Enhancing Research Development Success With Effective Project Management

A Hands-on Approach

Who Are We?

Sharon Sweetser Pound, **PMP**
Manager, Research Development
Office of Research and Engagement
University of Tennessee

Anne Maglia, **PhD, PMP**
Associate Vice Chancellor
Research and Compliance
University of Massachusetts Lowell
Project Management and Research Development

▪ Today, we’ll:
  ▪ Describe the Project Management Professional (PMP) certification process
  ▪ Discuss the benefits of becoming a PMP
  ▪ Explain how understanding the PMP process can benefit RD

▪ We’ll share our experiences and applications

▪ We’ll walk you through two use cases:
  ▪ Improving processes and restructuring for a centralized RD office
  ▪ Planning and managing a project schedule
We’ll use Plicker cards for real-time feedback

- Using Plickers:
  - We’ll show a question slide
  - Orient your card with your answer on top
  - Hold your card so we can see it
  - We’ll scan the room and show results
  - Your answers are anonymous
What is your level of experience with formal Project Management?

A. I am a certified PMP and/or CAPM
B. I have completed some formal project management training
C. I have managed projects but without formal training
D. I have no experience but am curious
The Project Management Institute (PMI) delivers value for more than three million professionals around the world through global advocacy, collaboration, education and research.

Visit PMI at
- www.PMI.org,
- www.projectmanagement.com,
- www.facebook.com/PMIInstitute
- Twitter @PMIInstitute
Some Definitions from PMI

- **Project**: a temporary endeavor undertaken to create a unique product, service, or result.

- **Project Management**: The application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.

- **Program**: A group of related projects, subprograms, and program activities managed in a coordinated way to obtain benefits not available from managing them individually.

- **Portfolio**: Projects, programs sub-portfolios, and operations managed as a group to achieve strategic objectives.
Standards for Project Management

- *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)* is PMI's flagship resource for effective project management in any industry.

- The sixth edition of the *PMBOK* includes the *Agile Practice Guide*.

- *PMBOK* has been recognized by the American National Standards Institute.

- In 2012, ISO adapted the project management processes from *PMBOK*. 
The PMBOK Framework

- **Five Process Groups**: Initiating, Planning, Executing, Monitoring and Controlling, and Closing

- **Ten Knowledge Areas**: Integration, Scope, Time, Cost, Quality, Human Resource Management, Communications, Risk Management, Procurement and Stakeholder Management

- Inputs and Outputs

- Enterprise Environmental Factors

- Organizational Process Assets
The PMBOK (pronounced “Pim-Bock”):

A. Has not changed since 1974
B. Outlines standards and guidelines for managing projects
C. Is a small antelope, maybe native to the African savanna
D. I’m still not sure what the PMBOK is
PMI’s Professional Certifications

- PMI, the world’s leading association for the project, program and portfolio management profession, offers eight certifications that recognize knowledge and competency, including the Project Management Professional (PMP)® certification – renowned as the global gold standard.

- Others include:
  - Program Management Professional
  - Portfolio Management Professional
  - Certified Associate in Project Management
  - PMI Professional in Business Analysis
  - PMI-Agile Certified Practitioner
  - PMI-Risk Management Professional
  - PMI Scheduling Professional

- There are currently 833,025 active PMP-certified individuals and 286 chartered chapters across 210 countries and territories worldwide.
The PMP Examination

▪ Eligibility, format, cost
  ▪ Experience + education
  ▪ 200 multiple choice questions
  ▪ $405--$550

▪ Many options to help you prepare:
  1. Online or weekend courses (6-8 weekends)
  2. “Boot camp” study programs
  3. Sample tests (websites, apps), books, tutorials

▪ Maintaining certification
  ▪ 60 PDUs over 3 years
Project Management Professional (PMP) certification:

A. Demonstrates mastery of PMI’s Project Management Body of Knowledge (PMBOK)
B. Is required by law before you are allowed to manage projects
C. Is valid only in the US
D. If we say “Pim-Bock” for PMBOK, how do we say PMP?
The Benefits of PMP Certification

