



Project Management: Lessons from Annual Linac Replacements

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Sunnybrook

ODETTE CANCER CENTRE



About Sunnybrook

- 1946 – opens as veterans' hospital
- 1966 – University of Toronto teaching hospital
- 1982 - Toronto-Bayview Regional Cancer Centre
- 2007 - Odette Cancer Centre





Funding Context

- **Single insurer**
- **Secure capital funding via provincial health agency (Ontario Health – Cancer Care Ontario)**
- **Credible five-year funding horizon**
- **Operational funding on a per case basis (with targets)**
- **Vendor-of-record model**
- **Local purchasing decisions**

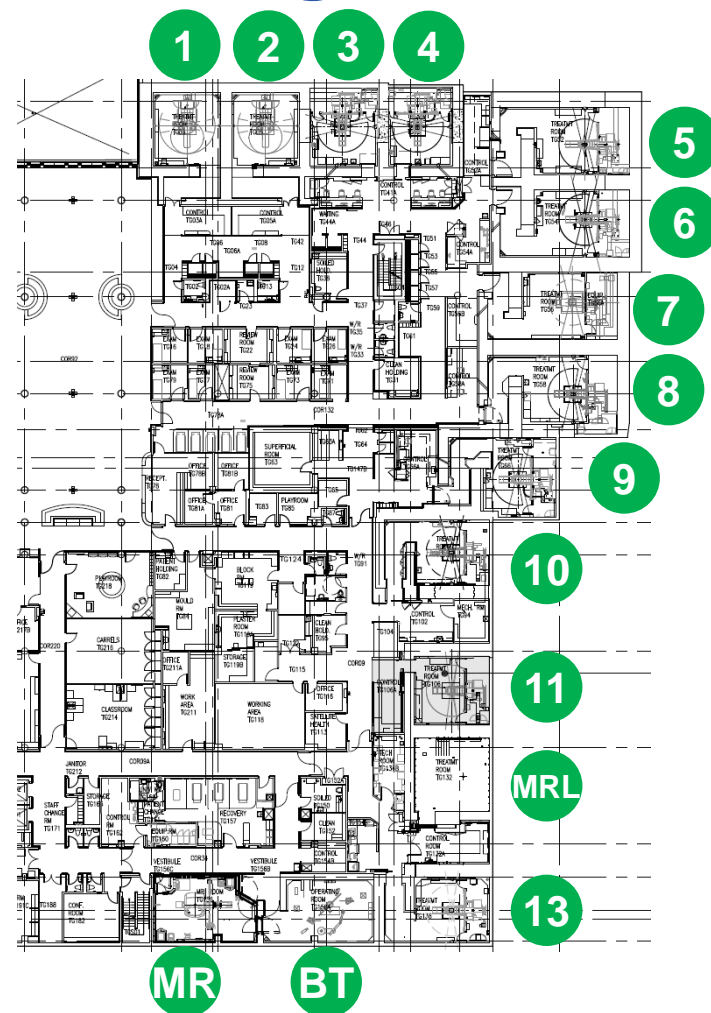


Radiation Treatment Program

- 12 linacs
- 1 MR-Linac
- 1 Gamma Knife™
- 1 HDR
- 4 CT-Sims
- 2 MR-Sims

Replacement Intervals

- linacs – 12 y
- Gamma Knife™ - 15 y
- CT-Sims – 9 y
- MR-Sims – 10 y





Deming System of Profound Knowledge

Appreciation for a system

Understand the complexities and interactions of the system you are studying or working in.

project management

statistical process control

Knowledge of variation

Variation has two causes, common and special, which should never be confused.

Theory of knowledge

Use a scientific approach to testing theories. This is encapsulated in the plan-do-study-act cycle.

continuous improvement

ergonomics and human factors

Psychology

Treat people with dignity and respect. They are not cogs in a machine.

