Mechanism for Understanding Engineering Design Teams

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# Overview

- + Need for New/Better Teamwork Methodologies
- + Variable vs. Team-centric Approaches
- + Application: Teamwork Process Profiles
  - + Method
  - + Results
  - + Interpretation
- + Discussion & Future Directions

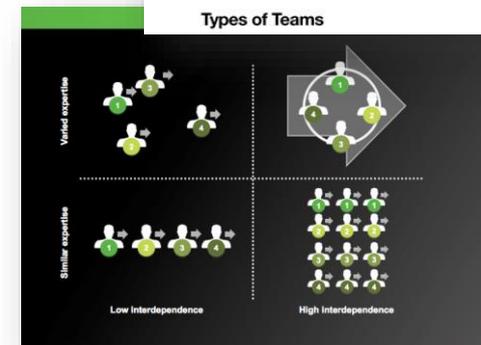
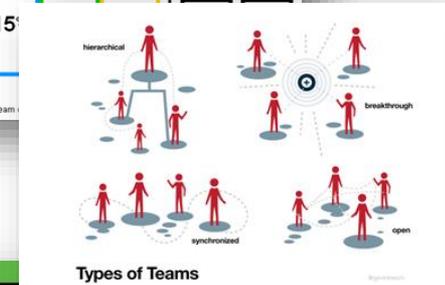
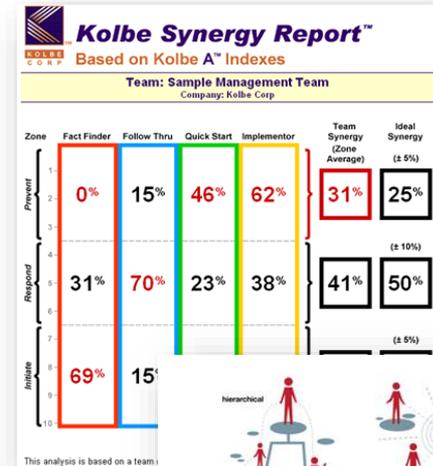
# The Challenge of Capturing Teamwork

- + We know a LOT about teams
  - + Many theories
  - + Many models
  - + MANY constructs
- + BUT—we know too little about...
  - + How to best represent teamwork complexities
  - + How to elucidate meaningful interactions of constructs
  - + How to identify important PATTERNS over time
- + Need for new thinking, perspectives, methods that help advance parsimony



# Towards a Holistic Perspective

- + Massive yet disjointed research
  - + Difficult to translate research into practice
  - + What actually matters the most for effective teamwork?
  - + What interventions are best?
- + To advance the practice AND science of teamwork, need to think towards a holistic, integrative view
- + Common use of profiles, types in practice
  - + MBTI, DISC, Kolbe
  - + *How do we make these more scientifically driven for teamwork?*



# A Team-Centric, Profile Approach

- + Focus is on integrating team constructs
  - + Moves beyond a variable-centric approach
  - + Identifying how/when different constructs may co-occur at different levels simultaneously
- + Mix of inductive & deductive approaches to identify meaningful patterns/subgroups in a given population
  - + E.g., high-high-low, high-med-low, med-med-high
  - + Looks at the ACTUAL configurations that exist, not just all possible combinations
  - + Can consider a range of different types of constructs

# Variable vs. Team-Centric Approaches

## Variable-Centric

- + Focus is on identifying relevant variables
- + Explain as much variance as possible from a set of predictors
- + Difficult to interpret interactions beyond 2 or 3 variable

## Team-Centric

- + Identify subgroups within a larger sample that differ meaningfully on a complex system of variables
- + Groupings must differ qualitatively and quantitatively to be meaningful
- + Well suited for complex combinations of 3 or more variables

# Application: Teamwork Processes

- + Marks, Mathieu, & Zaccaro (2001) proposed that teams experience multiple processes:
  - + Transition processes (e.g., planning)
  - + Action processes (e.g., completing goals)
  - + Interpersonal processes (e.g., conflict resolution)
- + Processes are:
  - + Embedded within one larger team process dimension
  - + Positively related to team performance, member satisfaction (LePine et al., 2008)
- + However—these processes may interact
  - + **Research Question:** are varying levels of interpersonal, action, and transition processes present in meaningful patterns/profiles?

