

# ECEN 478: Senior Design

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# Outline

- 1 Introduction
- 2 What is a Team?
- 3 Models of Team Development
- 4 Characteristics of Real Team
- 5 Project Application: Team Process Guidelines

# Introduction

- Engineering projects are often very large and require too many diverse skills to be completed by a single person.
- This necessitates the use of teams
- Teams can collectively perform tasks that could not possibly be completed by individuals working in isolation.

# Learning Objectives

- Understand the characteristics that define a team and understand why a team is formed.
- Understand different models for the stages of team development.
- Understand the characteristics of effective teams.
- Be able to develop team process guidelines.

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# What is a Team?

## Team

A small group of people with complementary skills, who are committed to a common performance, performance goals, and approach for which they hold themselves mutually accountable.

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- Teams larger than this become very difficult to manage.
- The number of person-to-person relationships is equal to  $n(n - 1)/2$
- it is hard to develop consensus on important issues in large teams

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  - Cross-functional teams are particularly important in new product.
  - Multidisciplinary implies that the team is composed of members from different disciplines.
  - For example, the development of a robot would require members with multidisciplinary expertise in computing, electronics, and mechanical systems.



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- The team's goals are defined by the problem statement and requirements specification discussed in Chapter 1

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- This can be a common approach to solving problems, such as application of the design process.
- One of the biggest problems that teams face is handling situations where the team fails to meet a given objective.
- The team must be able to hold each other mutually accountable in a constructive manner in these situations.

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- It is likely that the team's objectives are not well defined and that the members' roles are ambiguous.



## 2- Storming

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- The team must resolve individual versus group goals.
- Failure to navigate the storming stage means that the team will not reach the performing stage.

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- Team develops common approaches for solving problems and managing conflicts.



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- The team should be collaborating and easily making decisions.
- Disagreements that arise are accepted and resolved by the team norms.

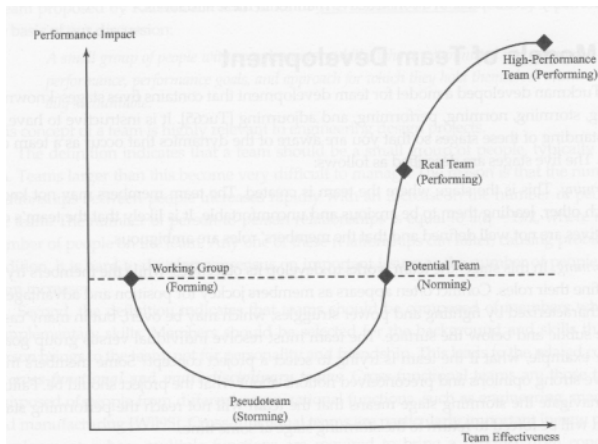
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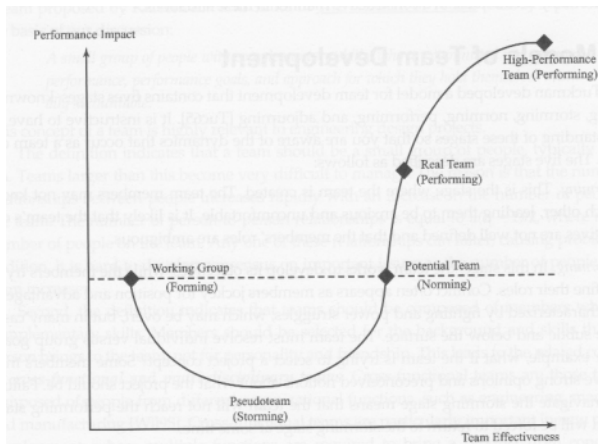
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- or if the project is cancelled, or even worse, if the team is unable to function together.

# Models of Team Development (Graph)



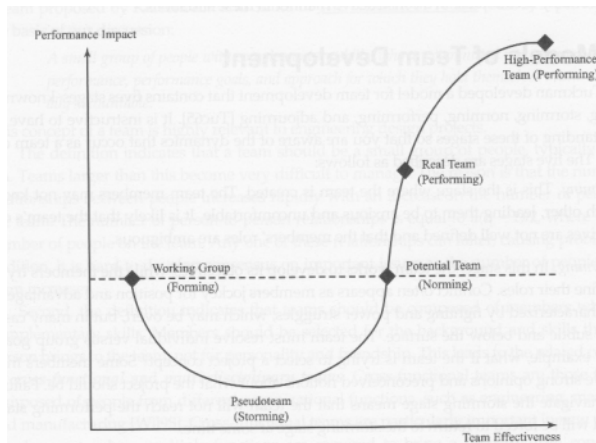
- Working group is defined as a group of individuals working in isolation, who come together occasionally to share information.