W. Edwards Deming, *The New Economics for Industry, Government and Education*, Massachusetts Institute of Technology, 1994



understand the work we do



Quality Tools

Decision Matrix

	Weight	Vendor 1		Vendor 2	
		Score	Weighted Score	Score	Weighted Score
	(1-5)	(1-5)		(1-5)	
Support for growing patient volume with an short booking times, high clinical uptime.	3	4	12	5	15
Integrated volumetric imaging, online image guided radiotherapy. Motion management and precise remote couch motion	5	4	20	5	25
Support for adaptive radiotherapy program. Accessories and immobilization systems compatibility	5	3	15	5	25
Specialized quality assurance phantoms and devices must be included.	2	5	10	5	10
Connectivity with our existing Radiation Oncology Information System. Interoperability with Pinnacle (Philips) treatment planning system and other TPS.	5	5	25	3	15
Safety, quality, automation, ergonomics.	4	3	12	4	16
Score			94		106

Gantt Chart



Roles and Responsibilities Matrix (RACI)

	Role 1	Role 2	Role 3	Role 4	Role 5
Task 1	R	R,A	C		I
Task 2	I	R,A			
Task 3	R,A	C	R	R	I
Task 4	A	R			I
Task 5	A	R			



Decision Matrix Example

Evaluation of 5-year linac RFP

- Departure from *replace-with-like* model
- Decision to undertake fleet management approach
- No longer focus on technical parameters of linac
- Focus on satisfying program requirements
 - Patient volumes
 - Treatment techniques
 - Alignment with vendor roadmap



Multi-factor decision-making

Situation:

Decision to enter an extended agreement for linac procurement

Constraint:

Must procure via Request for Proposals

Problem:

How to select one option when multiple factors must be considered?

Decision matrix

Evaluates and prioritizes a set of options

Step 1: Identify criteria for decision

Step 2: Weight criteria

Step 3: Score options for each criterion

Step 4: Sum scores and rank options

		Options				
		weight	1	2	...	N
Criteria	1	w_1	$s_{1,1}$	$s_{1,2}$		$s_{1,N}$
	2	w_2	$s_{2,1}$	$s_{2,2}$		$s_{2,N}$
	\vdots	\vdots	\vdots		\vdots	\vdots
	M	w_M	$s_{M,1}$	$s_{M,2}$		$s_{M,N}$
Scores		$\sum_{m=1}^M w_m s_{m,1}$	$\sum_{m=1}^M w_m s_{m,2}$		$\sum_{m=1}^M w_m s_{m,N}$	



Decision criteria

- **Decision Matrix must match RFP criteria**

Functionality and features	Value-add and Innovation	Service, Warranty, Training
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operations

innovation

sustainability



Decision criteria

Functionality and features	Value-add and Innovation	Service, Warranty, Training
Must support growing patient volumes Short booking times Integrated volumetric imaging Some units with motion management, precise motion Specialized quality control phantoms included Connectivity with existing infrastructure Ergonomic design		



Decision criteria

Functionality and features	Value-add and Innovation	Service, Warranty, Training
<ul style="list-style-type: none">• Alignment with research program• Strategic relationship options• Options for practice management• Creative workflow management		

