Skill-based planning and delivery

Success Driven Project Management

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Project Controls EXPO
Melbourne, Australia

Introduction

Alex Lyaschenko

PMO | Portfolio Planning & Delivery | PMP | P3O Practitioner | AgilePM Practitioner | Six Sigma

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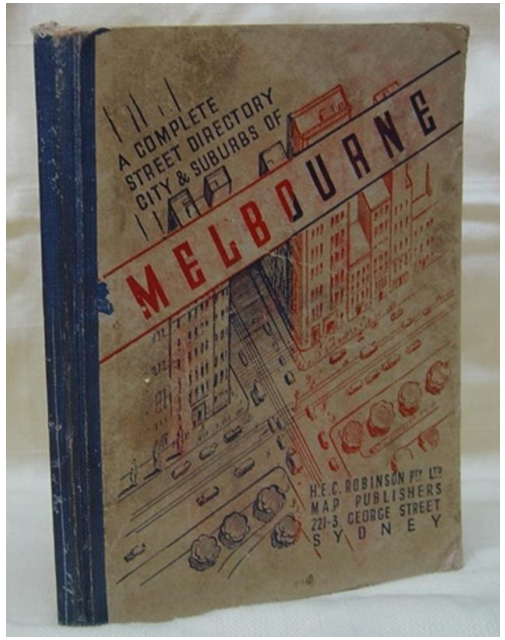
Project Management Innovations



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Critical Path Method Challenges

The critical path method (CPM) is commonly used for scheduling of construction, business and technology projects.

However, the critical path method is not capable of optimal scheduling of projects when there are **resource constraints** or **project deadlines**.

These issues are known as

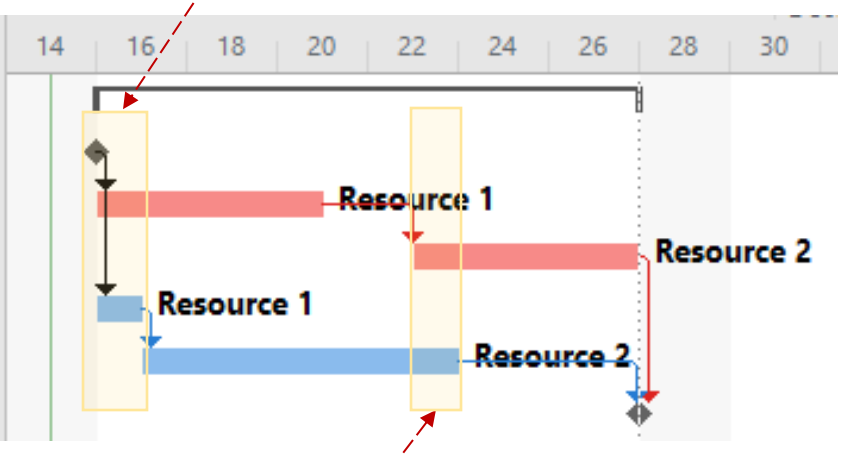
- resource-constrained project scheduling problem
- the time-cost trade-off problem.

Resource-constrained project scheduling problem

The Resource Constrained Project Scheduling Problem (RCPSP) is the sub-class of the Scheduling Problem that deals with scenarios where personnel or workforce employed to perform the tasks are limited & each job has an arrival time, a due date, and a penalty associated to delays.

Resource-constrained project scheduling problem

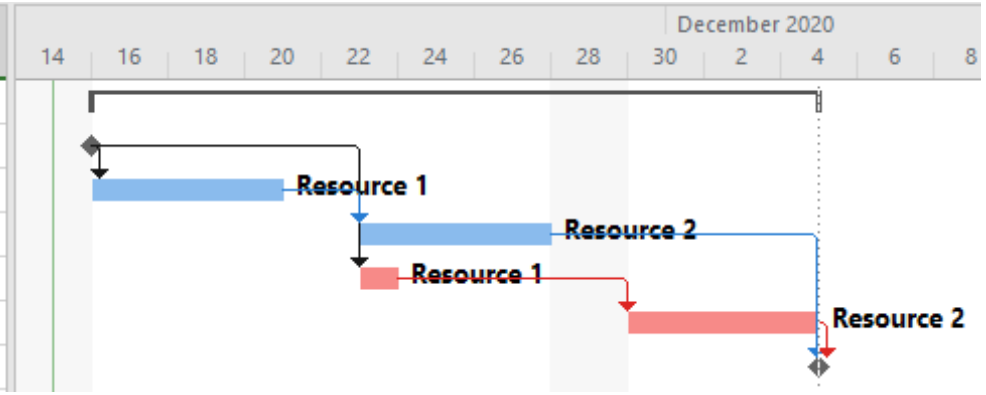
Task Name	Duration	Predecessors	Resource Names
4 Tasks Project	**10 days**		
Start Milestone	0 days		
Task 1	5 days	2	Resource 1
Task 2	5 days	3	Resource 2
Task 3	1 day	2	Resource 1
Task 4	5 days	5	Resource 2
Finish Milestone	0 days	4,6	



Resource-constrained project scheduling problem

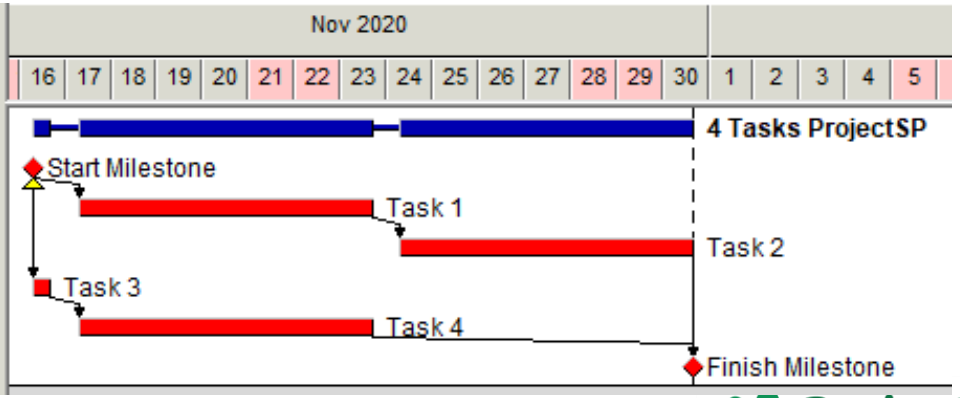
- Algorithm 1:

