

Successful Virtual Design Team Formation and Collaboration

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3D

3D

3D



2014
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Movie of Scott yelling “Yahoo!” and or pictures of teams holding UAV’s

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EMBRY-RIDDLE
Aeronautical University



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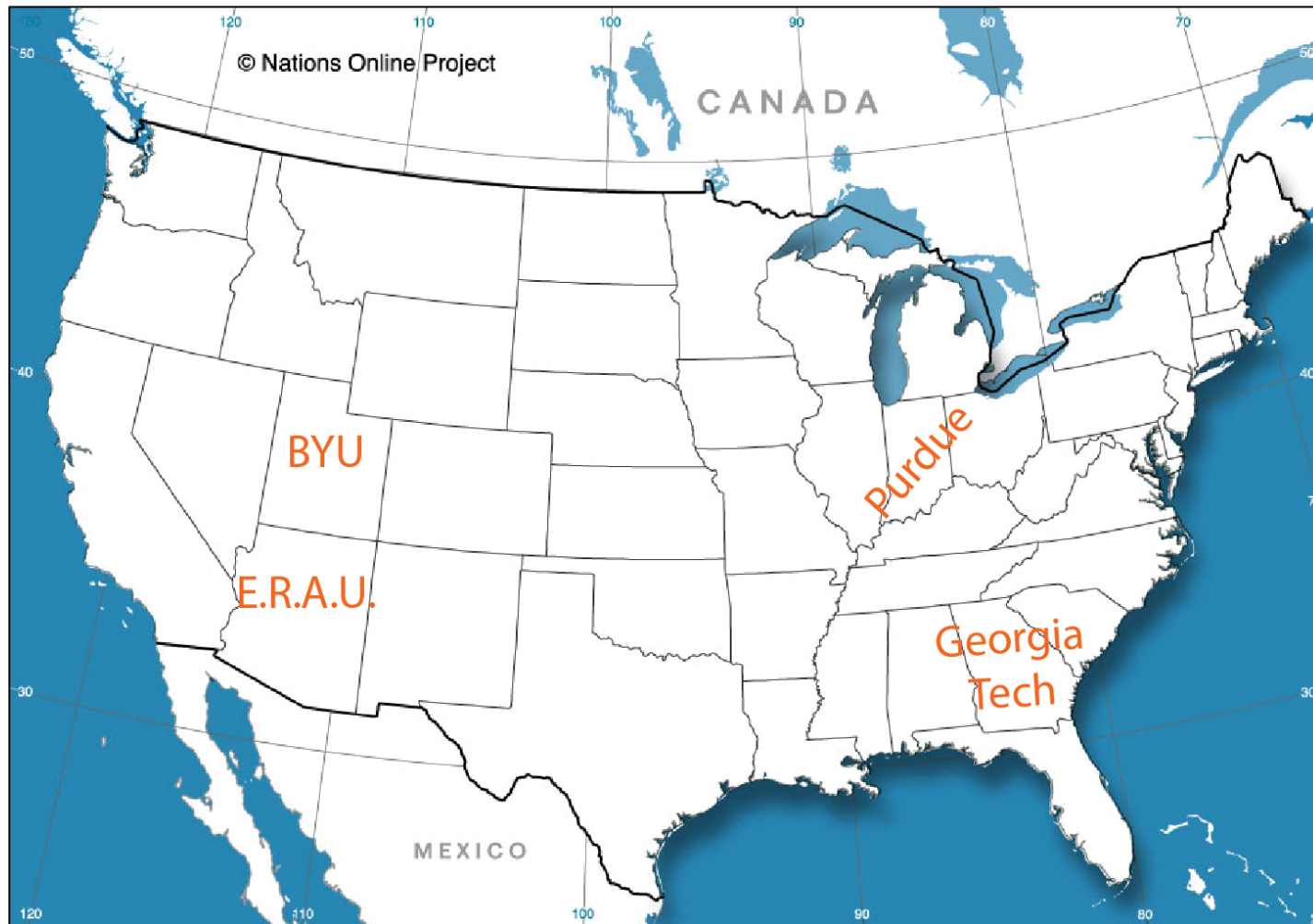


- Blended Wing Body
- Identify diseased crops
- Easy to operate

<http://modernfarmer.com/2014/01/precision-hawk/>

AersosPACE 2013-2014

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http://www.nationsonline.org/maps/USA_blank_map.jpg

“Raw Materials”

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34 students

4 Universities

3 time-zones

1 Request for
Proposals

‘Demonstrate a blended-wing-body (BWB) unmanned aerial vehicle (UAV) to assist farmers in identifying diseased and other crops to conserve water and increase crop yields to help feed a growing population, especially in third world countries.’