▪ Helps build trust for the RD professional; faculty respect the PMP certification
▪ Enables professional advising to help faculty build effective teams
▪ Facilitates efficient proposal development and research collaborations
▪ Enables RD professionals to help conceptualize and write project management and organizational management sections of proposals
▪ Empowers RD professionals to help faculty identify priorities, research goals, and action plans
RD Application: Proposal Project Planning

- Project Charter
- Integration, Scope
- Schedule, Human Resources
- Quality, Risk
- Communications, Stakeholders
- Cost, Procurement
RD Application – UT Example
Supporting Collaborative Proposal Development

- NSF Engineering Research Center Proposal
  - Team Kickoff – Project Charter
  - Scope Management – Set Expectations, Create Work Breakdown Structure
  - Stakeholder Identification – Innovation Ecosystem
  - Scheduling, Project Monitoring – Timeline, Recurring Meetings, Prompts
  - Human Resources – Fill Gaps, Maintain Motivation, Define Group “Rules”
  - Communications – Multiple Departments, Multiple Institutions, Different Languages
  - Cost – Assist PI with Realistic Budget
  - Management Plan – Assist PI with Writing Plan
Many funding opportunities require investigators to prepare complex project management documents:

- NSF Science and Technology Centers
- NSF Major Research Instrumentation
- NSF Major Research Equipment and Facilities Construction
- NIH RM1
- NSF Mid-scale Research Infrastructure

Many faculty haven’t had access to project management training, and RD professionals can provide this valuable skill.
RD Application – UT Example
NSF Mid-scale Research Infrastructure

Mid-scale Research Infrastructure-1 (Mid-scale RI-1)

PROGRAM SOLICITATION
NSF 19-537

<table>
<thead>
<tr>
<th>3 FACILITY LIFE CYCLE MANAGEMENT PLANS FOR MAJOR FACILITIES</th>
<th>3.1-1</th>
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</thead>
<tbody>
<tr>
<td>3.1 Introduction ..................................................................</td>
<td>3.1-1</td>
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<td>3.2 NSF Facility Plan [Reserved] ........................................</td>
<td>3.2-1</td>
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<td>3.3 NSF Oversight Management Plans for the Major Facility Life Cycle</td>
<td>3.3-1</td>
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<tr>
<td>3.4 Project Execution Plan ..................................................</td>
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<td>3.4.2 Detailed Guidelines for Project Execution Plans ............</td>
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<td>3.4.2.2 Organization [Reserved] ...........................................</td>
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<td>3.4.2.3 Design and Development [Reserved] ..........................</td>
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<td>3.4.2.4 Construction Project Definition ...............................</td>
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<td>3.4.2.10 Project Management Controls ...................................</td>
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<td>3.4.2.11 Site and Environment [Reserved] ..............................</td>
<td>3.4.2-1</td>
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<td>3.4.2.12 Cyber-Infrastructure .............................................</td>
<td>3.4.2-1</td>
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<td>3.4.2.13 Environmental, Safety and Health [Reserved] .............</td>
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<td>3.4.2.14 Review and Reporting ............................................</td>
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<td>3.4.2.15 Commissioning .....................................................</td>
<td>3.4.2-2</td>
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<tr>
<td>3.4.2.16 Project Close-out Plan ..........................................</td>
<td>3.4.2-3</td>
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MAJOR FACILITIES GUIDE
Utilizing the principles taught in the PMP certification process:

1. Can further a research development professional’s career
2. Takes extra time to apply to the proposal development effort
3. Can improve the proposal development process
4. All the above
RD Application: Exec/Manager Decision Making

▪ Change Management
▪ Risk Management
▪ Process Improvement and Organizational Re-Engineering
▪ Cost, Schedule, and Quality Control
RD Application – UMass Lowell Example
Change Management

- RD groups manage change:
  - Priorities
  - Policies
  - Processes
  - People
  - Positions
  - …and more!

