The Effective Management of Time in Complex Projects
An ICT Perspective

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1 Managing Time **mosaic**

Outline

- Time is not money!
- Dealing with Uncertainty
- The New Standards
  - PMI Standards
  - *The Guide*
- Good Scheduling Practice
- Education Framework
- Discussion

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Time is not money!

This section:

- The state of play
  - ICT – Gartner
  - Construction – CIOB
- Time -v- Money
- Skills and Knowledge

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The state of play

- ICT – Gartner

- Construction – CIOB
  - *Managing the Risk of Delayed Completion in the 21st Century*
    (http://www.mosaicprojects.com.au/PDF/CIOB_TM_report_full.pdf)

- Complex -v- Simple

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Time -v- Money

- Money – keep until you spend
  - Symptom of other successes or failures
- Time – 60 seconds lost every minute
  - Can't change the past
  - Now is too late to change
  - Manage the future

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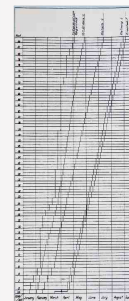
Burj Khalifa -v- Empire State Building

102 Floors built in 410 days

The steel frame rose at the rate of four and a half floors per week

Burj Khalifa Dubai
208 floors in 5+ years

Empire State Bldg.
completed in 1931

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Burj Khalifa -v- Empire State Building

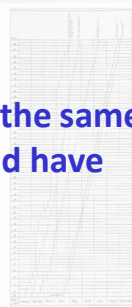**If the Burj Khalifa in Dubai had been built at the same speed as the Empire State Building it would have opened two years earlier!**

The steel frame rose at the rate of four and a half floors per week

Burj Khalifa Dubai
208 floors in 5+ years

Empire State Bldg.
completed in 1931

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Time -v- Money

- Things that don't work!
  - Contract terms and conditions / penalties
    - CIOB Report
    - UK Government metrics (Constructing Excellence)
  - Static contract programs
    - Measure failure
    - Used for claims and court actions after the event

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Dealing With Uncertinty

This section:

- Complexity Theory
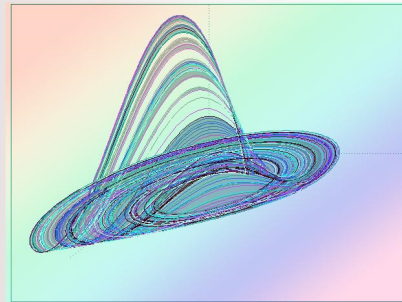- The origins of modern Project Management
- Dealing with uncertainty

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Complexity Theory

- Chaos Theory and Complexity
  - Projects are Chaordic (a system that blends characteristics of chaos and order)

See:
A Simple View of 'Complexity' in Project Management
https://mosaicprojects.com.au/PDF_Papers/P070_A_Simple_View_of_Complexity.pdf
Scheduling in the Age of Complexity
https://mosaicprojects.com.au/PDF_Papers/P089_Schduling_in_the_Age_of_Complexity.pdf

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Complexity Theory

- Chaos Theory and Complexity
  - Nonlinearity and the 'Tipping Point'

    the result of an action is **NOT** predictable
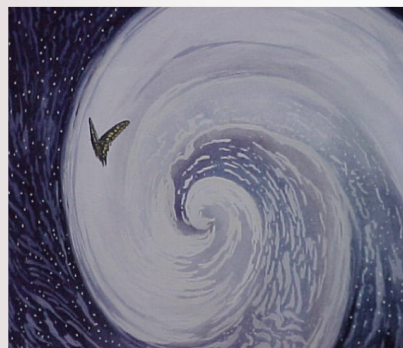
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Complexity Theory

- Chaos Theory and Complexity
  - Nonlinearity and the 'Tipping Point'

    the result of an action is **NOT** predictable

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Complexity Theory

Self-organising systems
complex dynamical systems that are capable of self-organisation