Other Collaboration Tools

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When is Good

Cisco
webex

<http://corpu.com/>

<http://excursives.files.wordpress.com/2011/05/logo2.gif>

<http://canadianoutages.com/status/webex>

http://commons.wikimedia.org/wiki/File:Google_Drive_Logo.svg

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Brigham Young University – PACE Laboratory

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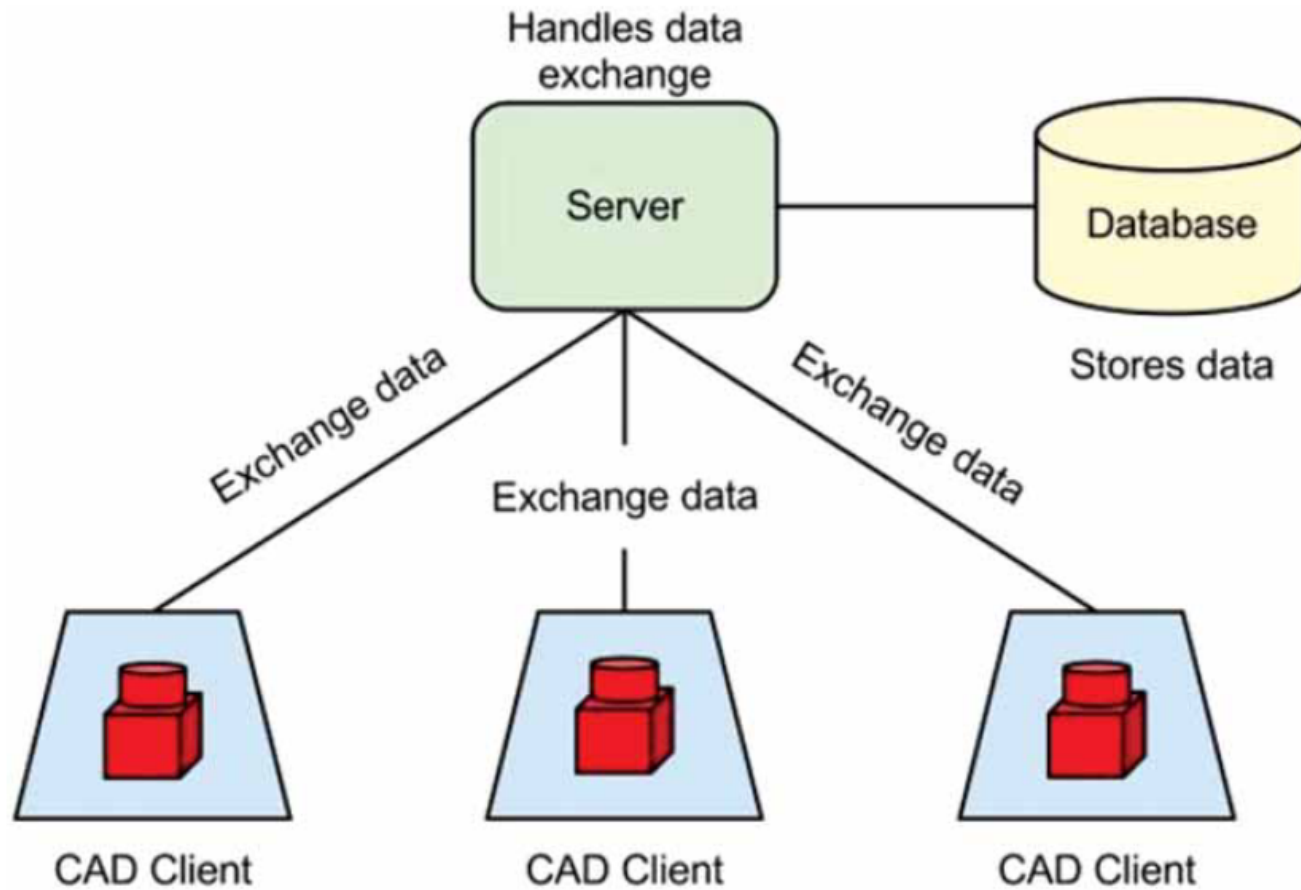
NXConnect - Demo

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Video of NXC demo

NXConnect: Basic Architecture

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Proposed Advantages of Multi-User Design

