PROCUREMENT RISK MANAGEMENT IN CONSTRUCTION

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Agenda

- Identifying procurement procedures
- Brief Review of Risk Management Process
- Sources of risks in procurement
- Procurement Route selection
- Alternative Approach

What is Procurement

- According to Burt (1984) procurement is "…*the systematic process of deciding what, when and how much to purchase; the act of purchasing it; and the process of ensuring that what is required is received on time in the quantity and quality specified*"

- Kidd (2005) found the term procurement is interchangeable with supply management, covering a range of actions and procedures from the identification of a requirement for an asset, product or service through to its termination or disposal.

Procurement Objectives

- Quality / Product (fit for purpose)
- Time / Programmed
- Cost

Quality / Product (fit for purpose)

- Is defect free on delivery/completion
- Has a reasonably efficient running cost
- Has satisfactory durability
- Is aesthetically pleasing
- Has undergone value analysis/engineering
- Is innovative - that is, it incorporates original design quality
- Is subject to satisfactory guarantees and after sale service

Time/Programme

- Timely delivery/completion
- Certainty of completion date and other time related estimates
- Early commencement of work/fabrication/manufacture
- Design proposals to be submitted expeditiously
- Rapid rectification of defects

Costs

- Certainty of cost estimates
- Value for money
- Ease of accountability
- Competition - lowest possible tender
- Obtaining cost certainty or reduction in risk of cost overrun
- Realistic maintenance and running costs

Procurement Systems

- Construction Management
- Design and Build
- Develop and Construct
- Design by Employer
- Management Contract

Procurement Systems

- **Management methods**
  - **Management contracting**
  - **Construction management**
  - *Prime Contracting*
- *Partnering*
- *Alliancing*

Risk Management

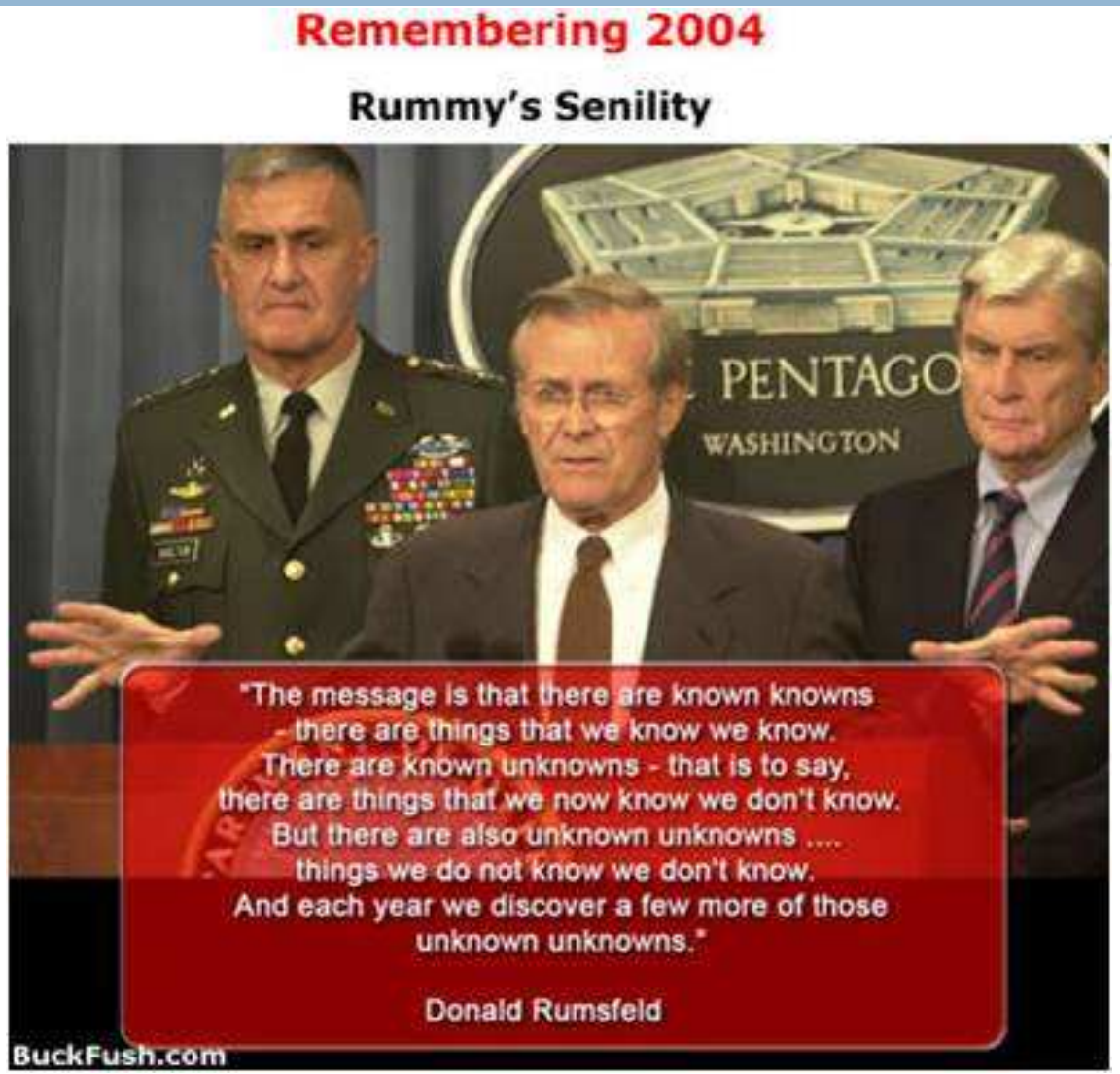
Risk Management Consists of four processes, these processes are:

- Risk Identification : Identify the risks associated with a project or package
- Risk Analysis: Analyse the severity and probability of the risk to quantify the extent of the risk
- Risk Response: Prepare a risk schedule with the decided response to every risk. Typical responses
- Risk Monitoring: The Risk Schedule prepared will be the basis to monitor risk and assign risk management responsibility with updating the status of risk.

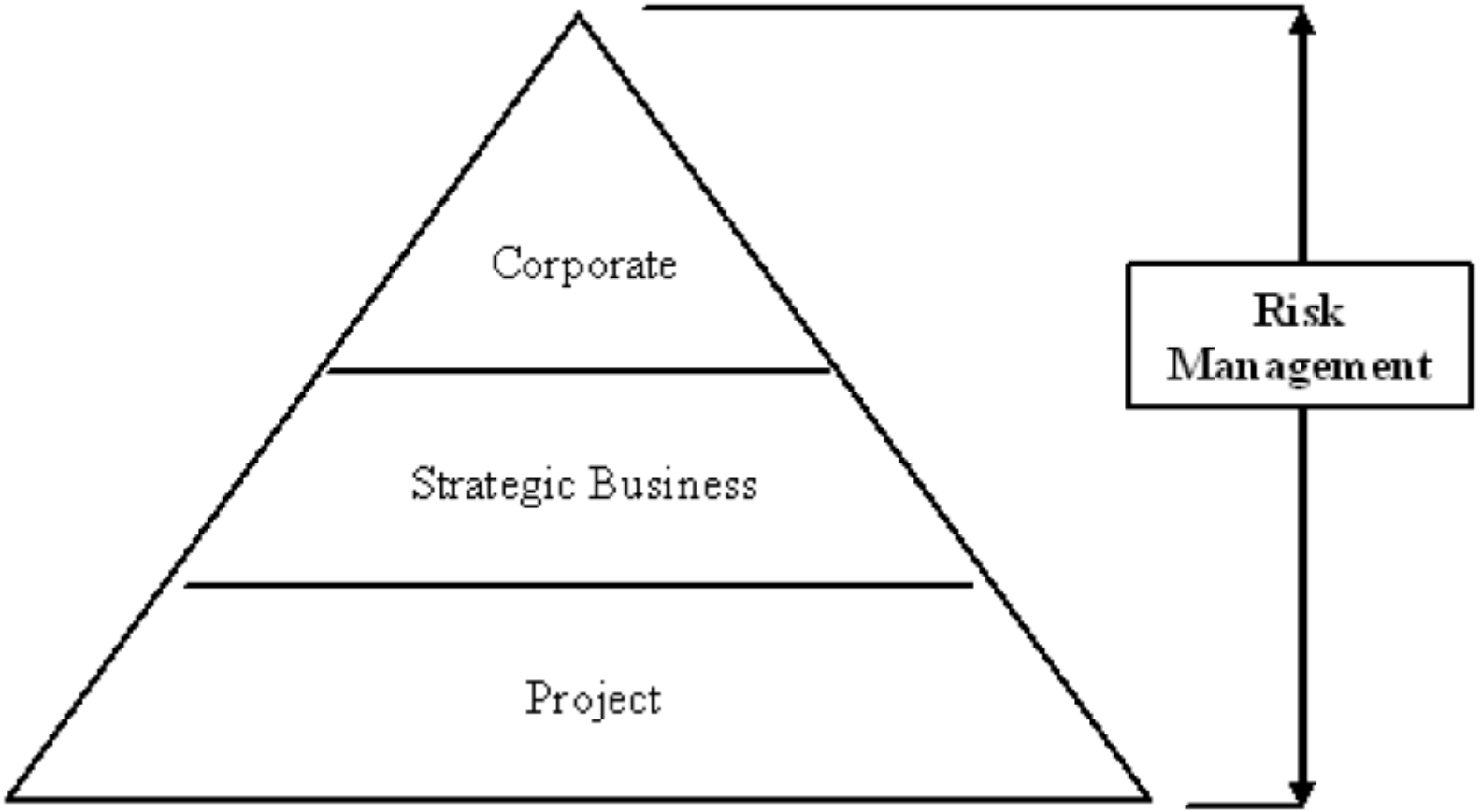
Risk Management

RISK		UNCERTAINTY
Quantifiable	→	Non-quantifiable
Statistical	→	Subjective Probability
Assessment		
Hard Data	→	Informed Opinion

Risk Management



Risk Management



Sources of Risks in Procurement

Source of Risk	Reason for Uncertainty
Financial	Bankruptcy, insurance, risk share
Economical	Economical Conditions, Taxation, inflation, interest rates
Technical	Design adequacy, Operational efficiency, reliability.
Market	Demand, Competition, Customer Satisfaction
Project	Definition, Scope, Programme, labour and resources, and quality control
Safety	Regulations, Hazardous, Collapse, Fire, Explosions
Legal	Those are related to legislation in the countries.

Practical Examples of Occurring Risks

- Burj Dubai Façade Contractor (Schmidlin Ltd) went bankrupt 31st January 2007 (Bloomburg)
- Global Financial Crisis (Credit Crunch) in 2008 affected the whole world economics.
- The Demand risk that occurred in 2007 that lead to substantial increase in construction materials prices.
- Exchange rate is a continous risk that affect international contractors and suppliers due to the continuous fluctuation of rates.

Risk Analysis

Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Severe
Almost certain	M	H	H	E	E
Likely	M	M	H	H	E
Possible	L	M	M	H	E
Unlikely	L	M	M	M	H