# Methods

## + Participants

- + 188 4-person teams comprised of undergraduate students from a large Southeastern university (752 individuals)
- + 3.5 hour experimental session working as a team

## + Team Simulation Task

- + Computer simulation
  - + Democracy 2
- + Requires participants to work as a leaderless team of prime ministers
- + Must make decisions regarding policies and finances of a fictional country
- + Performance goal of being re-elected



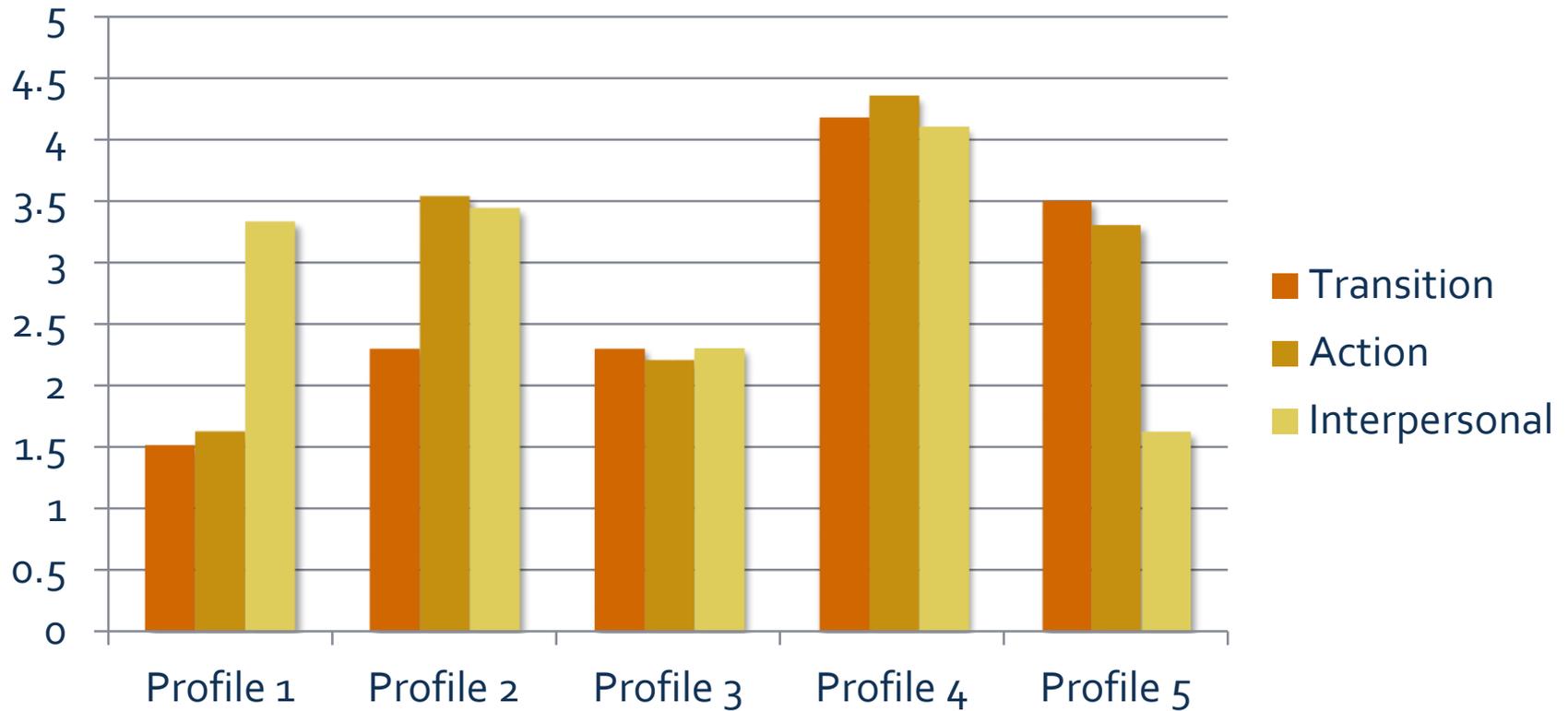
# Teamwork Process Measurement

- + Behaviorally Anchored Rating Scales
  - + Transition, Action, Interpersonal
  - + Adapted from BARS used in prior teamwork studies
  - + Scale of 1 to 5
- + Ratings made by trained observers
  - + Teamwork processes observed using recordings of performance episodes
  - + Two coders per team, disagreements reconciled to reach 100% agreement

# Analysis

- + Latent profile analysis in Mplus (Muthen & Muthen, 2007)
- + Five profiles were extracted as the best fitting model
- + Fit for these profiles was determined based on profile solution guidelines utilized by O'Neill et al (2015):
  - + Demonstrated the lowest sample size adjusted Bayesian information criterion value (aBIC)
  - + Significant ( $p < .05$ ) bootstrap likelihood ratio test (BLRT)
  - + Posterior probabilities that distinguish which profile a team is likely to fit in (87%-96%)
  - + High entropy (88%)
  - + Greater than 5% of the total sample in each profile class (ranging from 8%-28%)

# Results: Teamwork Process Profiles



# Implications & Limitations

- + Team centric view has a place in our methodological toolkit
- + May be particularly useful for exploring multi-faceted constructs like teamwork processes
- + Need adequate sample sizes
- + Need for multiple replications across contexts
- + Need to understand appropriate types of constructs that should/shouldn't be included

# Future Research Directions

- + Exploration of what constructs might be most appropriate, meaningful as profiles
- + Connection of profiles to inputs, outcomes
- + Examining profile transitions over time, in response to interventions
- + Combining multiple levels of profiles, profiles with other methodologies
  - + Social network analysis
  - + Physiological data





# Thank You! Questions?

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