

Research Project Management Principles & Tools (Juggling 101)



A photograph of a rocket launch at night. The rocket's path is visible as a bright, glowing orange arc against a dark blue and black sky. The arc starts from a small, intense flame at the base and curves upwards and to the left. The horizon line is visible in the foreground, showing some land and water. The overall atmosphere is dark and dramatic.

**Karl Benedict, PhD
Ward Fleri, PhD, PMP**

**ESIP Summer Meeting
17 July 2018
Tucson, AZ**

Overview

Session 1

- Why us?
- Why project planning?
- What is a project?
- Requirements & scope
- Intro to TaskJuggler
- Task breakdown
- Estimating effort

Session 2

- Assigning resources
- Budgeting
- Analysis & visualization
- Project execution
- Communication
- Project close-out
- Terminology

Who are we and why are we talking about this?

Ward Fleri

- PhD in Applied Math from Brown University
- Photon Research Associates – Scientist, PM, Software Engineering Group Leader
- Protein Data Bank at UCSD/SDSC – PM
- Immune Epitope Database at LJ Institute – PM
- Project Management Professional since 2003
- Certified Scrum Master since 2016

Who are we and why are we talking about this?

Karl Benedict

- PhD in Anthropology from the University of New Mexico
- Director of Research Data Services, UNM Libraries
- Former Director and Research Scientist, Earth Data Analysis Center, UNM
- Cyberinfrastructure Lead/ Co-I for multiple large-scale, multi-year NSF and NASA funded projects



Why Knowing Project Management Makes Sense No Matter What Career You Choose

Importance of Project Management

- You are likely already involved in projects
- Writing grant & contract proposals
- Organizing awards
- Communicating among team members, subcontractors, your boss
- Achieving results on time and within budget



Top 10 Skills Employers Seek in 20-Something Employees

Ability to:

- **Work in a Team**
- **Make Decisions & Solve Problems**
- **Plan, Organize & Prioritize Work**
- **Communicate Verbally**
- **Obtain & Process Information**

- **Analyze Quantitative Data**
- **Technical Knowledge
in Job**
- **Proficiency with Computer
Software**
- **Create/Edit
Written Reports**
- **Sell & Influence Others**



Forbes
October 2013

The Top 12 Skills Employers Seek



The Balance
Dec 2017

- 1. Positive Attitude**
- 2. Strong Work Ethic**
- 3. Excellent Communication**
- 4. Problem-Solving**
- 5. Time Management**
- 6. Flexibility**