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Complexity Theory

- Complex Responsive Processes of Relating (CRPR)
  - Emphasises the importance of interactions within relationships
- Projects as Temporary Knowledge Organisations (TKOs) & Social Networks
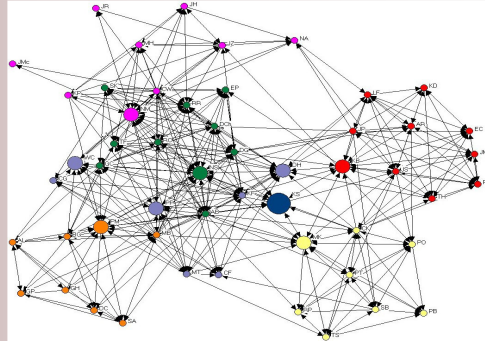
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Complexity Theory

- Projects as Temporary Knowledge Organisations (TKOs) & Social Networks

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Complexity Theory

- Combining:
  - TKOs
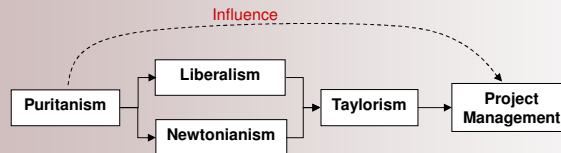 - Social Network Theory
  - CRPR
- High Performance Teams

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The origins of Project Mgmt

- The 'Clockwork Universe'

Influence

Puritanism → Liberalism → Taylorism → Project Management

Puritanism → Newtonianism → Taylorism

For a full discussion of this diagram see 'The impact of Puritan ideology on aspects of project management'. International Journal of Project Management 25 (2007) 10-2015

See: **The Origins of Modern Project Management**

https://mosaicprojects.com.au/PDF_Papers/P050_Origins_of_Modern_PM.pdf

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The origins of Project Mgmt

- The 'Clockwork Universe'
- The future is predictable
- Detail increases accuracy
- Schedules create control
- Embedded in the legal view of
  'the contract schedule'

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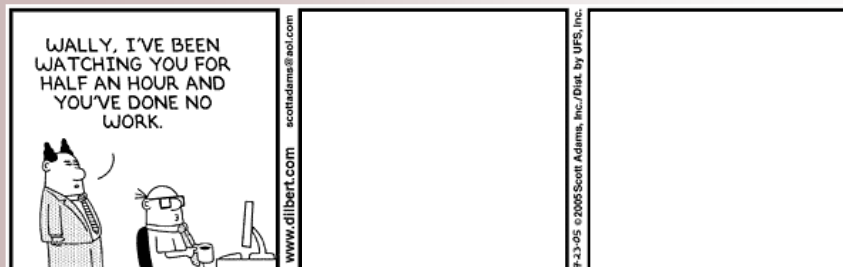
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Dealing with Uncertainty

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Dealing with Uncertainty

- Risk and Uncertainty – it is impossible to accurately predict the future
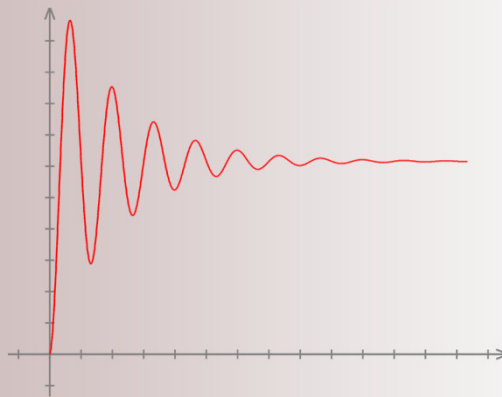- The knowledge worker conundrum

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Dealing with Uncertainty

- Feedback loops that can amplify or attenuate the effect of stimuli

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Dealing with Uncertainty

- PERT Errors – well known
- Monte Carlo's false assumptions

NN Taleb
The Black Swan

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Dealing with Uncertainty

- Monte Carlo's false assumptions

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Dealing with Uncertainty

- Monte Carlo's false assumptions
  - The data used is valid statistically?
    - It's not a **random** sample

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Dealing with Uncertainty

- Monte Carlo's false assumptions
  - The data used is valid statistically?
    - It's not part of a large population

Photo # NH 105700   Officers and Crew of USS Imperator, 1919

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Dealing with Uncertainty

- Monte Carlo's false assumptions
  - Black Swans don't exist
  - The range of variables are bounded
  - The data used is valid statistically?
    - It's not a **random** sample
    - It's not part of a large population