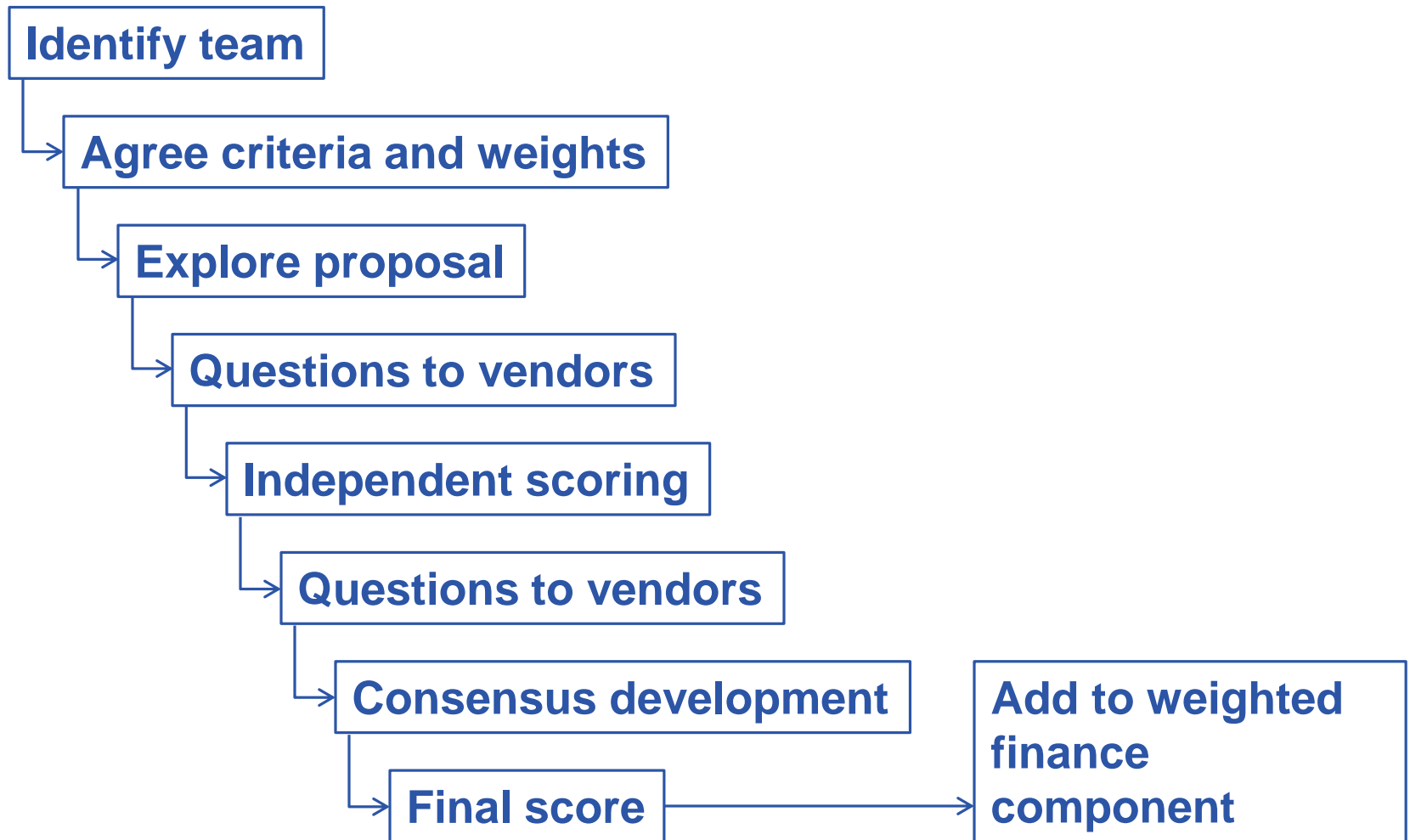


Decision criteria

Functionality and features	Value-add and Innovation	Service, Warranty, Training
Training program (RTs, MPs, service) Educational program Consultation on product integration into program Warranty coverage Total cost of ownership <ul style="list-style-type: none">• Maintenance, upgrades, and service OEM warranty		



Evaluation process



Linac RFP evaluation

	Weight	Vendor 1		Vendor 2	
		Score	Weighted Score	Score	Weighted Score
	[1-5]	[1-5]		[1-5]	
Support for growing patient volume with an short booking times, high clinical uptime.	3	4	12	5	15
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Decision matrix: the big wins

- **Forces value statements**
- **Structure enables development of consensus**



Quality Tools

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Task 3	R,A	C	R	R	I
Task 4	A	R			I
Task 5	A	R			



