Module Purpose: Teamwork

- Demonstrate the role of teamwork in the execution of systems engineering.
- Describe the principles of successful teams.
- Recognize, describe and self-evaluate the personality types that may be found within any team.
- Learn the types, benefits and applications of the Myers-Briggs personality type indicator.
A major difference between university studies and the work world: transition from individual work performance to team work performance.

Academic opportunity to experience team work is the senior (capstone) design class.

Systems Engineering Relies on Teamwork

♦ A multidisciplinary team is system engineer’s most powerful tool.

♦ Often called Integrated Product Team (IPT) or Integrated Product Development Team (IPDT).

♦ Team led by systems engineer, with all significant technical disciplines represented.

♦ Reasons / Value of this approach
  • No one individual has all the required knowledge.
  • Diverse team interaction encourages ingenuity and creativity.
  • Reduces engineering design time.
  • Enables fewer problems in transition from engineering to manufacturing to operations.
  • Identifies and resolves technical subsystem conflicts early.
Developing a Team

- Today’s challenge: “Team of teams”
  - Team members are dispersed geographically
  - Different culture basis
  - Different process approaches
  - Your team’s performance depends on a sub-team or supplier’s performance

- Goal: Creating a culture of collaboration
  - Explicitly reward collaboration traits
    - Honesty, integrity, sharing, receptivity, consistency, respect
  - Build trust
    - Individual involvement in planning, creating, strategizing, structuring

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Team Principles from the JSC Constellation Program Office, (1/2)

1. An atmosphere of professional expectations, trust and mutual respect
   - Trust one another
   - Engage in unfiltered conflict around ideas
   - Commit to decisions and plans of actions
   - Hold one another accountable for delivery against those plans

2. Staff leadership positions with team players

3. Focus on outcomes

4. Cooperation
   - Designate what we should be working together with mutually advantageous roles and responsibilities.
   - Designate what efforts should be organized and operated as separate, integration-free delegation of authority.

5. Healthy teaming that maximizes leverage of the entire agency (& industry)
   - Define roles and responsibilities in terms so that teams do not clash but rather mesh like teeth on a gear train.
   - Employ a philosophy that teams are properly sized to their task and function – no more, no less – at all levels.
Team Principles from the JSC Constellation Program Office, (2/2)

6. Vigilance in finding and eliminating ‘wasted motion’ in pursuit of desired outcomes
   • Remain lean in the role of Program review of Project products.
   • Allow duplication of project tasks only on an approved exception basis.
   • Putting a team ‘out of business’ is GOOD; the participants and supporting talent can then be applied to the ‘next problem’ on the road to the Moon.
   • Ask if there are better ways to produce the product.

7. Team leads must take a ‘servant leader’ approach.
   • Ascertaining what are the problems of the team’s members (related to the function of the team).
   • Determine how they affect the desired outcomes of the team, and what can be done to resolve them.

What are the personalities that comprise engineering teams?

What kind of team member are you?
"Personality Type or Psychological Type" are terms most commonly associated with the model of personality development created by Isabel Briggs Myers (aka Briggs Meyers, Meyers Briggs, Briggs & Myers) the author of the world's most widely used personality inventory, the MBTI or Myers-Briggs Type Indicator. Myers' and her mother, Katharine Briggs, developed their model and inventory around the ideas and theories of psychologist Carl Jung, a contemporary of Sigmund Freud and a leading exponent of Gestalt personality theory."

Over the sixty years since its inception in 1943, the MBTI has evolved and improved through continual test research and development of ever more accurate questions. Millions of people have taken the test.

- It is a standard tool for government executive training.
- 16 different personality types defined by using 4 letters in a code.

**First Letter: Ways of gaining energy**

- **Energy Orientation** pertains to the two forms of Energy Consciousness each of us experiences on a daily basis. Where do you get your energy: from an inwardly turned world, or outwardly turned world. One of these worlds is our elemental source of energy; the other secondary.
  - [E] Extraversion versus [I] Introversion

**Second Letter: Ways of taking in information**

- This set of mental preferences relates to how people "Perceive" or take in information or gather data.
  - [S] Sensing versus [N] iNtuition
Myers-Briggs Type Indicator
The 4 Letter Code... (2/2)

Third Letter: Ways of making decisions

- This set of mental preferences identifies how people form "Judgments" or make decisions.
  - [T] Thinking versus [F] Feeling

Fourth Letter: Ways of living in the world

- **Extraverted Orientation** relates to which mental preference one relies upon in dealing with/relating with the **Outside World**. It is the mental function that takes the lead in the Extraverted portion of a person's personality.

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Myers-Briggs Type Indicator
Benefits...

- **Know thyself**...
  - Developing a self-portrait to understand your strengths and preferences in addition to your areas for improvement and opportunities for growth.

- **Know that others are different**...
  - Awareness of our own personality type and that there are many different types makes it less likely that we assume that others are like us.

- **Team dynamics**...
  - An appreciation and value of the differences between people and how you can relate to your colleagues better.

- **Working in a diverse world**...
  - Improved communication and interpersonal skills.
Myers-Briggs Type Indicator
Applications...

♦ Leadership tool
  • Improve employee communication

♦ Team-building
  • Increase team effectiveness and productivity

♦ Hiring and staffing
  • Establish the right mix of people

♦ Career planning
  • Match individuals to career interests

♦ Problem solving
  • Reduce workplace conflict

Myers-Briggs Type Indicator
Taking a simplified test...