Task Name	Duration	Predecessors	Resource Names
4 Tasks Project	15 days		
Start Milestone	0 days		
Task 1	5 days	2	Resource 1
Task 2	5 days	3	Resource 2
Task 3	1 day	2	Resource 1
Task 4	5 days	5	Resource 2
Finish Milestone	0 days	4,6	



- Algorithm 2:

Name	Duration, Days [Remaining]	Preceding activities	Assigned resources
4 Tasks ProjectSP	11.00		
Start Milestone			
Task 1	5.00	2	Resource 1
Task 2	5.00	3	Resource 2
Task 3	1.00	2	Resource 1
Task 4	5.00	5	Resource 2
Finish Milestone		4; 6	



Time-cost trade-off problem

The project duration can often be compressed by accelerating some of its activities at an additional expense.

This is the so-called time-cost trade-off (TCT) problem, which has been studied extensively in the project management literature.

TCT decisions, however, are complex and require planners to select appropriate resources for each project task, including crew size, equipment, methods, and technology. As combinatorial optimisation problems, finding optimal decisions is difficult and time-consuming considering the number of possible permutations involved.

Time-cost trade-off problem

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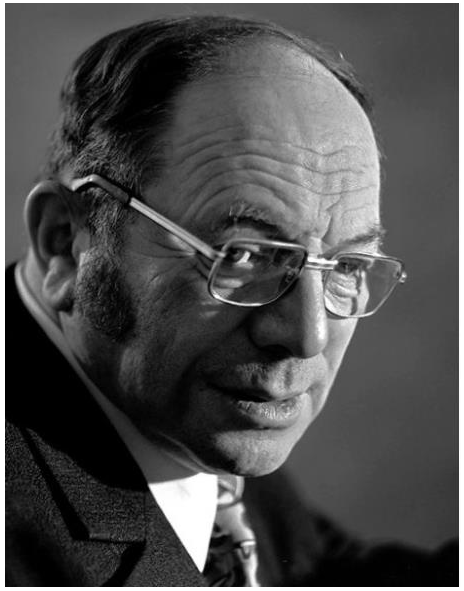
Resource-constrained project scheduling problem

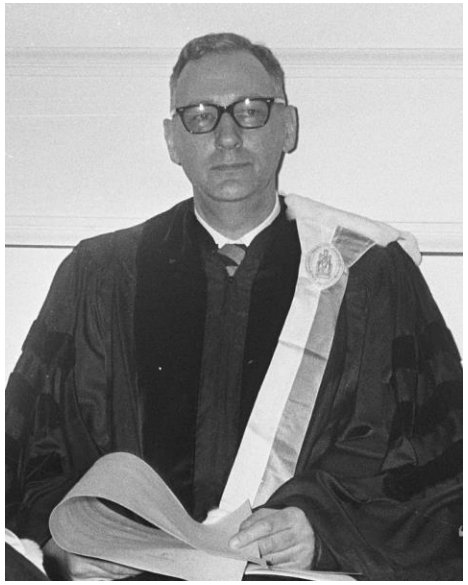


Leonid Kantorovich (1912 – 1986)

Prize in Economic Science in Memory of Alfred Nobel for 1975 in equal shares to

- Professor **Leonid Kantorovich**, USSR, and
- Professor **Tjalling C. Koopmans**, USA,

for their contributions to the theory of optimum allocation of resources.

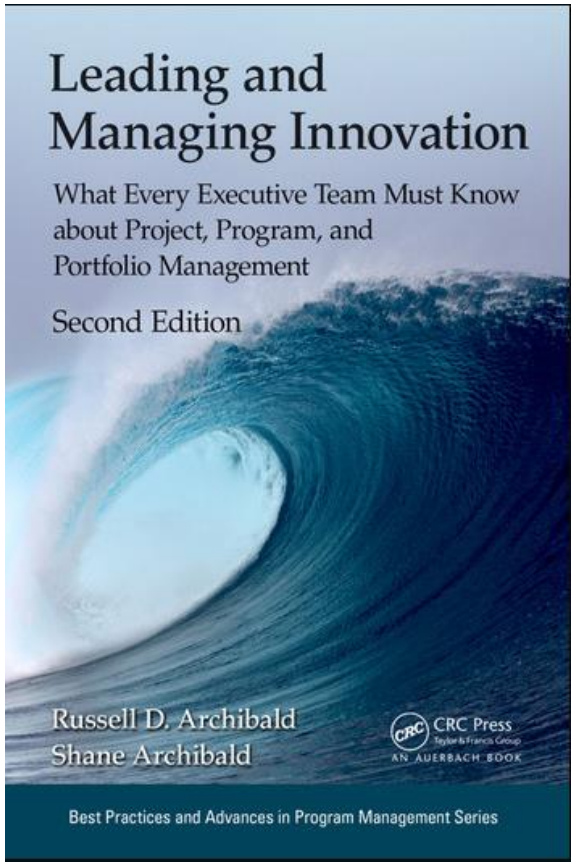


«…As the starting point of their work in this field, both have studied the problem – fundamental to all economic activity – of how available productive resources can be used to the greatest advantage in the production of goods and services….”

Innovative Methodology and Tools

- 1992: Success Driven Project Management & Spider Project
- 2001: PMI - Resource Critical Path Approach to Project Schedule Management (V. Liberzon)
- 2003: The Application of Success Probabilities and Success Driven Project Management to the Oil & Gas Industry in Brazil (V. Liberzon and R. Archibald, Peter Mello)

Spider Project



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Innovative Methods

Success Driven Project Management

- Volume of Work & Productivity
- **Skills**
- Multi-Resources
- Teams
- Shifts
- Conditional Scheduling: Triggers & Switch
- Project Success Criterion
- CPM optimisation Metrics

Volume of Work & Productivity

	Volume	Unit of Volume	Productivity	Duration
Activity 1	100	m		
			5 m/h	20 hrs
Activity 2	200	m3		Calculated
			20 m3/h	10 hrs
			10 m3/h	20 hrs

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Volume of Work & Productivity