7. Work in Team Environment

8. Computer/Technology

9. Project Management

10. Self Confidence

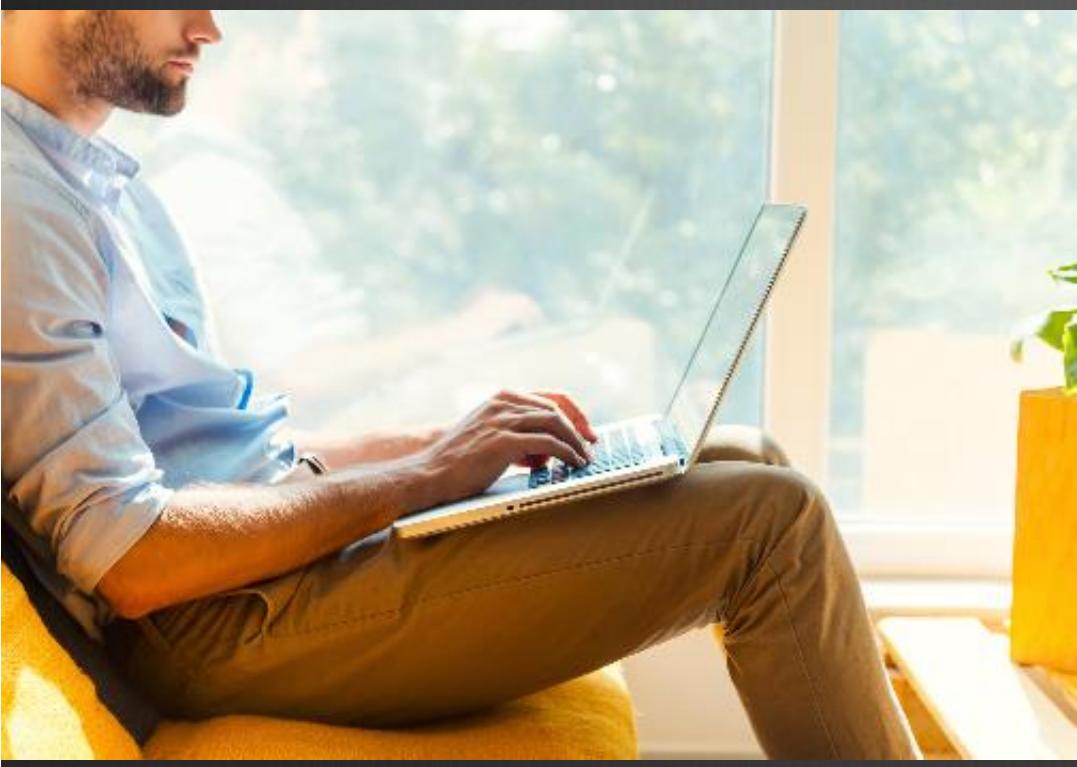
11. Accept Constructive Criticism

12. Strong Research Skills



What should you know?





Individuals going about the daily routine of their job will need to know how to prioritize and plan each activity to be able to get the best job done in the least amount of time.

What is a project?

A **temporary effort** with a beginning and an end.
It creates a **unique** product, service, or result.



A few
project
management
pointers...

Requirements & Scope

Know Where You're Going

Goals, aims, objectives

Pick a Road

Approaches, constraints,
assumptions



Out of Scope

Related
Aims

In Scope

Aim 1
Aim 2
Aim 3

Feature 1
Feature 2
Feature 3
Feature 4

Related
Goals

Additional New Features

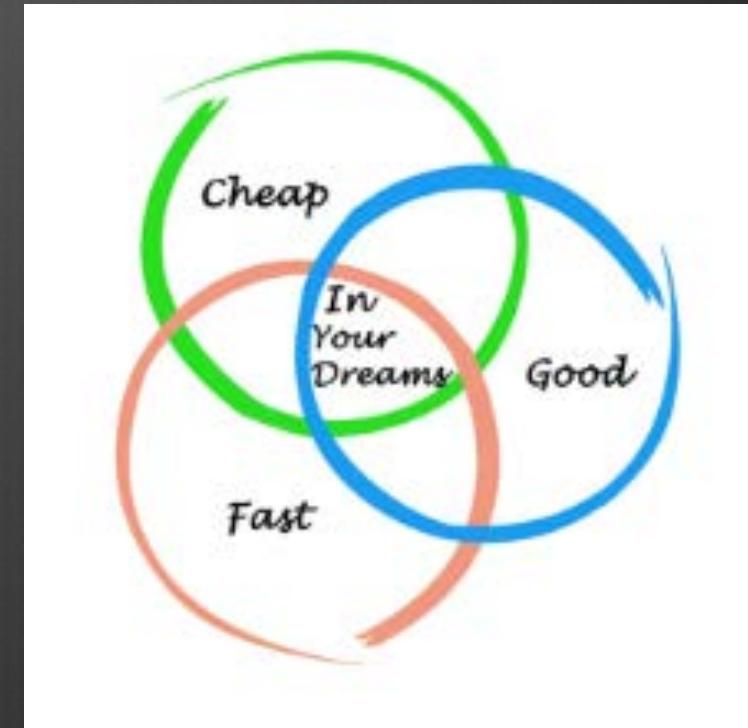
Beware of Scope Creep!



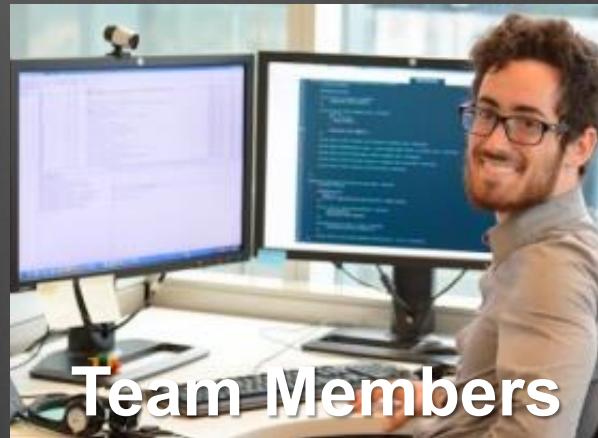
Intro TaskJuggler

- Overview
- Project skeleton

The Triple Constraint (Iron Triangle)



Constraint Prioritization → Communicate with Stakeholders



Planning

Break down
the overall
effort into
manageable
tasks.