  Statistically Monte Carlo cannot stack up!
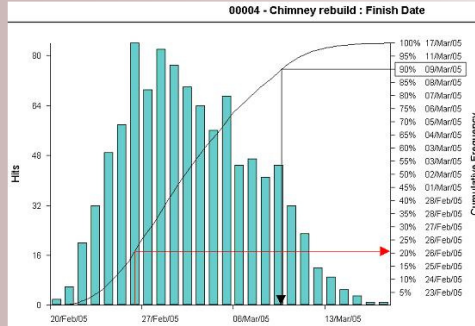 Practically it provides very useful insights!!!
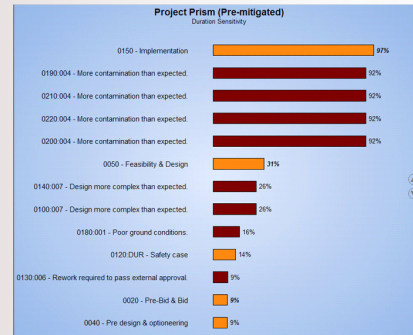
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Dealing with Uncertainty

PertMaster Reports

The statistics are questionable

The insights are invaluable

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The Standards

This section:

- Skills and Knowledge
- PMI: Standards
- CIOB: *The Guide*

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Skills and Knowledge

- Skills and Knowledge
  - Very few skilled planers and schedulers
  - Not used or respected by management
  - Except for the fights after the event

- A Brief History of Scheduling

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

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A Competent Schedule
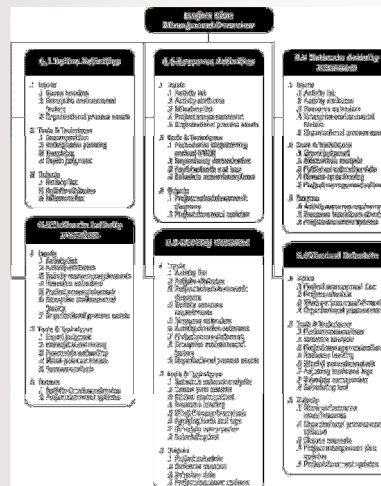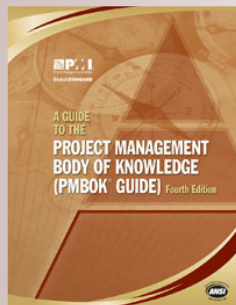
- PMI's Contributions
  - *PMBOK® Guide*
    3rd and 4th Editions

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A Competent Schedule

- PMI's Contributions
  - *PMBOK® Guide* 3rd and 4th Editions
  - The Practice Standard for Scheduling
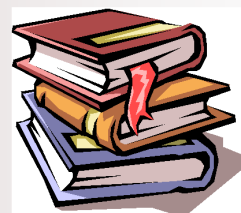 - 2nd Edition 2011

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A Competent Schedule

- PMI's Contributions
  - *PMBOK® Guide* 3rd and 4th Editions
  - The Practice Standard for Scheduling
  - The PMI College of Scheduling,
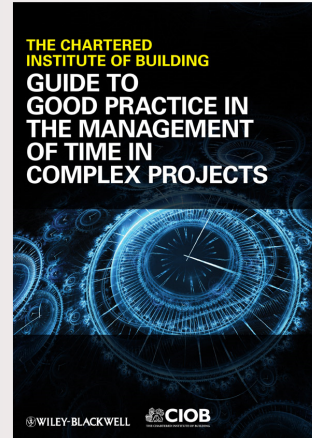   - Scheduling Excellence Initiative (SEI)

http://www.pmicos.org/

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The Guide

- *Guide to Good Practice in the Management of Time in Complex Projects*
- Publication Early 2011

THE CHARTERED INSTITUTE OF BUILDING
GUIDE TO GOOD PRACTICE IN THE MANAGEMENT OF TIME IN COMPLEX PROJECTS

WILEY-BLACKWELL   CIOB

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The Guide

- Planning -v- Scheduling
- Schedule design
- Schedule Density
- Durations and Links
- Updating & Maintaining the schedule
- Reporting & Communicating