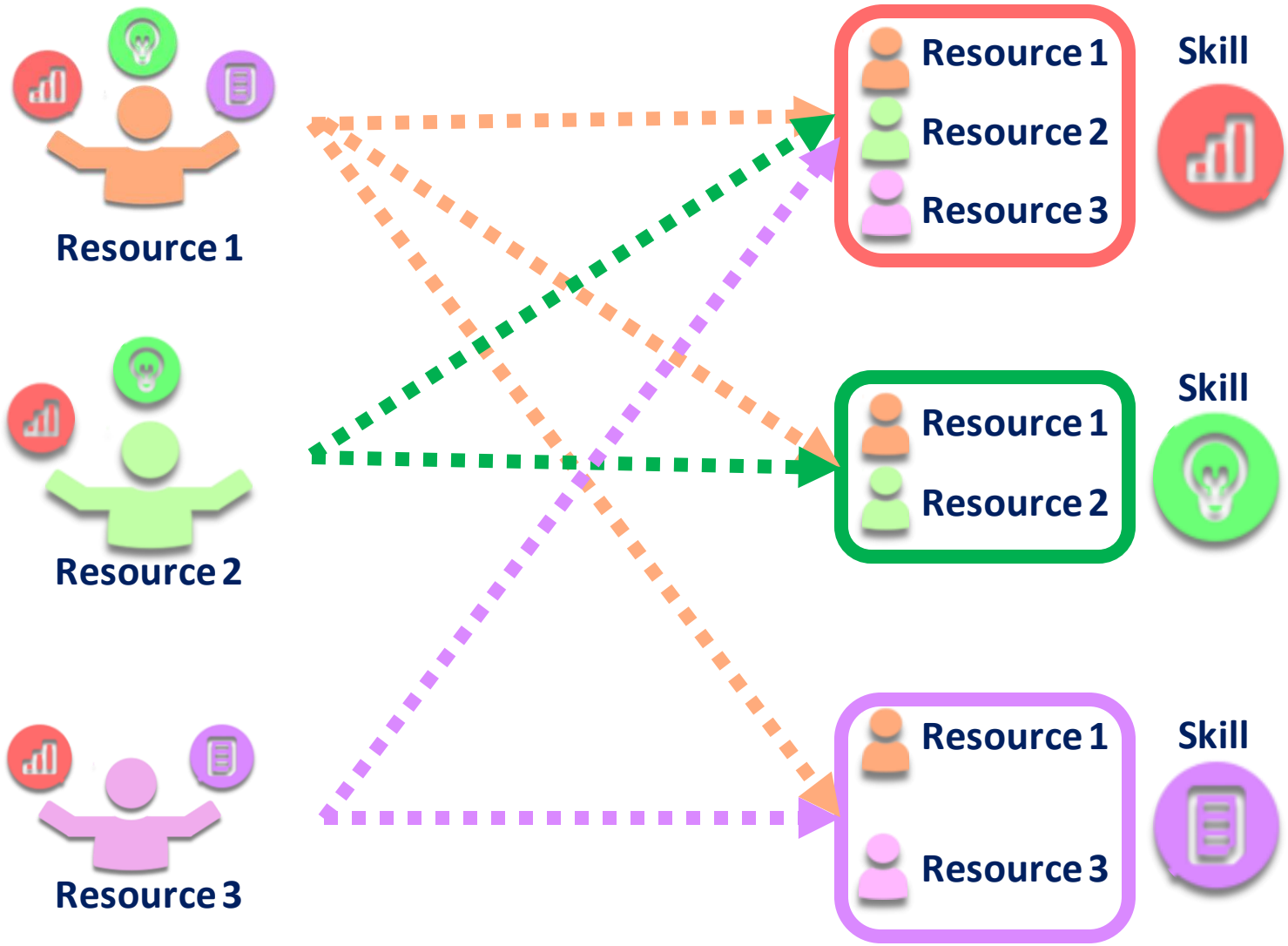
Unit of Volume

- m,
- m2,
- m3,
- tons,
- items
- story points,
- work hours,
- percentages,
- pages,
- pieces,
- etc

Productivity

Number of units per hour

Skills (Pools)