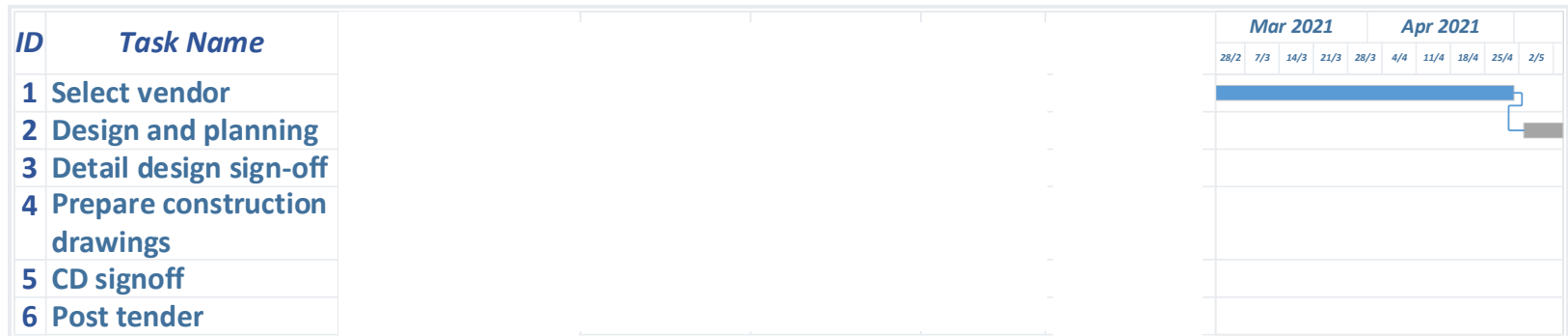
Gantt Chart

A bar chart that shows

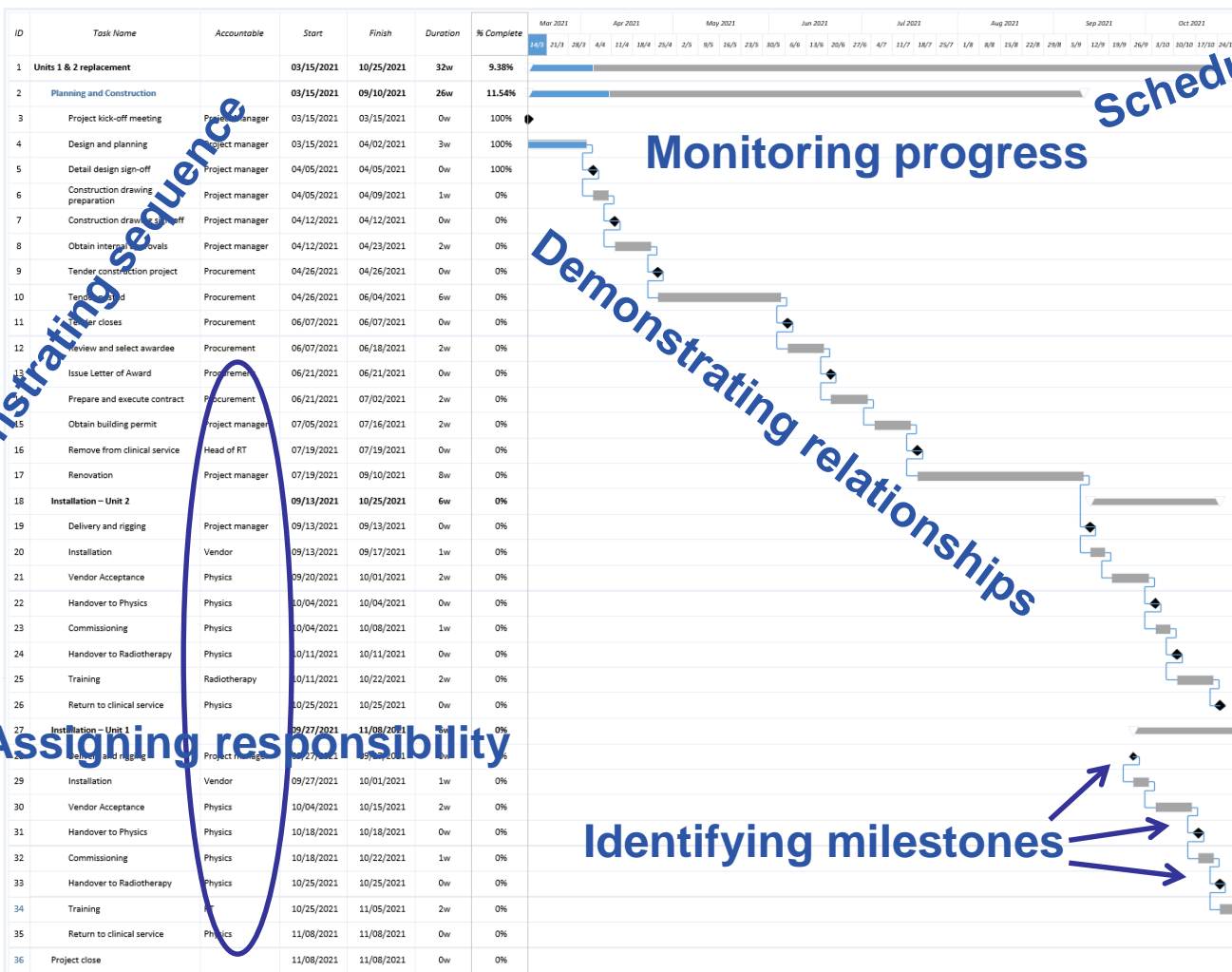
- Tasks
- Order of execution
- Accountable
- Duration of task
- Current state