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Good Practice

This section:

- Planning -v- Scheduling
- Creating a competent schedule

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Planning -v- Scheduling

- Project Planning
  - Strategic process
  - Focus on objectives and methods
  - Foundation for scheduling
- Project Scheduling
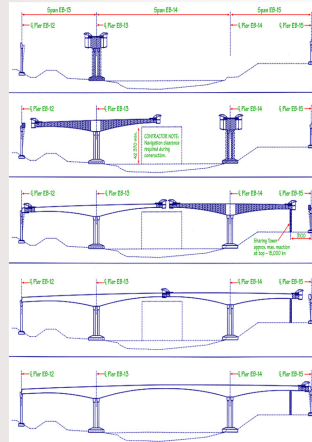 - Develop and maintain an effective schedule

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Project Scheduling

- Requires good knowledge of scheduling
- Understanding of the scheduling tool
- Involves:
  - Designing the schedule
  - Developing the schedule
  - Maintaining the Schedule

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Designing the schedule

- Understanding the Project Scope & Objectives (Planning)
- Determine the optimum update cycle
- Major milestones, gateways and phasing
  - The project life cycle

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Designing the schedule

- Schedule users / audience
  - Code and report structures
- Schedule size
  - Heuristics (25 / 600)
  - Control using Schedule Levels

See: Core Papers @
https://mosaicprojects.com.au/PMKI-SCH-010.php#Overview

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Designing the schedule

- Schedule Levels & Schedule Density
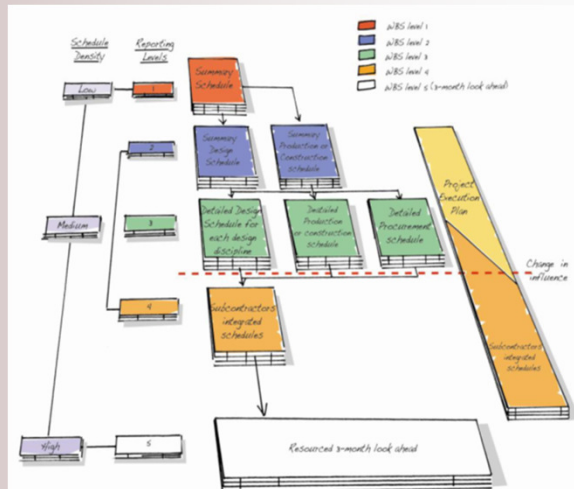

Figure © Guide to Good Practice in the Management of Time in Complex Projects

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Developing the schedule

- Schedule Density
- Sensible Activities
- Practical Logic

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Developing the schedule

- Schedule Density
  - Overall framework is essential for Time Management….. But
  - Detail planning requires the people doing the work to be involved (eg, Last Planner)
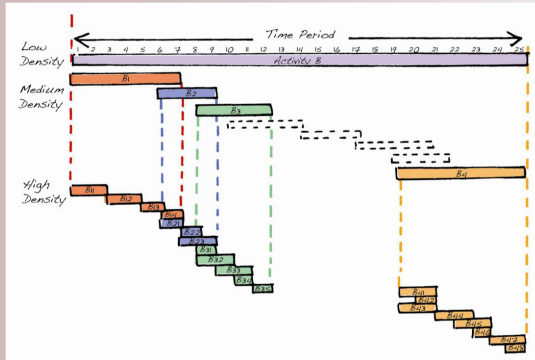 - Therefore, add detail when appropriate

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Slide 45 — Schedule Density

Figures © Guide to Good Practice in the Management of Time in Complex Projects

Activities are progressively expanded to greater levels of 'density' as more information becomes available
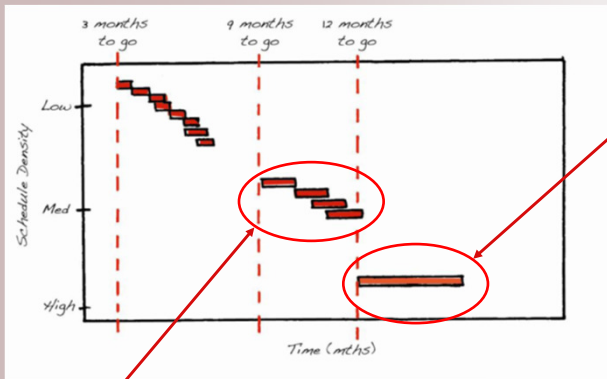
Unless the work is designed in its entirety and all subcontractors and specialists appointed before any work commences, it is impossible to plan the work in its entirety, in detail at the beginning of a project.