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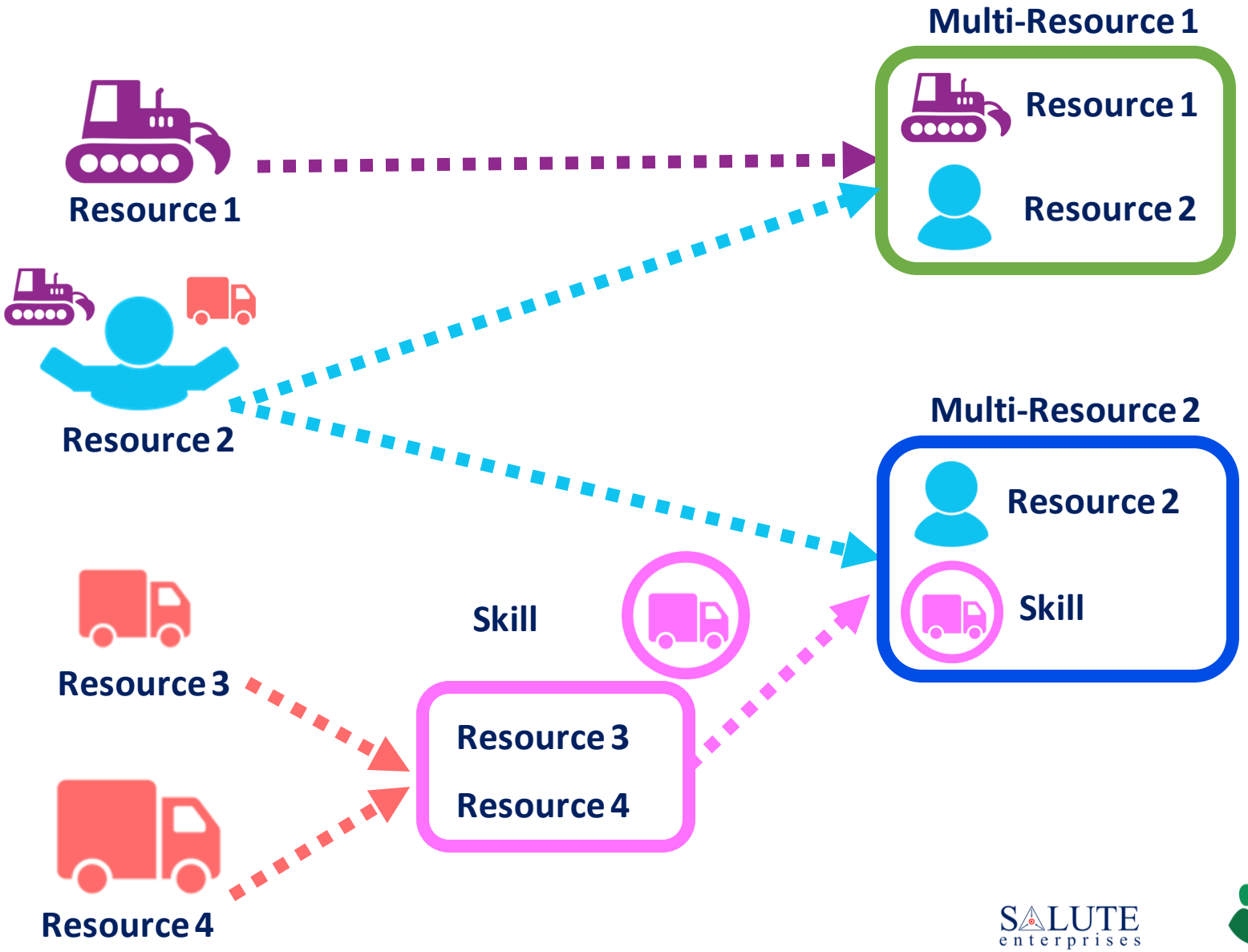