Example: Institutional Letters of Support
RD Application – UMass Lowell Example
Risk Management

- Risks: reputational (integrity, compliance), financial, physical, etc.
- Types: individual, project, organization

Example: Increased Investment in a Given Strategic Focus Area
Using a formal change management approach:

A. Ensures that there is clear communication about the reasons for change

B. Helps with getting buy-in from those affected by the change

C. Includes steps such as: articulating the need for change, pre-change planning and preparation, stakeholder impact and involvement, communication planning, and post-change monitoring

D. All of the above, of course!
Any questions so far?

Sharon Pound, spound@utk.edu
Anne Maglia, anne_maglia@uml.edu
Business Process Review/Strategic Enterprise Analysis

Hands-On Practice
Process Improvement is to Me as:

A. Green is to Frogs (= I know it and love it)
B. Oil is to Water (= we don’t mix)
C. A Peloton bike is to a Fish (= I am not familiar with it)
D. A Cardboard Box is to a Cat (= I am curious to know more)
Business Process Review and Strategic Enterprise Analysis

- **BPR**: Evaluate current processes and identify ways to make them more efficient
  - Identify gaps, inefficiencies, bottlenecks, single points of failure
  - Identify areas for streamlining and automation
  - Identify unnecessary, ineffectual, or legacy processes

- **SEA**: Understand the unit/organization’s strategic goals, identify supporting business needs, and map out initiatives that support the goals
  - Thoroughly examine the needs and solutions
  - Analyze the solutions, their risks, and their feasibility in the existing organizational climate
## RD Application – UMass Lowell Example
### BPR/SEA

<table>
<thead>
<tr>
<th>Office</th>
<th>Unit</th>
<th>Item</th>
<th>Current state</th>
<th>Preferred state</th>
<th>Initiative</th>
<th>Business Case/Strategic Goal</th>
<th>Required capacity</th>
<th>Impact on strategic goals (1-5)</th>
<th>Ease of change (1-5)</th>
<th>Dependenci es</th>
<th>Risk Level (LMH)</th>
<th>Priorit y (LMH)</th>
<th>Timelin e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research and Engagement</td>
<td>Research Development</td>
<td>Process for capture and sharing of lessons learned</td>
<td>Debrief after each project, RD Director makes notes and changes procedures, as necessary</td>
<td>All lessons from all teams should be archived for everyone to access</td>
<td>Work with stakeholders to develop a plan for capture, storage, and sharing</td>
<td>Improved customer service, increased process efficiency</td>
<td>Knowledge of the current process; understanding of what needs to be captured; system for storage and access</td>
<td>3</td>
<td>3</td>
<td>Archival, organizational asset development</td>
<td>L</td>
<td>L</td>
<td>July 2019</td>
</tr>
<tr>
<td>RAIC</td>
<td>Research Support Services</td>
<td>Process for assigning grant reviewer s to projects</td>
<td>Assoc. Deans identify candidates ad hoc/after call, RSS staff reach out to assess, coordinate</td>
<td>Requests captured from PIs directly, information into DB for tracking</td>
<td>Develop online request form</td>
<td>Improved customer service, strategic resource allocation, improved process efficiency, increased proposal success</td>
<td>website, IT buy-in, assoc. dean buy in,</td>
<td>2</td>
<td>4</td>
<td>Assoc Deans, IT, ORA, AVC, SRAs</td>
<td>M</td>
<td>M</td>
<td>Sep 2019</td>
</tr>
<tr>
<td>RAIC</td>
<td>Research Support Services</td>
<td>Improve d training materials</td>
<td>Topics identified ad hoc/randomly, legacy information, mostly handouts/job aids</td>
<td>Series of branded, brief videos covering FAQs, input from faculty, made available to PIs online/youtube</td>
<td>Research ready videos</td>
<td>Improved customer service, increased proposal success</td>
<td>Website, IT buy-in, SRAs and ORA staff, project manager, appropriate software and management plan</td>
<td>1</td>
<td>4</td>
<td>SRAs, IT, ORA, AVC, faculty, ADRs</td>
<td>L</td>
<td>H</td>
<td>Ongoing start Feb 2019</td>
</tr>
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</table>