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Slide 46 — Schedule Density

Low-density is appropriate for work, which is intended to take place 12 months, or more in the future.

Tasks may be several months in duration

Medium density is appropriate for work, which is intended to take place between 3 and 9 months after the schedule date. At this stage the work should be designed in sufficient detail to be allocated to contractors, or subcontractors. Task durations should not exceed 2 months.
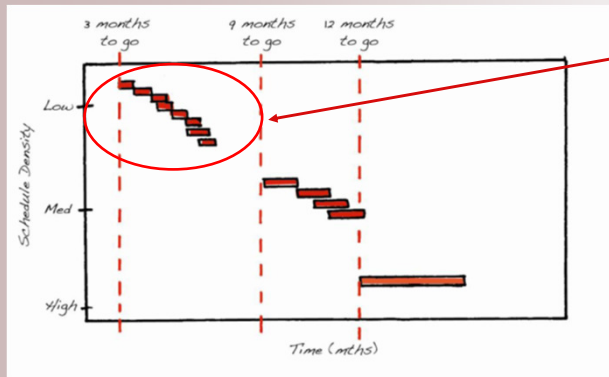
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The Effective Management of Time in Complex Projects

Schedule Density

High-density scheduling is an essential prerequisite for undertaking work. The schedule is prepared with the people doing the work.

Task durations should be no more than the update cycle

As the density is increased, adjustments to the plan take into account actual performance to date, resources, work content, and other factors necessary to achieve the overall schedule objectives.

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Schedule Density

	Location	Zone	Area	Section	Item	Description	Activity ID
Low Density	A	B	A			Substructures	ABAZZ00010
Medium Density	A	B	A	A		Excavations	ABAAZ00010
	A	B	A	B		Piling	ABABZ00010
	A	B	A	C		Ground beams	ABACZ00010
	A	B	A	D		Floor slabs	ABADZ00010
High Density	A	B	A	C		Ground beams	ABACZ00010
	A	B	A	C	A	Formwork	ABACA00010
	A	B	A	C	B	Reinforcement	ABACB00010
	A	B	A	C	C	Placing concrete	ABACC00010
	A	B	A	C	D	Curing	ABACD00010
	A	B	A	C	E	Strike formwork	ABACE00010
	A	B	A	C	F	Backfill	ABACF00010

The activity coding structure (ID) maps high to medium to low density

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Sensible Activities

- Milestones
  - Zero Duration
  - Marks a significant point or event in a project
  - Start and Finish
  - Other key points

Personal preference – ALL constraints are placed on Milestones

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Activity Identification

- Involve Stakeholders and Team
- Test for completeness
- Keep level of detail consistent with your 'plan for the schedule'
- Identify all Activities before moving onto next stage

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Attributes of a 'Good Activity'

- A discrete element of work
- A single person is responsible for managing the performance of the work
- Its description is unique and unambiguous
- The work is capable of proceeding to completion without interruption

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Estimate Activity Durations

- Deal with each activity in turn
- Estimate optimum duration for activity
- Consider: the work involved, the ideal crew size & the team's experience
- Involve people who will be responsible actually for 'doing' the work

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Estimate Activity Durations

- High Density - Its duration is less than twice the update cycle (or undividable)
- Be real!
  - For 90% of projects use 'days'
  - Most of the rest 'weeks'

See: **The Cost of Time** (Durations)-
https://mosaicprojects.com.au/PDF_Papers/P009_The_Cost_of_Time.pdf

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Developing the schedule

- Practical Logic
  - Organise the activities into a logical sequence
  - Only use 'real logic'
  - Use Finish-Start relationships where possible
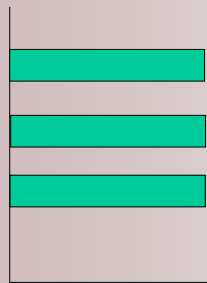 - Keep getting agreement