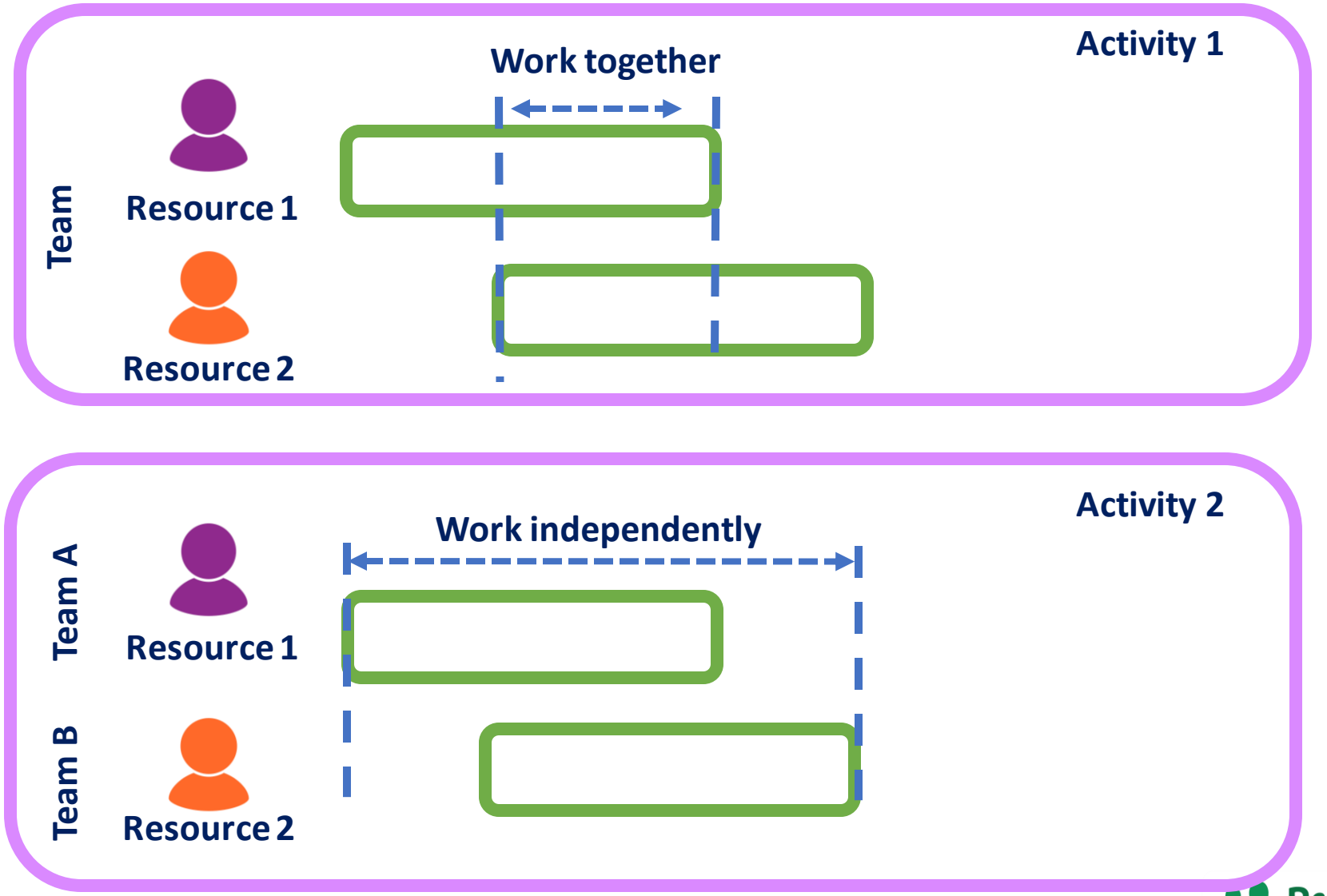
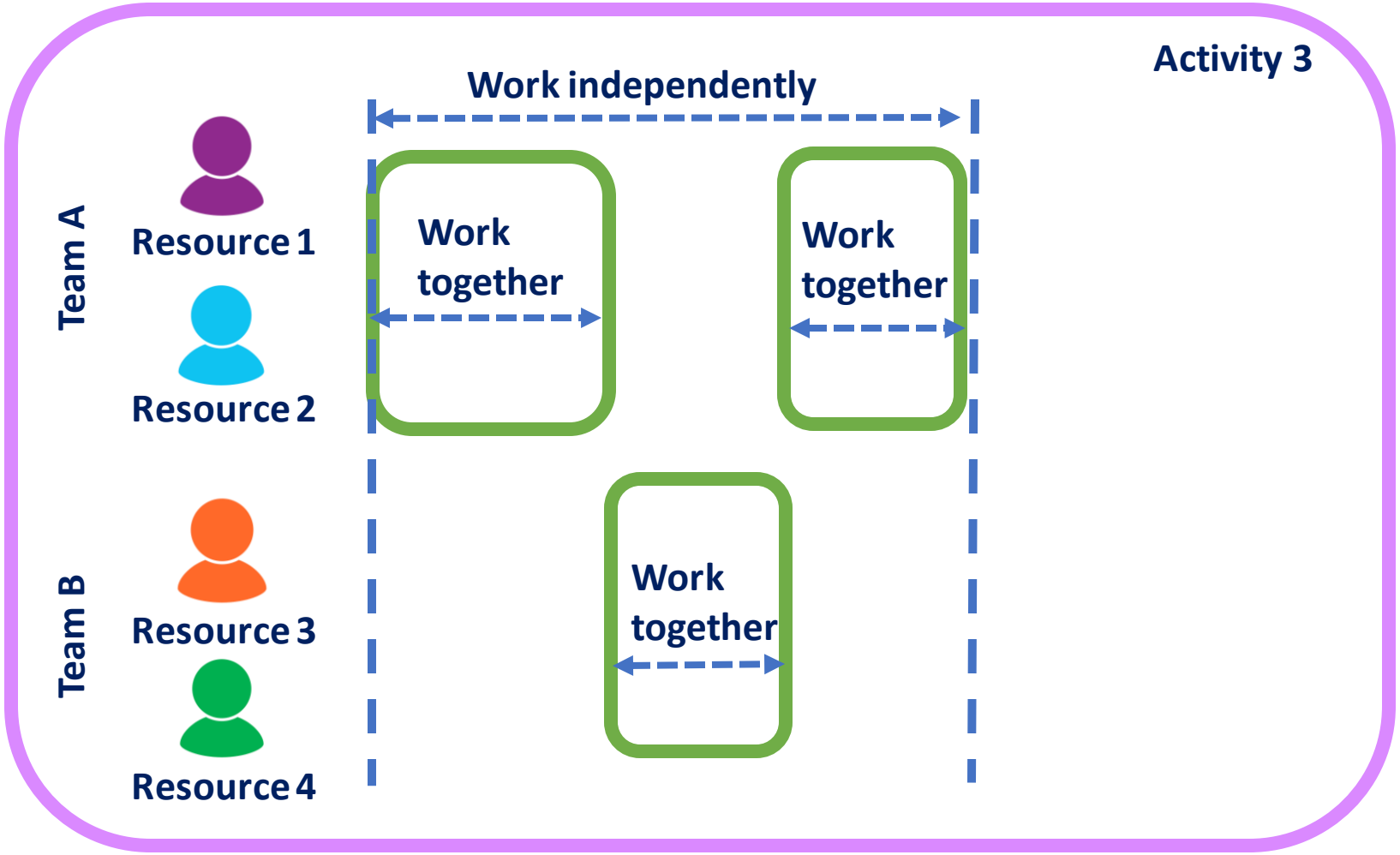
Multi-Resources (Crews)