Tasks

Time



Gantt Chart



Demonstrating sequence

Scheduling tasks

Monitoring progress

Demonstrating relationships

Assigning responsibility

Identifying milestones



Example: A busy two years

- **Major capital projects**
 - **Replace one linac in FY2020/2021**
 - **Replace adjacent linac in FY2021/22**
 - **Replace a CT in FY2020/2021**
 - **Reload Gamma Knife in FY 2020/2021**



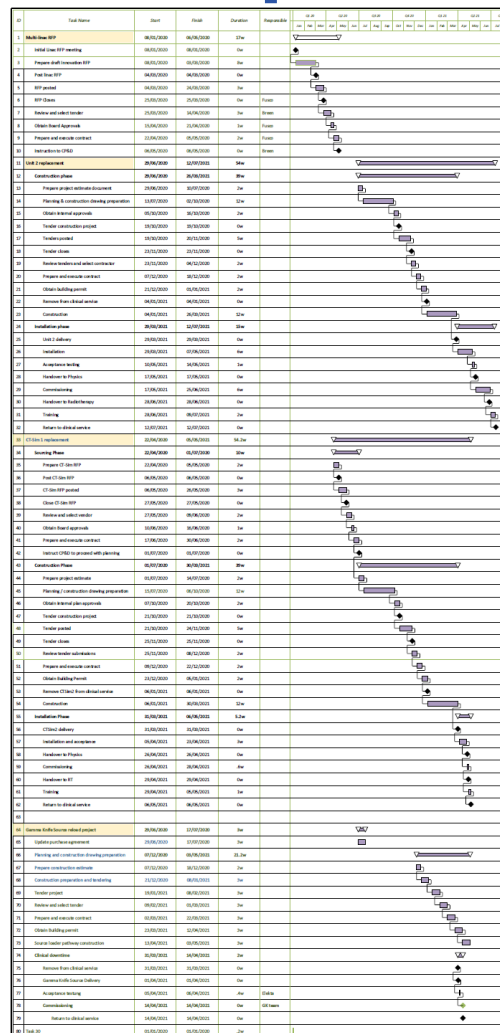
High-level plan

Multi-linac RFP

Unit 2
replacement

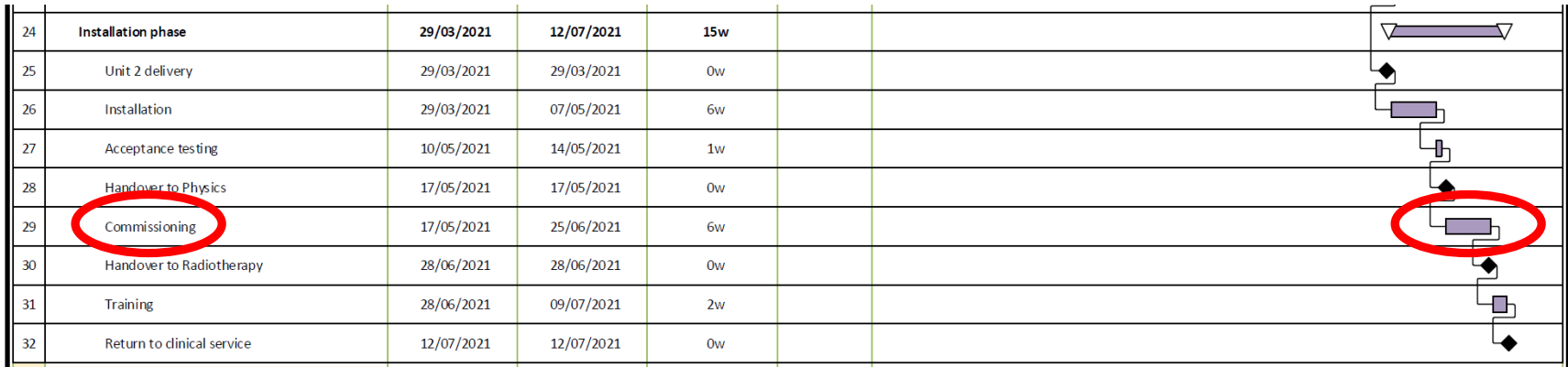
Unit 1
replacement

Gamma Knife
source replacement



Extra-
departmental
audience

Detailed plan



- **Needs another Gantt Chart**
- **Medical physicists like detailed plans**
- **Need to identify individual tests**
- **Can turn to Guidelines for advice**



Mid-level planning

- **The most interesting and most challenging**
 - **Commissioning**
 - Detailed plan: how to do each test
 - Mid-level planning: how to fit all tests in schedule
 - High-level planning: get tests on Gantt Chart
 - **Training**
 - Detailed plan: Session content and staff
 - Mid-level planning: Identify curriculum and trainees
 - High-level planning: Identify scope



Gantt chart: the big wins

- **Forces explicit consideration of steps and their relationships**
- **Consider three levels in hierarchy**
 - **High-level planning**
 - **Mid-level planning**
 - **Detailed planning**



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Task 4	A	R			I
Task 5	A	R			



Project charter

Objective
Background
Project Objective

Project Scope
Included
Excluded

Project Approach/Plan
Project Approach Milestones

Benefits
Critical Requirements
Assumptions
Issues
Risks
Critical Success Factors

Roles and Responsibilities Matrix
Communications



Who does what?

- A RACI chart assigns roles within a project

R esponsible	<ul style="list-style-type: none">• the ones doing the work