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- Enhance awareness
- Help catch mistakes sooner
- Reduce design time
- Enhance collaborative problem-solving
- Shorten feedback loops
- Enhance mentoring

Multi-User Design: Lessons Learned

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- Training is essential to tool adoption
- Importance of communication

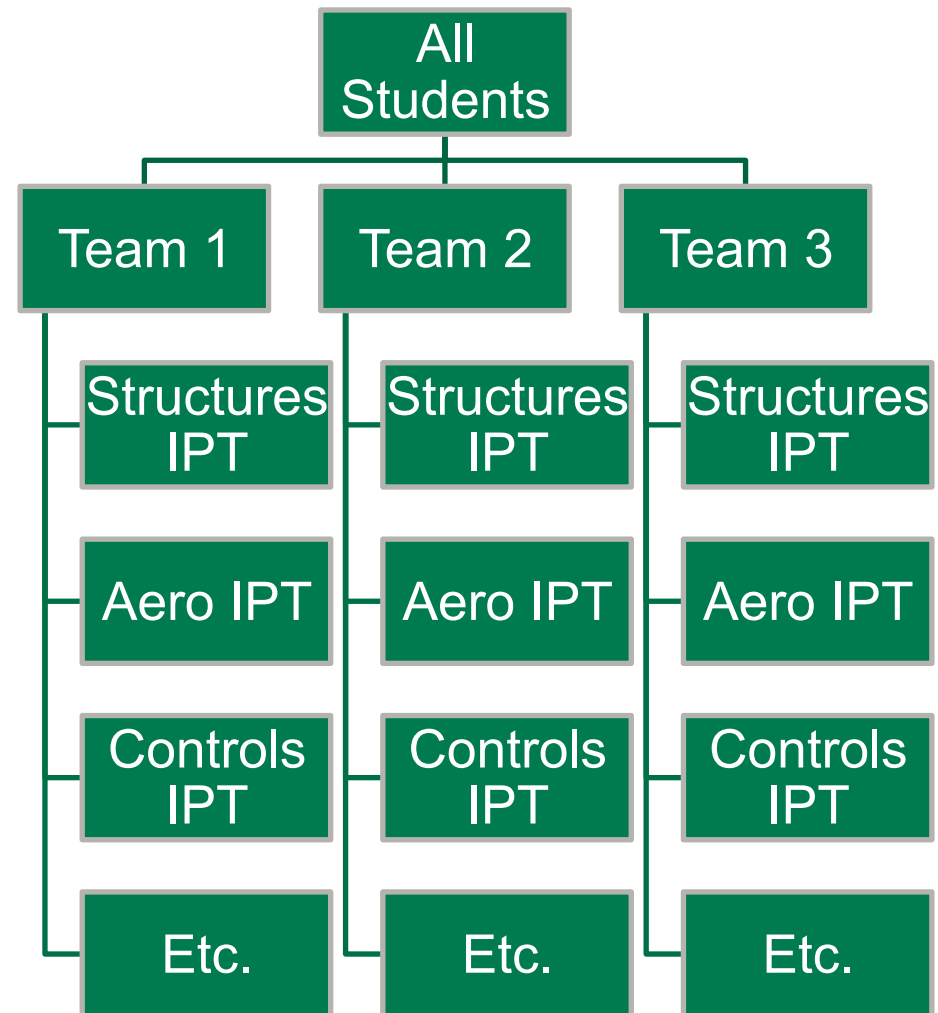


How to Form the Teams?

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How to group 34 students?

- **Common Approaches**
 - Mostly ad-hoc
 - Hierarchical
 - Draft or other
- **Proposed Approach**
 - “Intelligent” team formation



Intelligent Team Formation

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Hypothesis: A given team will be more successful if its members are selected in a way which tends to maximize the characteristics desired for that team's work.



What to Measure?

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Access to Tools



Team Members:

- Social Skill
- Technical Skill
- Motivation
- Leadership
- Logistics

http://sweetclipart.com/multisite/sweetclipart/files/check_mark_green.png

How to Measure it?