TaskJuggler

- Project outline

A collage of images depicting a team working together on a large chalkboard. In the center, a large chalk drawing of a lightbulb contains a dollar sign, symbolizing ideas or cost. Several hands are visible, some holding pens and writing on the board, while others point at the drawing. Two cups of coffee are placed on the board. The overall theme is collaborative problem-solving and planning.

Identify
dependencies
among tasks.

A photograph of a man from the side, wearing a white t-shirt, sitting at a desk and working on a silver laptop. He is looking down at the screen. A floating digital interface is superimposed over the scene, consisting of several translucent blue rectangular panels. These panels contain binary code (0s and 1s) and a horizontal timeline with various markers. One large panel in the foreground contains the text "Estimate duration of tasks." in bold black font.

**Estimate
duration of
tasks.**

TaskJuggler

- Progressive elaboration

Session 2

Assign Resources (People & Equipment)



Make a Budget



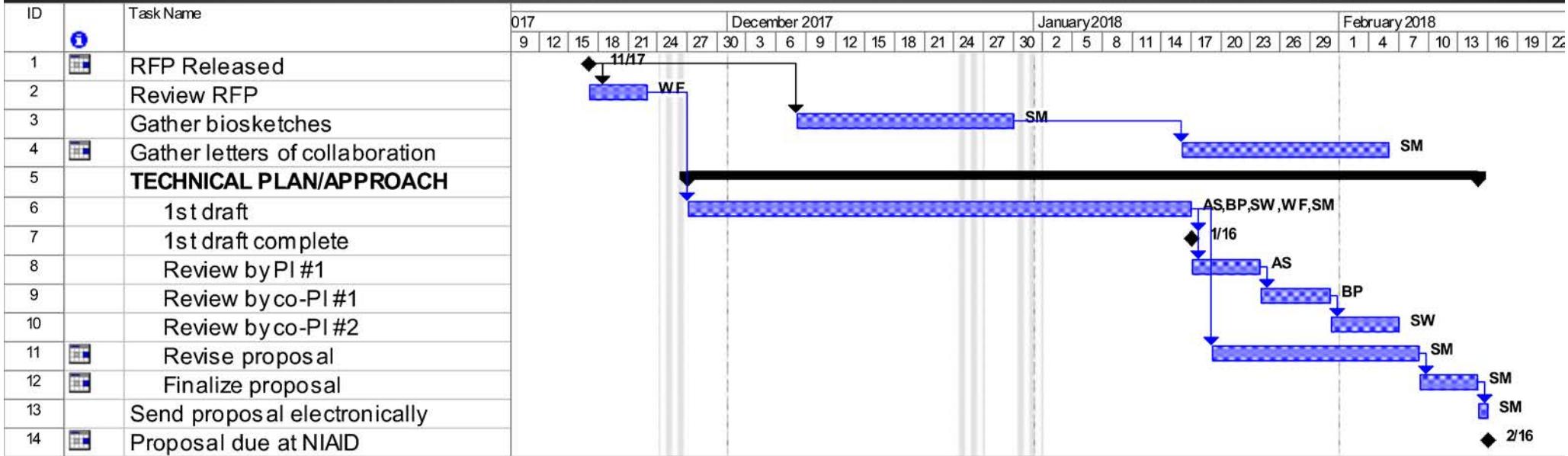
TaskJuggler

- Assigning resources
- Cost estimation



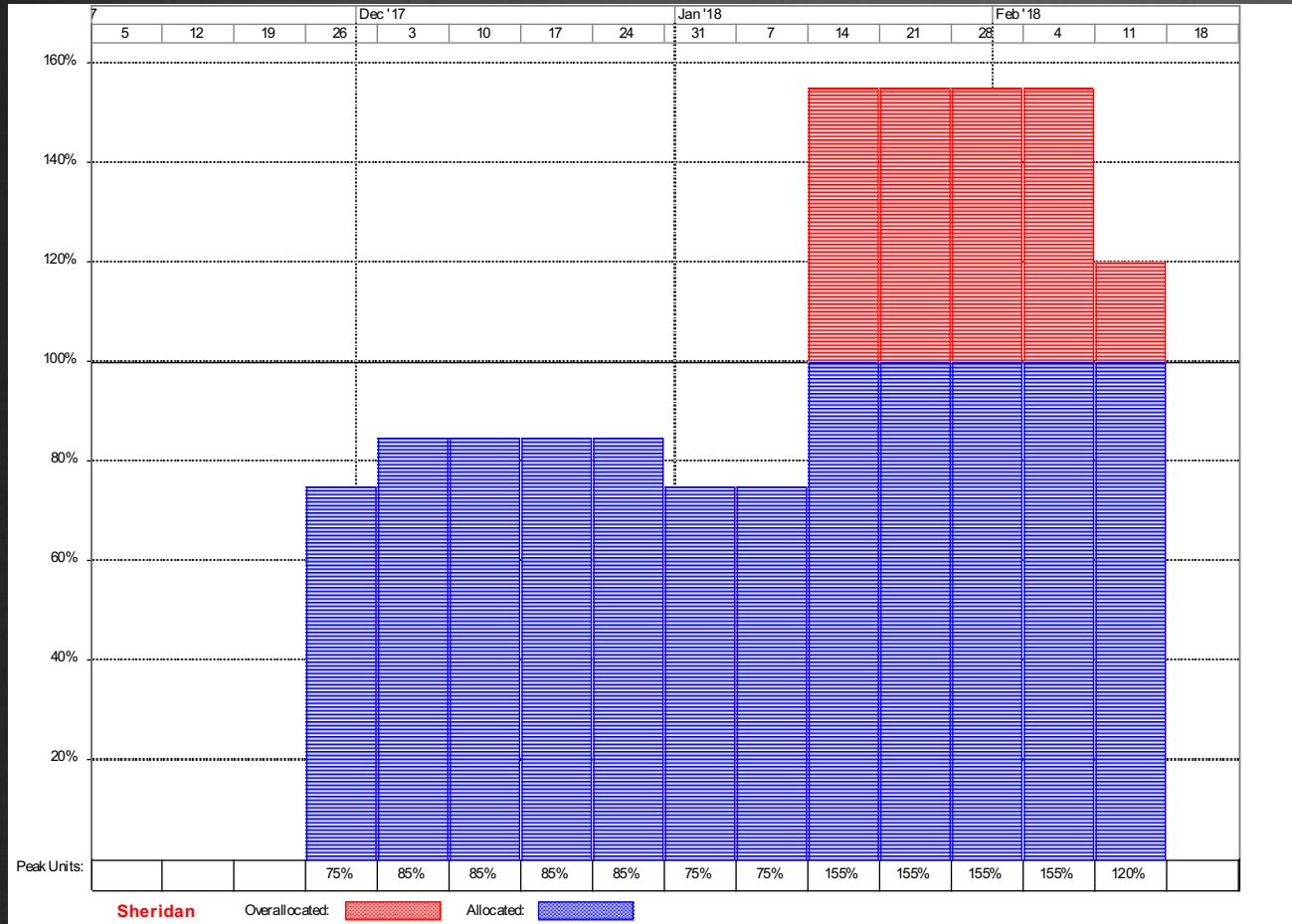
**Expect
Changes**

Plan with a Gantt Chart



**Microsoft Project (\$\$)
TaskJuggler (Free)**

Some Programs Offer Resource Profiling



Project Execution

NOPE

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127 300
KORD KDCA 07:09PM

- Identify risks
- Expect variations from the plan
- Correct course as needed
- Provide leadership to the team

TaskJuggler

- Project tracking

A photograph of a man in a dark suit and glasses speaking to a group of people in an office. He is gesturing with his hands while holding a pen. In the background, there are windows and sticky notes on a wall.

**Surprises are
usually not good**

Communication

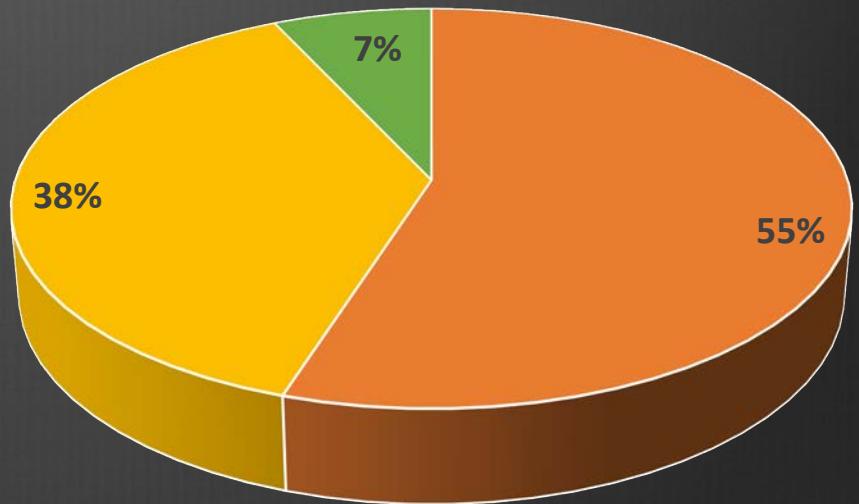
Did you know?