See: **Links, Lags & Ladders** -
https://mosaicprojects.com.au/PMKI-SCH-010.php#Overview
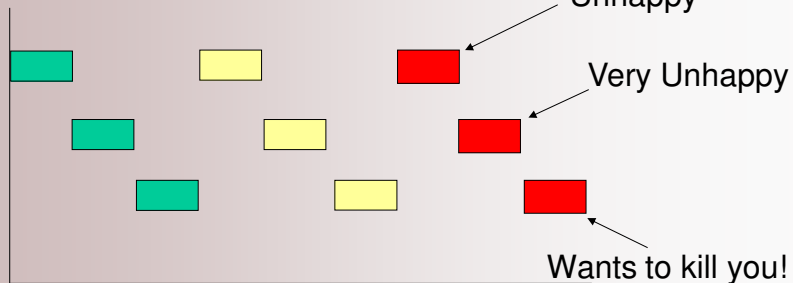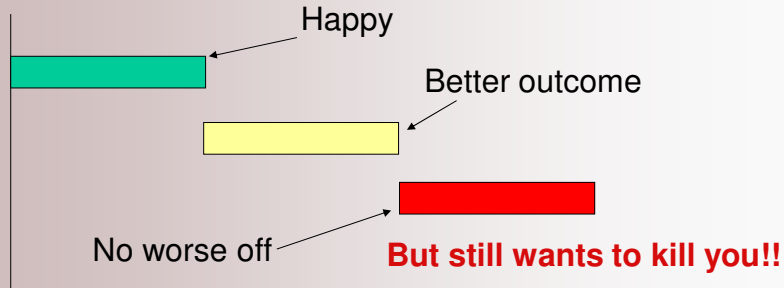
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Links Cause Problems

- But make sure you understand how your system works

Task A - 10 Days Work — FF +1 — **Typical software solution**

Task B - 3 Days Work

SS +1 — Task C - 12 Days Work

Task A - 10 Days Work — FF +1 — **A strange result……**

Task B - 6 Days Work

SS +1 — Task C - 12 Days Work

Increasing the duration of 'critical' Task B reduces the overall duration of the work!
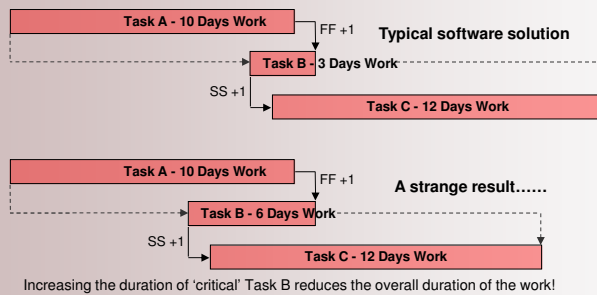
59   **Managing Time**   mosaic
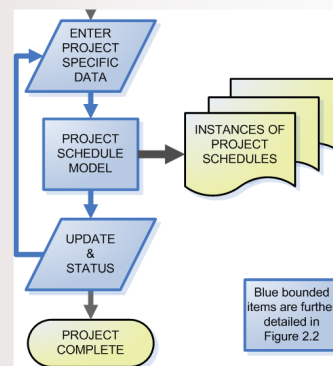
Maintaining the Schedule

- Establish a baseline
  - At the development stage
  - As part of a re-baseline
- Record actual progress
- Reschedule from 'data date' (or Time Now)

ENTER PROJECT SPECIFIC DATA

PROJECT SCHEDULE MODEL → INSTANCES OF PROJECT SCHEDULES

UPDATE & STATUS

Blue bounded items are further detailed in Figure 2.2

PROJECT COMPLETE

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Maintaining the Schedule

- Edit for accuracy
  - No tool accurately manages all of the issues around partially complete tasks
- Involve both task owners and managers
  - Use 'their data' not yours!

See: **Managing for Success** - The power of regular updates-
https://mosaicprojects.com.au/PDF_Papers/P002_MFS_Full.pdf

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Limitations of CPM

- CPM does not scale remaining durations
  - EV does for project costs
  - ES might for project durations
- The CPM Technique assumes:
  - Durations are meaningful
  - Logic is complete
  - Float exists

All models are wrong, some are useful!