♦ http://www.personalitypathways.com/type_inventory.html

♦ NOTE: This modest self-scoring inventory is Not a substitute for taking an MBTI. It is simply an introduction to personality type or psychological type. It may whet your appetite for learning more about the Myers and Briggs model of personality development and its message of increased human understanding. The Style Inventory will allow you to approximate what are your MBTI Type preferences. After determining your 4 Type letters, you can jump to a number of links we have provided to help you get acquainted with the characteristics and indicators of the 16 types and verify if your type, as determined by this "unscientific" survey, seems to "fit" or not.
Pause and Learn Opportunity

Use class time to have the students take the quick M-B test provided on http://www.personalitypathways.com/type_inventory.html
If the classroom does not have internet access, print the quiz so they can register results on a hardcopy.
Takes approximately 10 minutes to complete.
Have the students state their 4-letter M-B result and register on the following chart; number of students in each type.

Space Systems Engineering Class Type Table
Results for class of “x” students and “y” instructors
Red indicates JPL screen of SE types

<table>
<thead>
<tr>
<th>ISTJ</th>
<th>ISFJ</th>
<th>INFJ</th>
<th>INTJ</th>
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<tr>
<td>Overseer/Inspector</td>
<td>Provider/Nourisher</td>
<td>Forsee/Developer</td>
<td>Forsee/Mobilizer</td>
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<td>Performer/Composer</td>
<td>Proponent/Advocate</td>
<td>Inventor/Designer</td>
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<tr>
<td>Overseer/Supervisor</td>
<td>Provider/Caretaker</td>
<td>Forsee/Mobilizer</td>
<td>Director/Commandant</td>
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### The General US Population Distribution

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<td>ISFJ</td>
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<tr>
<td>INFJ</td>
<td>1.5%</td>
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<tr>
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### Myers-Briggs Type Distribution for Engineering Students

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<tr>
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<td>ENFJ</td>
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<td>ENTJ</td>
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Note: N=1,252, l=Selection Ratio Index, *p<0.05  #p<0.01  *p<0.001.
Myers-Briggs Meets Star Trek

♦ What sort of crewman would you make?
  • If you were in Starfleet, would you be an excellent Engineer, commanding Captain, or fearsome fighter? Or would you be the guy in the red shirt who doesn't come back from the Away Mission?

♦ Different Star Trek personality tests online; 3 examples:
  • http://www.blifaloo.com/quizzes/trek/trek_quiz_start.php
  • http://members.tripod.com/Melissa_Umlor/trek.html
  • http://www.seabreezecomputers.com/startrek/

♦ MYERS-BRIGGS STAR TREK PERSONALITY INDICATOR
  • Which character are you?
  • Summary results at the following site:
  • http://www.wischik.com/damon/Texts/myersbriggstrek.html

Related Reading:

If You Want Good Systems Engineers, Sometimes You Have To Grow Your Own!
JPL paper by P. A. Trisha Jansma and Mary Ellen Derro
Module Summary: Teamwork

♦ Working in teams is a major difference between university work and space project development work.

♦ Multi-disciplinary teams, called integrated product teams (IPTs) are responsible for the development of subsystems.

♦ There are well-defined principles to successful teamwork.

♦ Myers-Briggs is a popular personality indicator that is useful in understanding your own preferences and those of your team.

Backup Slides for Teamwork Module
**Team Behavior (1/2)**

♦ What it means to be an effective team member:
  • Take responsibility for the success of the team
  • Be a person who delivers on commitments
  • Be a contributor to discussions
  • Give your full attention to whomever is speaking and demonstrate this by asking helpful questions
  • Develop techniques for getting your message across to the team
  • Learn to give and receive useful feedback

**Team Behavior (2/2)**

♦ Characteristics of an effective team:
  • Team goals are as important as individual goals.
  • The team understands the goals and is committed to achieving them.
  • Trust replaces fear and people feel comfortable taking risks.
  • Respect, collaboration and open-mindedness are prevalent.
  • Team members communicate readily; diversity of opinions are encouraged.
  • Decisions are made by consensus and have the acceptance and support of the members of the team.
**IPDT Approach**

- A basic principle of IPDT is to get all disciplines involved at the beginning of the development process to ensure that requirements are completely stated and understood for the full life cycle of the product. This up-front activity is considered part of the Systems Engineering process.
- Historically, the initial development of requirements has been led by Systems Engineers. In an IPDT, the Systems Engineers still lead the requirements development process, but now more (all) disciplines participate in it. Requirements are developed initially at the system level, then successively at lower levels as the requirements are flowed down. Teams, led by Systems Engineers, perform the upfront Systems Engineering functions at each level.
- This is different from the previous, classical development approach where Systems Engineers did the up-front work and passed the requirements along to development engineers who passed their designs on to manufacturing, thence to test, without the continuous involvement of the initial engineers. This resulted in a loss of understanding caused by asynchronous communications.
- The general approach is to form cross-functional product/process teams for all products and services, plus a Systems Engineering & Integration Team (SEIT) to cover systems issues, balance requirements between product teams, and help integrate the teams.

**Myers-Briggs Type Indicator**

**Benefits to Teamwork**

- One of the practical applications of the MBTI and understanding these preferences is in supporting better Teamwork. Differences in these mental preferences lead to quite different value structures and communication styles, which can hamper mutual understanding and cooperation.
- For example, people who share Sensing and Thinking preferences find they are naturally on the same wavelength; they easily understand one another, making good teammates and partners. Likewise, people who share Intuition and Feeling have a similar kinship among them. However, in the "real" world, it is more likely that you'll find a mixed bag of people, a variety of types, in the same work group. While this diversity can be a useful strength, contributing to greater depth and breadth of team competence, there will be natural communication barriers within the team due to their natural mental language differences.
- Such differences can be overcome, and the communication gap bridged, with mutual respect and practice learning to "talk" and "think" in a second or third type.