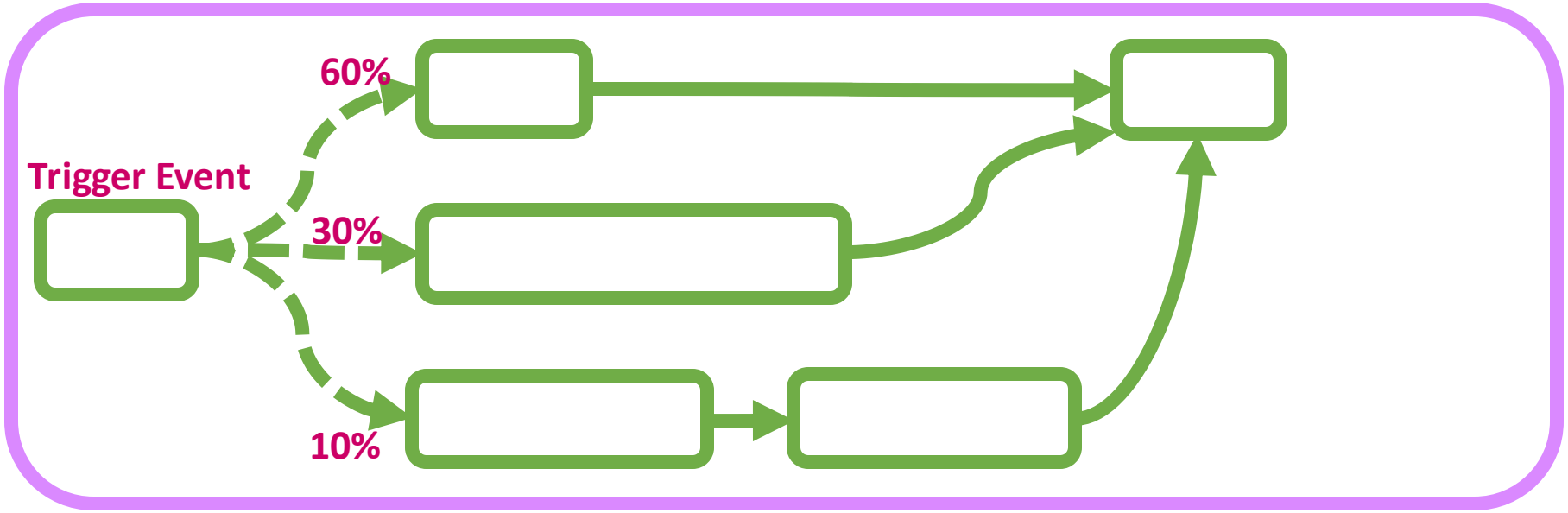
Teams



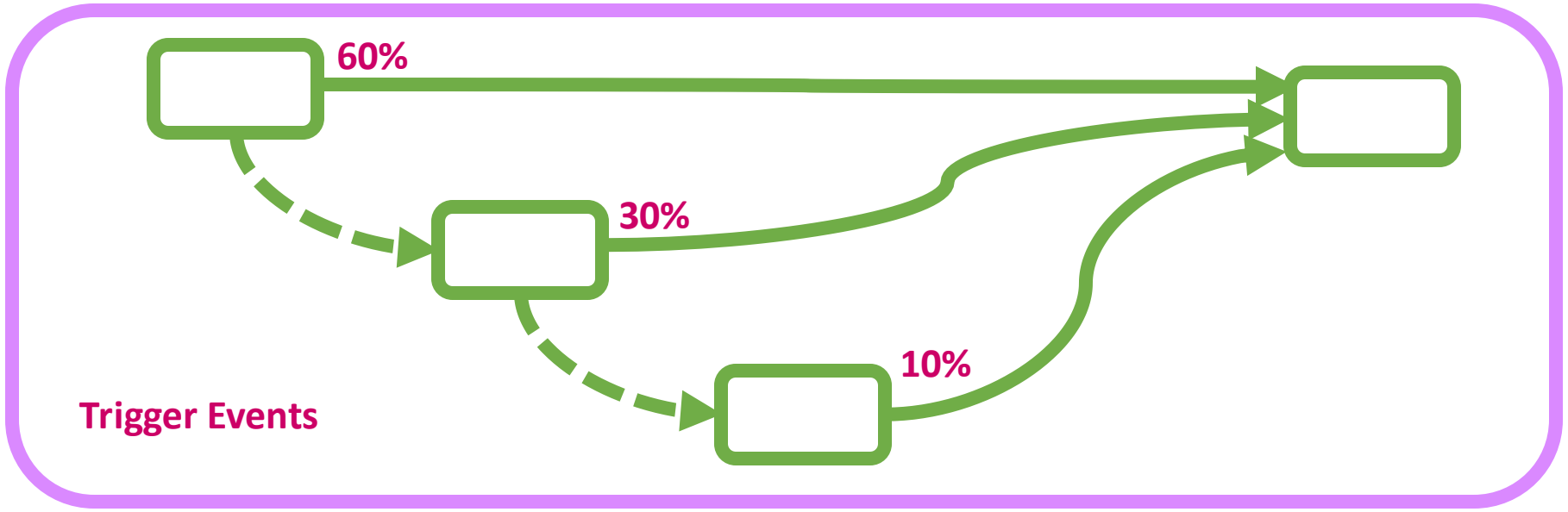
Teams (Shift)



