Influence of Social Network Structures on Team Dynamics

Jess Gomez, Lorenzo Sanders, Ezequiel Contreras Martinez

Mentor: Elizabeth Huang, Ph.D. Student
Principal Investigator: Dr. Francesco Bullo, Mechanical Engineering
Social networks exist in every facet of life
Behavior of team dynamics analyzed in distinct social networks

Performance

Appraisal

Work Assigned
An Individual’s performance translated into a graphical model

\[ \text{Performance}_i(\text{work}_i) = \left( \frac{\text{Skill}_i}{\text{work}_i} \right)^\gamma \]

Gamma is how fast the individual’s performance approaches 1
Appraisal translated into a graphical model

Change In Appraisal

\[ \frac{da_{ij}}{dt} = a_{ij} \left( \text{Performance}_{j}(\text{work}_j) - \sum_{z=1}^{n} a_{iz} \text{Performance}_{z}(\text{work}_z) \right) \]

Person i’s appraisal of person j

Individual j’s performance

Weighted average of performance
Work assignment translated into a graphical model

\[ \text{Work Assigned} \]

\[ \text{work}_i = \sum_{z=1}^{n} a_{zi} \text{work}_z \]

Weighted average of evaluations
Team modeled as three network structures

Complete

Hierarchy

Insufficient Feedback
Complete structure optimizes due to sufficient feedback.

Skill $0.3 = i \leftrightarrow j \leftrightarrow k$

Person $i$ skill $= 0.5$
Person $j$ skill $= 0.2$

Work assignment (a.u.)

Performance (a.u.)
Hierarchical structure optimizes due to sufficient feedback

\[
\text{skill} \quad 0.3 = \quad \text{skill} = 0.2
\]

\[
\text{Time (a.u.)} \quad \text{Performance (a.u.)}
\]

\[
\text{Work assignment (a.u.)}
\]

\[
\text{Person } i \quad \text{skill} = 0.5
\]

\[
\text{Person } j \quad \text{skill} = 0.3
\]

\[
\text{Person } k \quad \text{skill} = 0.2
\]
Insufficient feedback will result in the decay of the team
Feedback is key to optimal team performance
Special acknowledgements to our team

Elizabeth Huang

Dr. Francesco Bullo