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Possible Methods:

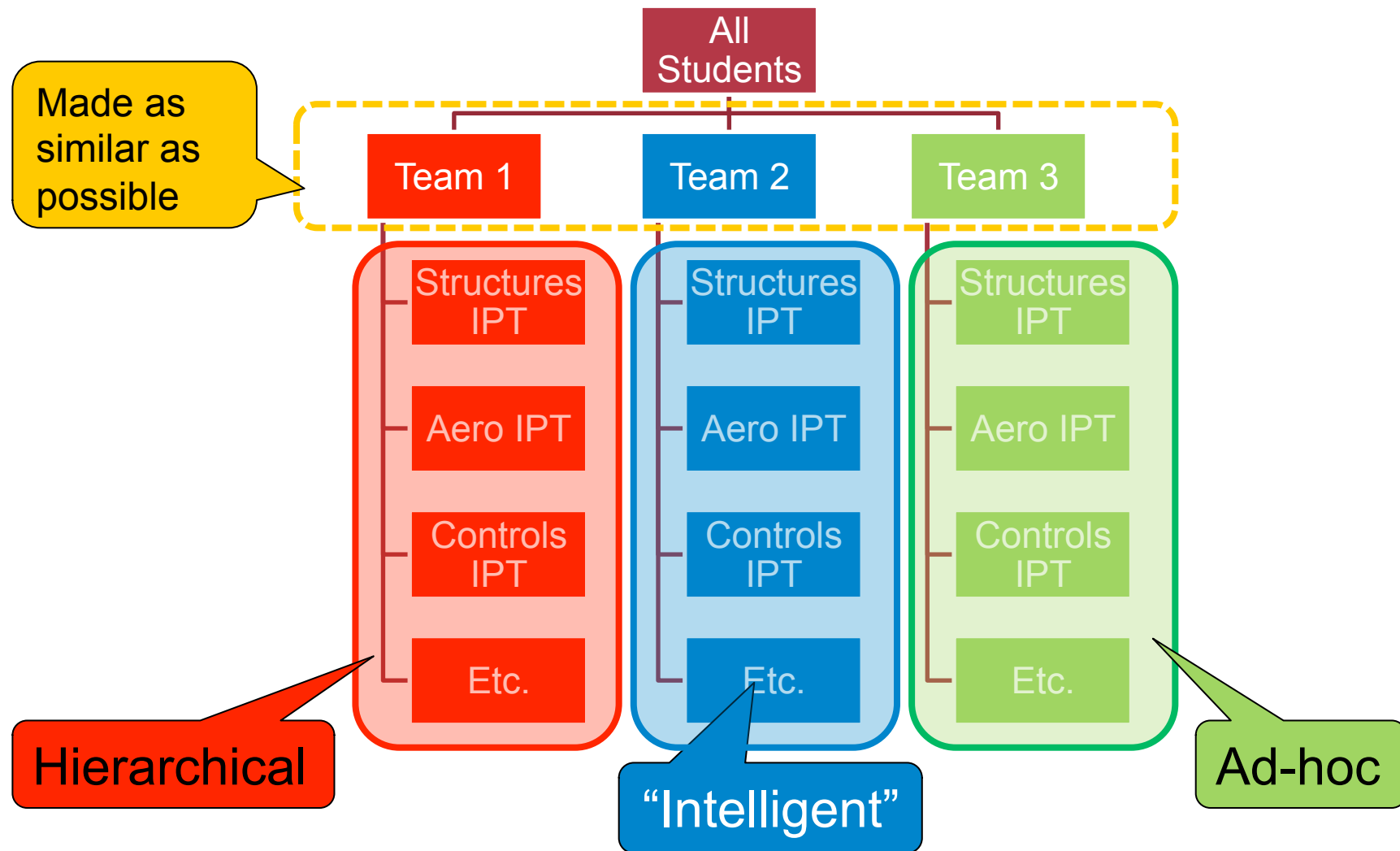
- Self-reporting surveys
- Tests
- Peer Evaluation
- Observation



http://www.qualtrics.com/wp-content/uploads/2013/05/q_logo_vertical.png

Teams and IPT Organization Strategies:

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Other Team Formation Guidelines

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- **Each team must have:**
 - A “core” group of 6 students from one university
 - The same number of graduate students on each team
 - At least one girl on each team
 - Include at least 3 of the 4 universities on each team
 - Avoid having only one student on a team from one university
 - At least one “expert” in each critical technical area
 - At least a couple leaders on each team
 - As even as possible distribution of the fundamental skills among the teams

Forming the Teams: Surveys

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The screenshot shows a web browser window with a Qualtrics survey. The URL is https://az1.qualtrics.com/ControlPanel/?ClientAction=EditSurvey&Section=SV_bPWpkAUx0POS8yV&S.... The survey is titled "Why did you decide to take this course? (select all that apply)".