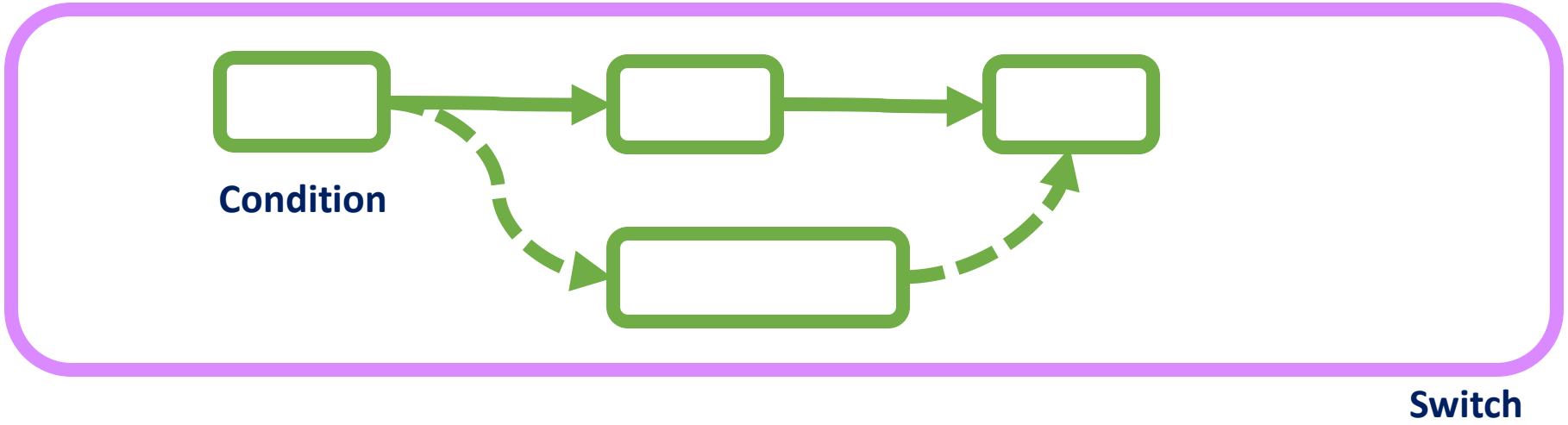
Conditional Scheduling. Trigger



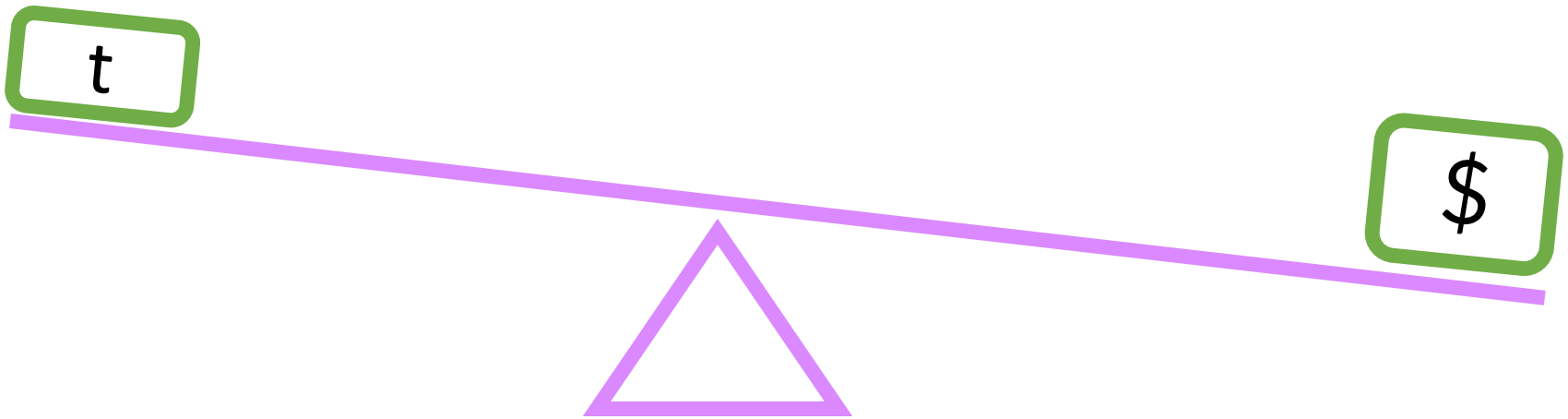
Conditional Scheduling. Trigger



Conditional Scheduling. Switch

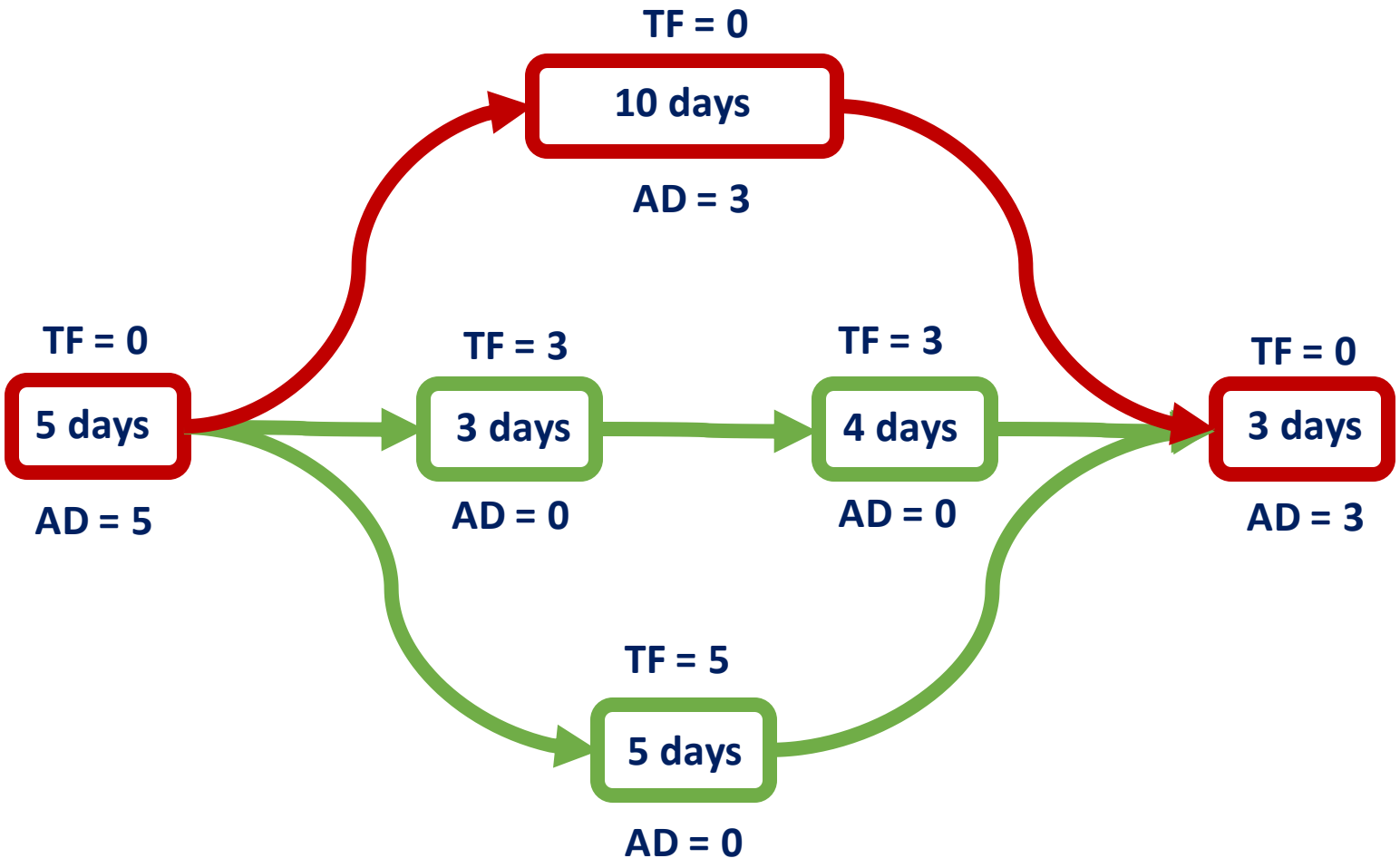


Time-cost trade-off problem

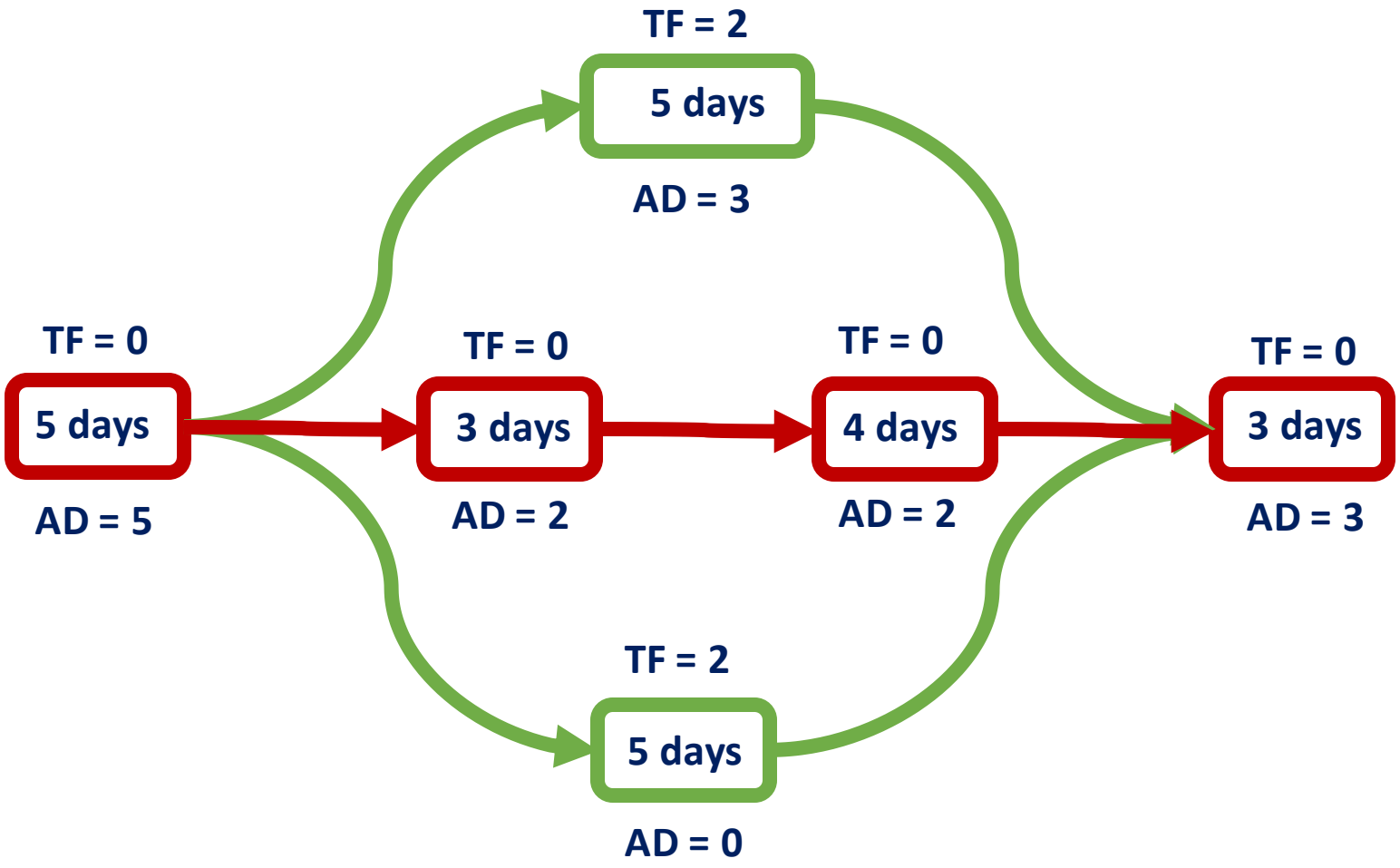


Project Success Criterion

Critical Path Metrics: Activity DRAG



Critical Path Metrics: Activity DRAG



Other innovative ideas

- Corporate reference books
- Multiple WBS
- Flex, Super Float
- Variable resource assignments
- Income and supply simulation
- Space and material constrained scheduling
- Success Probability targets
- Resource Gannt chart
- 3 scenario simulations

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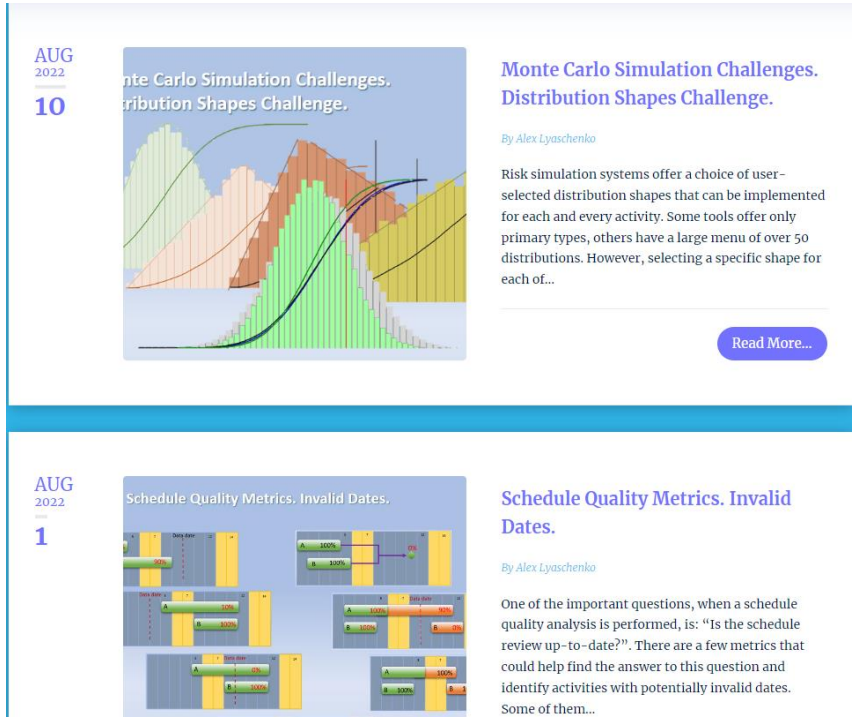

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Project Management Innovations

mosaic

A Brief History of Scheduling

available for many years[yy]. These developments should support the creation of career paths for schedulers within organisations.

Conclusions

The evolution of scheduling has been a fascinating journey:

- Kelley and Walker set out to solve the time-cost conundrum and invented CPM. For most organisations the resolution of time-cost issues is still in the 'too hard' basket (although SPIDER offers an interesting solution)!