# Models of Team Development (Graph)



- The pseudoteam represents an under-performing team where the sum effort of the team is below that of the baseline performance,

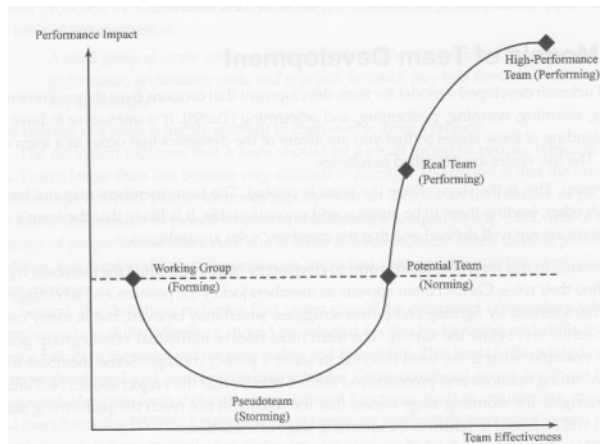
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- Potential team is one in which the team is functioning at a level equal to that of the working group. At a minimum, teams should at some point perform above the level of a potential team

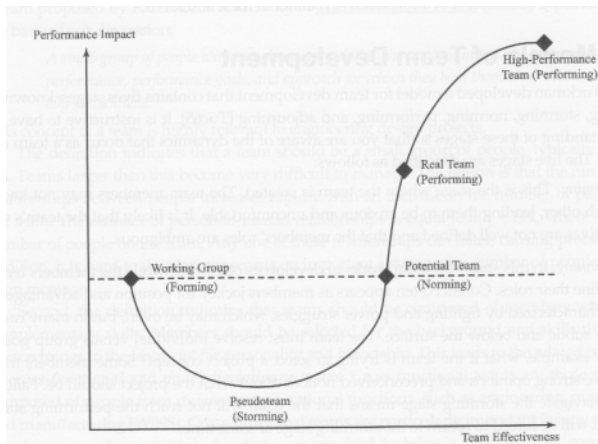


# Models of Team Development (Graph)



- Real Team is when the team starts performing where the performance exceeds that of the working group.

# Models of Team Development (Graph)



- The high performance team is when the team significantly outperforms all similar teams.

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- Unfortunately, there is no set process for guaranteeing that a team will become a real team.
- Successful teams adhere to good teamwork principles, but the application of good teamwork principles does not automatically guarantee that teams will be successful.
- However, ignoring teamwork principles almost always leads to failure.

# Member Selection

- Selecting team members for their skills is a key to success identified by Katzenbach and Smith.
- They defined three categories of relevant skills:
  - ① Technical and functional,
  - ② Problem solving
  - ③ Interpersonal.



# Self selection vs Assignment

## Self selection

- Members believe the objectives of the team are important,
- A higher level of commitment.
- A potential pitfall is that not enough attention is paid to the skills necessary to complete the project.

## Assignment

- Assignment according to the skills needed
- A potential pitfall is that team members that are unsatisfied with the project from the start may become angry.

# Identify Objectives

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- In the context of engineering design, the combined problem statement and requirements specification presented in Chapter 1 serve that purpose.
- The problem statement describes what the team is trying to achieve, while the requirements specification sets verifiable targets that define success.

## How Decisions will be taken?

The team must determine how decisions are to be made, and once they are, all members need to accept the outcome.

- **Decision by Authority.** The leader makes all decisions, typically without discussion by the rest of the team. This is effective for fast decision making, but often does not lead to the best decision. It can also produce resentment among the team.

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- **Decision by Authority after Discussion.** The leader makes a decision after all team members discuss the issue and provide input.

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- **Majority Control.** A simple majority is used to make decisions.
- **Consensus.** All team members must agree to and commit to the decision. This generally comes after much discussion and evaluation of the different alternatives. This is the best approach, and the most time-consuming. It is not necessary for all decisions to be made this way, but consensus should be reached for important decisions.

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  - **Analyst.** observe the team processes and provides feedback to the team for improvement.

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- The workload needs to be distributed in a **fair manner** and all members must perform real work.
- Chapter 10 presents project management principles, one of the primary aims of which is to develop and assign tasks to team members.
- It is important that the **project manager** also be **assigned tasks**, outside of project management, that contribute to the project.

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- **Agree upon a meeting time and place.** People have busy schedules and different work habits. Believe it or not, failure to agree upon this basic issue can lead to tremendous conflict.
- **Summarize.** At the end of the meeting summarize what was discussed, important decisions made, and actions to be taken.

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  - **Communicate your ideas.** If you have an idea, clearly state it and be prepared to explain what the merits are. Be prepared for critical analysis and discussion of the idea

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- **Identify concerns**. If you have concerns about something, it is best to identify and address them, rather than hide them.
- **Develop a plan to resolve the conflict**. Again, conflict can be positive and lead to the solution of problems.

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Mediation. A mediator can be used after all avenues for resolution of the conflict have been exhausted. (delphi technique)

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- 4 Steps 1-3 are repeated until consensus is achieved.

# Outline

- 1 Introduction
- 2 What is a Team?
- 3 Models of Team Development
- 4 Characteristics of Real Team
- 5 Project Application: Team Process Guidelines**

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- **Team rules.** What each member will bring to the team.
- **Conflict resolution strategies.** Identify how the team will resolve conflicts.



## Team Process Guidelines 2

Team Formation	Score
The team's objectives are clearly defined.	
There is consensus among all team members that the objectives are the correct ones.	
The team members' complementary skills (technical, functional, interpersonal) have been identified.	
There are enough members on the team to cover all of the necessary competencies.	
There are not too many members on the team.	
Team Processes	
The team has developed clear guidelines for resolving conflicts and disagreements.	
The team has developed effective guidelines for holding all members of the team mutually accountable for achieving the objectives.	
The team has developed a strategy for holding effective meetings.	
The team has agreed upon a mutual meeting time and place.	
The team members trust each other.	
The team members demonstrate respect for each others ideas.	

Self-assessment of the team formation stage and processes.

# References

- Ford, Ralph Michael Coulston, Chris S - Design for electrical and computer engineers theory, concepts, and practice-McGraw-Hill (2008)



Questions 