Q25 Why did you decide to take this course? (select all that apply)

Options for Q25:

- ☐ Mechanical Engineering
- ☐ Aerospace Engineering
- ☐ Manufacturing Engineering
- ☐ Other (please specify):
- ☐ Required for graduation
- ☐ A subject I'm interested in
- ☐ Friends are taking the course
- ☐ I'd like to work in a similar field after graduation
- ☐ Not really sure
- ☐ Only course that fit my schedule
- ☐ Sounded challenging
- ☐ Sounded easy
- ☐ Will help improve my skills for my future career or other courses
- ☐ I just love airplanes
- ☐ I just love designing things
- ☐ I just love working on team projects
- ☐ Other (please describe):

Q27 Please rate your level of interest in each of the following areas:

Scale: Very Uninterested (-5) to Very Interested (5), with Neutral at 0.

Area	-5	-4	-3	-2	-1	0	1	2	3	4	5
Team Leadership											
Aircraft Design											

Examples:

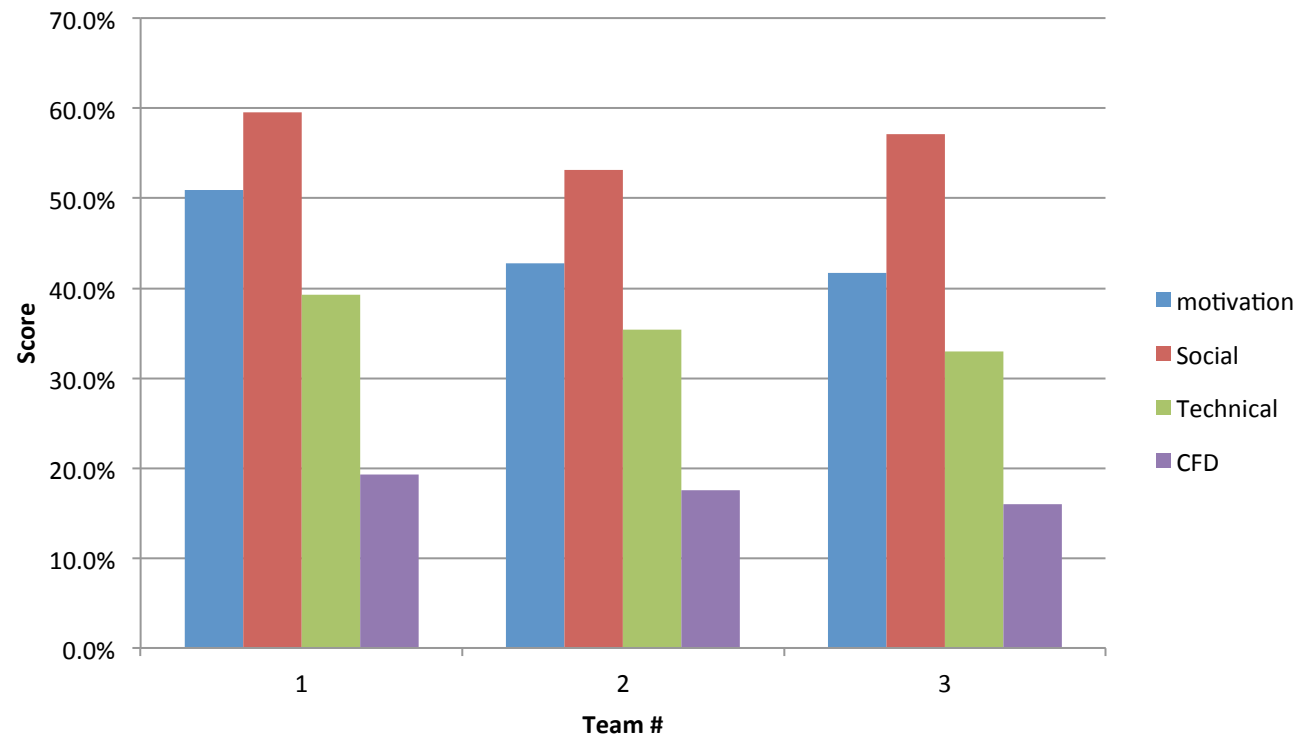
- Technical
 - “Rate your abilities (1-5) in the following CAD skills...”
 - “How much experience have you had with rapid prototyping?”
- Social
 - “How do you feel about working in teams?” (1-5)
- Motivation
 - “Why did you decide to take this class?”