- The PERT project invented the name 'Critical Path', and everyone else borrowed it.
- Dr. John Fondahl invented a non-computer methodology for scheduling that is now used by every computer package world wide!
- Whilst Kelley and Walkers CPM system that was developed for computers is now primarily seen as a manual technique.

Reference:

Patrick Weaver, myPrimavera Conference, Canberra, Apr 2006

https://mosaicprojects.com.au/PDF_Papers/P042_History_of_Scheduing.pdf

Summary

- ✓ Project delivery optimisation requires solutions for real-life problems:
  - resource-constrained project scheduling
  - the time-cost trade-off

- ✓ Advanced AI algorithms are useful for project optimisation. However, the effectiveness of the algorithms is highly dependent on the applied methods and the quality of the project delivery model.

- ✓ Success Driven Project Management (SDPM) is an innovative methodology that includes many advanced methods & techniques.

- ✓ Skill-based planning and delivery have many advantages and help reduce project delivery time and cost.

THANK YOU

Alex Lyaschenko

PMO | Portfolio Planning & Delivery | PMP | P3O Practitioner | AgilePM Practitioner | Six Sigma

Blog: SaluteEnterprises.com.au/blog/

Email: Alex.Lyaschenko@SaluteEnterprises.com.au

LinkedIn: https://www.linkedin.com/in/alex-lyaschenko-6b630314/

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