The majority of communication is nonverbal.



**Good
communication
is critical.**

3 V's of communication





Choose the most effective means for the situation

**Email
Phone
Face-to-Face
Formal Reports**

Communication Channels Expand Quickly

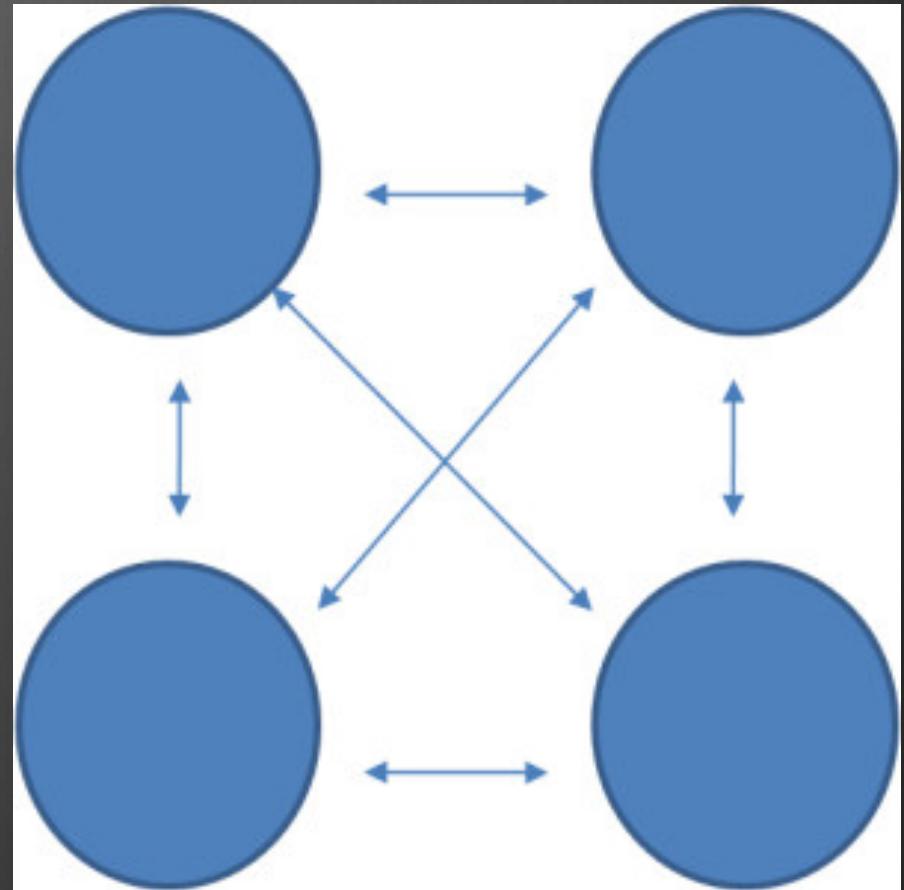
$N(N-1)/2$

$N = \# \text{ of}$
Stakeholders



4 Stakeholders?

$$4 (4-1) /2 = 6$$



10
Stakeholders?

$$10 \cdot (10-1) / 2 = 45$$



TaskJuggler

- Visualization
- Reporting



Project Closeout

- Make final contractual deliverables (e.g. code, reports)
- Finalize financials (vendors, subcontractors, invoices)
- Archive all artifacts
- Meet with team for “Lessons Learned”



Learn from Your Successes and Failures

**If you want to
succeed, double your
failure rate.**

Thomas Watson



Career Implications

- More effective use of time & resources
- Opportunity to develop leadership & management skills
- Critical skills to have as a PI

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- Alternative career path to traditional PI research trajectory
 - Sought-after skills in science, engineering, and software organizations
 - Expanded domain flexibility