See: **Float - Is It Real**
https://mosaicprojects.com.au/PDF_Papers/P043_Float-Is_it_Real.pdf

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Reporting Options

- The major challenge with scheduling is communicating complex data effectively
- This is achieved by effective reporting

See: **Seeing the Road Ahead** –
the challenge of communicating schedule data
https://mosaicprojects.com.au/PDF_Papers/P106_Seeing_The_Road_Ahead_PMOZ.pdf

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Reporting Options

Data is not information, information is not knowledge, knowledge is not understanding, understanding is not wisdom.

Clifford Stoll

See: **Beyond Reporting** - The Communication Strategy
https://mosaicprojects.com.au/PDF_Papers/P094_Beyond_Reporting.pdf

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Qualification Framework

This section:

- Current certifications
- Planning Planet

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Qualification Framework

- Current Qualification Framework
  - Association for the Advancement of Cost Engineering International (AACE) PSP
  - PMI Scheduling Professional (PMI-SP)
- Both focused on highly experienced schedulers 3 to 5+ years

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Qualification Framework

- Limited training for PMI-SP or AACE
  - Assumed self study by experts
  - Mosaic planning a PMI-SP course for 2011
- Relatively low numbers of credentials awarded
  - 650 AACE in 6 years
  - 360 PMI-SP in 3 years

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New Developments

- Planning Planet: www.planningplanet.com
  Planning Planet Accreditation Scheme (PPAS)
  - Developing training materials
  - Developing accreditation process
  - Likely to offer industry based qualifications
  - Entry level certification included

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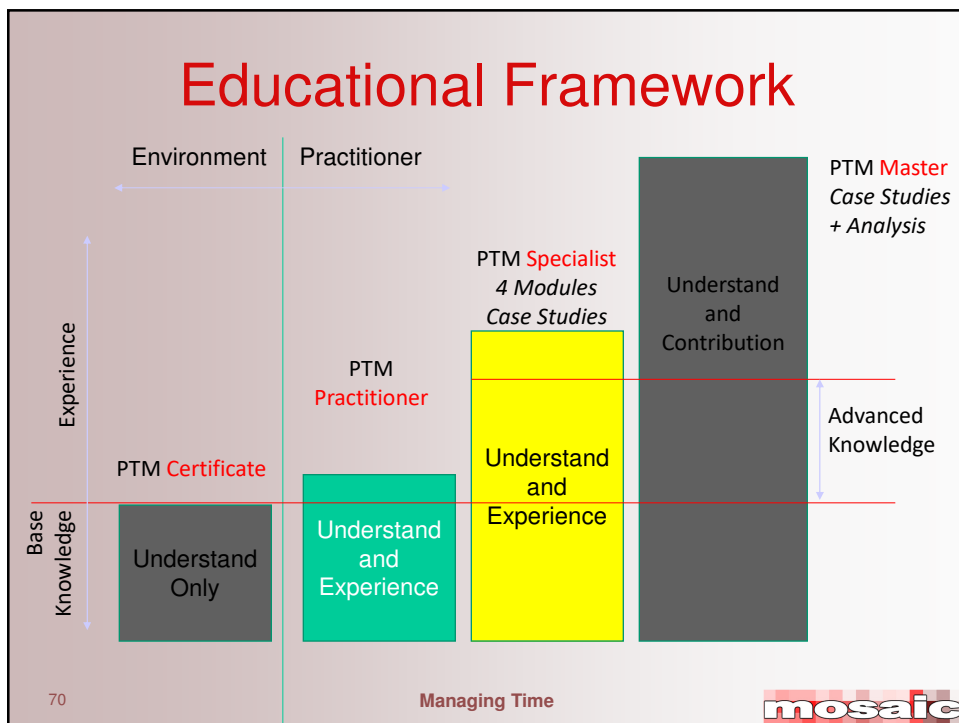
Planning Planet