http://commons.wikimedia.org/wiki/File:Microsoft_Excel_2013_logo.svg

Forming the Teams

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Teams Compared



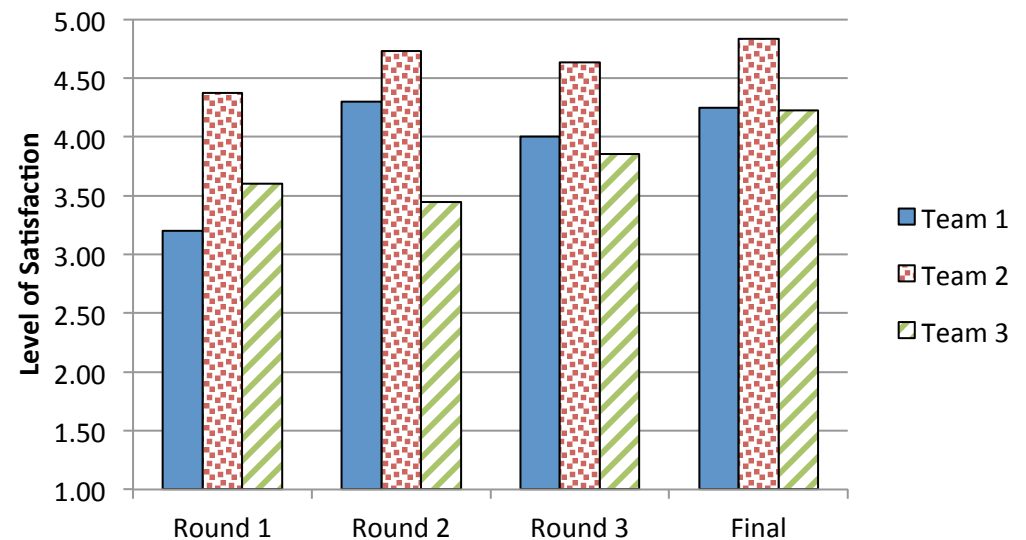
Measuring Success

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- **What is success?**
 - **Achieving Technical Objectives**
 - **Satisfaction With Team**

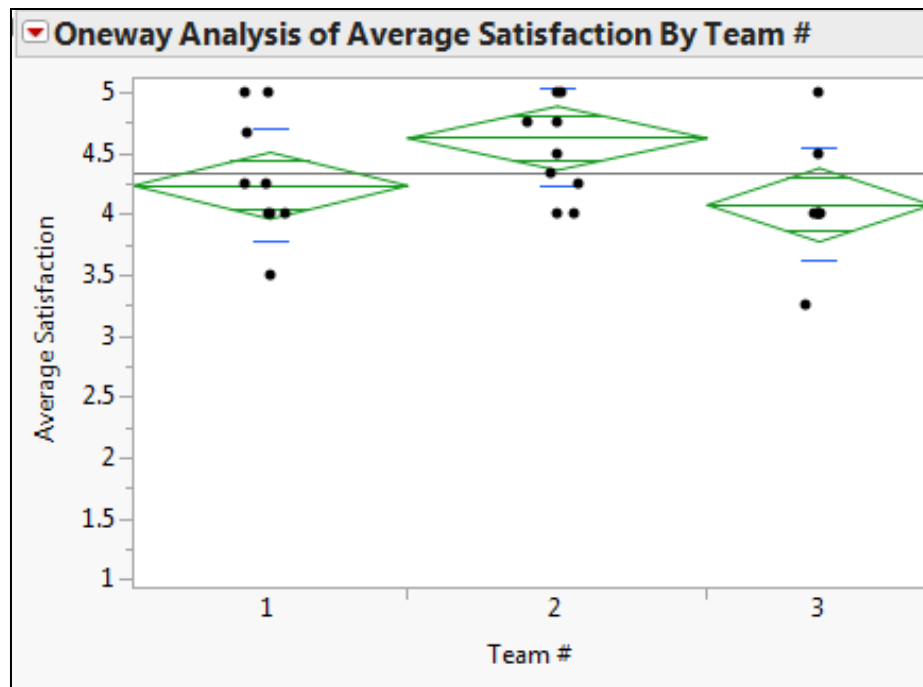
- Team 2: First team to fly working UAV

Average Team Satisfaction Ratings Over Time



Measuring Success: Statistical Analysis

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Team	Team	p-Value
2	3	0.0088
2	1	0.0437
1	3	0.4303

Future Work

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- Continue studying multi-user design teams in variety of situations, including in industry
- Refine team formation measurement criteria and methods
- Apply team formation method in other situations
- Identify other teaming factors

Questions?

Thank You!