### Research and Engagement
- **Process for capture and sharing of lessons learned**
  - Debrief after each project, RD Director makes notes and changes procedures, as necessary
  - All lessons from all teams should be archived for everyone to access
  - Work with stakeholders to develop a plan for capture, storage, and sharing
  - Improved customer service, increased process efficiency
  - Knowledge of the current process; understanding of what needs to be captured; system for storage and access
  - L (LMH)
  - L
  - July 2019

### RAIC
- **Process for assigning grant reviewer to projects**
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### RAIC
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  - 4
  - SRAs, IT, ORA, AVC, faculty, ADRs
  - L
  - H
  - Ongoing start Feb 2019
Working in pairs or small groups, identify two or more processes that you engage in at your home institution that you would like to analyze.

Don’t forget to identify the business case/strategic goal that each supports.
Report Out/Discussion

- How might you use BPR/SEA in your own unit?
- What benefits do you see in using this approach?
- What challenges might you have in applying this process?
- How might you change the approach?
Schedule Planning and Control

Hands-On Practice
What is your level of experience developing project schedules?

A. My middle name is Gantt!

B. OK, so I don’t build Gantt charts, but I do help develop project schedules

C. I have used project timelines and schedules but I’ve never developed them myself

D. I have no experience with project schedules, but am curious, so keep talking…!
Critical Path Method

- Critical path: shortest possible time to complete project
- Aka PERT: Program Evaluation Review Technique (US Navy 1950’s)
- Used to estimate project completion date, timeline, and budget
- Collect time and dependencies, generate network diagram, and calculate critical path
# Cooking Stuffed Pork Chops

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time (Minutes)</th>
<th>Predecessor</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Go to grocery store</td>
<td>90</td>
<td>-</td>
</tr>
<tr>
<td>B Wash dishes and cookware</td>
<td>30</td>
<td>-</td>
</tr>
<tr>
<td>C Go to farmer’s market</td>
<td>60</td>
<td>-</td>
</tr>
<tr>
<td>D Make stuffing</td>
<td>30</td>
<td>A</td>
</tr>
<tr>
<td>E Preheat oven, prep roasting pan</td>
<td>10</td>
<td>B</td>
</tr>
<tr>
<td>F Pick out serving platter</td>
<td>5</td>
<td>B</td>
</tr>
<tr>
<td>G Prep and cook vegetables</td>
<td>30</td>
<td>C</td>
</tr>
<tr>
<td>H Stuff and cook pork chops</td>
<td>120</td>
<td>D,E</td>
</tr>
<tr>
<td>I Arrange vegetables on platter</td>
<td>10</td>
<td>F,G</td>
</tr>
<tr>
<td>J Arrange chops on top of vegetables</td>
<td>10</td>
<td>H, I</td>
</tr>
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</table>
## Network Diagram

<table>
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<td>E Prep oven and roasting pan</td>
<td>10</td>
<td>B</td>
</tr>
<tr>
<td>F Get platter out</td>
<td>5</td>
<td>B</td>
</tr>
<tr>
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<td>30</td>
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<tr>
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<td>10</td>
<td>H, I</td>
</tr>
</tbody>
</table>
Identifying Critical Path