A ccountable	<ul style="list-style-type: none">• manager or delegator• last reviewer of task
C onsulted	<ul style="list-style-type: none">• domain knowledge• downstream project team
I nformed	<ul style="list-style-type: none">• kept in the loop



Benefits of a RACI Matrix

Responsible

Accountable

Consulted

Informed

	Role 1	Role 2	Role 3	Role 4	Role 5
Task 1	R	R,A	C	I	I
Task 2	I	R,A	I	I	I
Task 3	R,A	C	R	R	I
Task 4	A	R	I	I	I
Task 5	A	R	I	I	I

- Clarifies complicated projects
- Identifies decision-making
- Helps visualize workload equity
- Informs new team members



Benefits of a RACI Matrix

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Task 3	R,A	C	R	R	I
Task 4	A	R	I	I	I
Task 5	A	R	I	I	I

One or more Responsible roles per task

Must have only one Accountable role per task



Interpreting the RACI matrix

Column contents

- Too many Rs
- Only Rs and As
- Too many As
- Too many Cs

Risk

- Unbalanced workload
- Staff overload
- Centralized authority
- All talk, no action!

	Role 1	Role 2	Role 3	Role 4	Role 5
Task 1	R	R,A	C	I	I
Task 2	I	R,A	I	I	I
Task 3	R,A	C	R	R	I
Task 4	A	R	I	I	I
Task 5	A	R	I	I	I



Interpreting the RACI matrix

Row contents

- No Rs
- Too many Rs
- Too many Cs and Is

Risks

- Who's doing the work?
- Complicated task
- Entire team involved
- Slowed work?

	Role 1	Role 2	Role 3	Role 4	Role 5
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Task 2	I	R,A	I	I	I
Task 3	R,A	C	R	R	I
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RACI Matrix

Responsible
Accountable
Consulted
Informed

	Head of Physics	Procurement Admin	Associate Head of Physics	RFP Review Team	Operations Director
Prepare RFP	R	R,A	R	C	I
Post RFP	I	R,A	I	I	I
Review RFP; select vendor	R,A	C	R	R	I
Obtain C-suite approvals	A	R	I	I	I
Prepare contract	A	R	I	I	I



RACI matrix: the Big Win

- **Sets expectations for roles**
- **Clarifies project assignments**
- **Balances workload**



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