- PPAS –Standard Documents
  - SD 0 Why Plan ?
  - SD 1 Planning, Scheduling and Project Control Methods
  - SD 2 Designing the Schedule
  - SD 3 Creating and Building the schedule
  - SD 4 Maintaining the Schedule
  - SD 5 Using the schedule or Specialism's

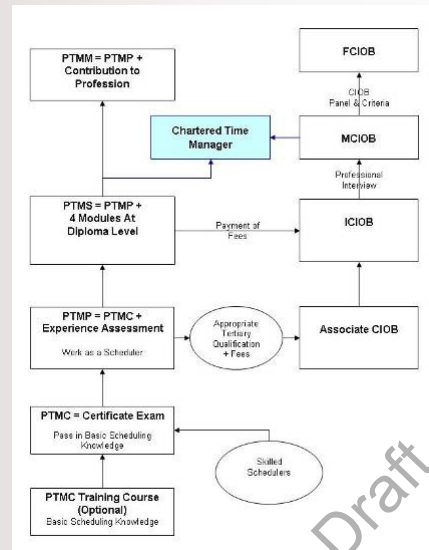69   **Managing Time**   mosaic

Educational Framework

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CIOB TM Framework

- Time Management
- Independent of CIOB qualifications
- 2 Examined levels
- 2 Assessed levels
- PTMC and PTMP launched 2011
- PTMS 2012

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CIOB TM Framework

- Examination specifications under development
  - Certificate no industry bias
  - Higher levels Construction industry
- International team (including me)
- CIOB has 190 years of experience as a professional association
- Malaysian Region and office

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What Mosaic is doing:

- We are developing a free resource at
www.mosaicprojects.com.au/Planning.html

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Conclusions

- Scheduling & Complexity / Uncertainty
- CRPR, TKOs, SNT all suggest:
  - 1000s of individual decisions drive success
  - People make these decisions
  - They can't be controlled

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Conclusions

- Scheduling & Complexity / Uncertainty
- CRPR, TKOs, SNT all suggest:
  - 1000s of individual decisions drive success
  - People make these decisions
  - They can't be controlled
- **But they can be influenced!**
- An effective schedule:
  - Communicates ideas about future directions
  - Is understandable, believable and believed

Useful schedules are useful because they are used!

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Conclusions

- Communication is the key
  - Schedules must speak to their users
  - What the scheduler understands is less important than what the users understand
  - **KISS – but elegantly**

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Conclusions

- Communication is the key
  - Schedules must speak to their users
  - What the scheduler understands is less important than what the users understand
  - **KISS – but elegantly**
    - **Data is not Information**
    - **Information is not knowledge**
    - **Knowledge is not understanding**
    - **Understanding is not wisdom** Clifford Stoll

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Conclusion

- Definite trend towards
  - Standardising planning and scheduling
  - Developing training frameworks
  - Accrediting Planners and Schedulers

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Conclusions

- Solve the 'chicken and egg' conundrum
  - Well trained schedulers can help project managers and advise senior managers
  - But no one is training senior schedulers
  - Therefore very few people experience the benefits of working with skilled schedulers
  - Consequently they don't know what they are missing
  - And don't invest in training…..

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Conclusions

- We need a management re-education program
  - SOX, etc mandate the need for predictive process like scheduling
  - So why do so many projects have time 'set in stone' before anyone looks at a realistic schedule?
  - Senior managers need to understand the value of skilled schedulers

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Conclusions

- International credentials will help
  - Focused on new planners and schedulers
  - Planning Planet & CIOB are in discussion to normalise or coordinate
- *The Guide* and PMI's Practice Standard provide the framework
- We have the opportunity to reinvigorate the role of planning and scheduling

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Conclusion

- Challenges:
  - Keep training and credentials aligned
  - Gain respect of management
- We can make a difference!

Useful schedule are useful because they are used!

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Discussion

- Questions please
- Contact details:
  - Free planning and scheduling resources:
    https://mosaicprojects.com.au/PMKI-SCH.php
  - Email: patw@mosaicprojects.com.au

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Questions Please

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Web: www.mosaicprojects.com.au

Download this paper from the '**Resources**' section of the Mosaic site

The '**Papers & Resources**' section of the Mosaic site has:
- Direct links to all of the project management associations
- A large number of free PM papers and useful scheduling references

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