A + D + H + J = 250 min
Identifying Critical Path

B + E + H + J = 170 min
Identifying Critical Path

B + F + I + J = 55 min
Identifying Critical Path

C + G + I + J = 110 min
Critical Path

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A + D + H + J = 250 min  
B + E + H + J = 170 min  
B + F + I + J = 55 min  
C + G + I + J = 110 min
Working in pairs or small groups, use the given project information to calculate the duration and critical path of the project.
<table>
<thead>
<tr>
<th>Label</th>
<th>Proposal Development Activity</th>
<th>Duration (days)</th>
<th>Predecessor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Generate/Go Over Submission Checklist</td>
<td>4</td>
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<tr>
<td>B</td>
<td>Develop Proposal Budget</td>
<td>8</td>
<td>A</td>
</tr>
<tr>
<td>C</td>
<td>Finalize Narrative/Supplemental Docs</td>
<td>6</td>
<td>A</td>
</tr>
<tr>
<td>D</td>
<td>Negotiate Cost Share Commitments</td>
<td>2</td>
<td>B</td>
</tr>
<tr>
<td>E</td>
<td>Review Budget</td>
<td>4</td>
<td>D</td>
</tr>
<tr>
<td>F</td>
<td>Get Commitment Letter Signed by VP</td>
<td>6</td>
<td>C, D</td>
</tr>
<tr>
<td>G</td>
<td>Get Routing Form Signed by PI, Chair, Dean</td>
<td>6</td>
<td>A</td>
</tr>
<tr>
<td>H</td>
<td>Load/Code/Submit Proposal</td>
<td>8</td>
<td>E, F, G</td>
</tr>
</tbody>
</table>
Solution: Network Diagram
Solution: Critical Path

Duration = 24 days
Part 1 Check In: How’d it Go?

▪ Did you have any challenges?
▪ Any questions before we move on to Part 2?
Part 2: Calculating Float

- **Float**: the amount of time a task can be delayed without causing a delay to subsequent tasks or project completion date
- Determine which portions of project can be delayed (and by how long) without affecting total duration
- Identify activities can be done in parallel
- Know when you need to add resources/crash the schedule or accept a delay
Forward Pass

Start

Activity	Early Start	Early Finish
A	0	90
B	0	30
C	0	60
D	30
t"90
E	30	40	10
F	5
G	60	90	30
H	120	240	120
I	100	10
J	250	10
 Finish
Float (Slack)

- **Total Float**: the amount of time a task can be delayed without causing a delay to the project completion date
- Late start – early start (or late finish – early finish)
Calculating Total Float

**TF**

<table>
<thead>
<tr>
<th>Early Start</th>
<th>Activity</th>
<th>Early Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late Start</td>
<td>Duration</td>
<td>Late Finish</td>
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<tr>
<th>A</th>
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</table>

Start ➔ B ➔ C ➔ G ➔ I ➔ Finish

Start ➔ A ➔ D ➔ H ➔ J ➔ Finish

Duration: 80, 190, 225, 30, 35, 10, 5, 230, 90, 200, 140, 140, 120, 240, 140, 240, 10, 250, 240, 10, 240, 100, 230, 10, 230, 120, 120, 240
**Float (Slack)**

- **Free Float**: the amount of time a task can be delayed without causing a delay to the subsequent task
- (Smallest) early start of successor – early start – duration
Calculating Free Float

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<th>Early Start</th>
<th>Activity</th>
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</table>

Start: A -> B -> C

A: 0
B: 0
C: 0
D: 90
E: 0
F: 0
G: 0
H: 0
I: 0
J: 0

TF: 0
FF: 0

Duration: 0 0 0 0 0 0 0 0 0 0
Working in pairs or small groups, calculate the forward and backward path of the network graph to determine duration, critical path, and float/slack.
Solution: Forward Pass
Solution: Backward Pass
Solution: Critical Path

Start → A → B → D → F → H → Finish

Critical Path: A → B → D → F → H

Early Start
Activity | Early Finish
---|---
A | 4
B | 12
C | 10
D | 14
E | 18
F | 20
G | 10

Late Start
Duration | Late Finish
---|---
A | 4
B | 12
C | 10
D | 14
E | 18
F | 20
G | 10
H | 28

Critical Path:
0 → A (4) → B (12) → C (10) → D (14) → F (20) → H (28) → Finish
Solution: TF and FF

Early Start | Activity | Early Finish
---|---|---
0 | A | 4
0 | B | 12
0 | C | 10
4 | D | 14
12 | E | 18
16 | F | 20
14 | H | 28

Late Start | Duration | Late Finish
---|---|---
14 | G | 10
14 | 2 | 14
16 | 4 | 20
20 | 8 | 28

TF and FF
Report Out/Discussion

- How might you use critical path analysis in your own work?
- What benefits do you see in using this approach?
- What challenges might you have in applying this process?
- How might you modify the approach?
Project Management Enhances RD Success

Sharon Pound, spound@utk.edu

Anne Maglia, anne_maglia@uml.edu