Rare	L	L	M	M	H

Risk Response Plan

After Identifying the Risks and analysing them risk response plan showing the response strategy for each risk. The common responses to risks are:

• *Risk Avoidance*: is the removal of particular threat. This can be achieved by removing the source of risk. An example for currency exchange rate, risk can be avoided by agreeing deals in local currency

• *Risk Reduction*: Different approached for reducing the risks shall be explored as construction methods, sequences, sourcing of materials, interfaces with other disciplines.

• *Risk Transfer:* this is achieved by transferring the perceived risk to suppliers, subcontractors, or third parties as insurance.

• *Risk Retention:* Accept the risk. This response is used when the aforementioned responses were not achievable.

Contract selection

		Uncertainty of the product			
		Low	High		
Uncertainty of the process	High	Fixed Price Design & Build	Cost Plus Design & Build Alliance	High	Complexity
	Low	Remeasurement Build Only	This situation was not researched	Low	
		Low	High		
		Ability of the client to intervene			

Source: Turner and Cochrane, 1993

Managing Risks using Contracts

- Fixed Price Contract (Lump sum): is a risk transfer strategy.
- Resmeasurement: it is a risk reduction technique were risks are limited to the variation in quantities only.
- Cost Plus: it is a risk acceptance were suppliers are paid there expenses plus agreed prpfit

Managing Risks using Procurement Routes

- Build Only: This route is best to be used when the uncertainty is low and complexity is low. It is a risk reduction approach.
- Design & Build: it is used when having high process uncertainty and complexity. The route is a risk transferring approach when used with lump sum contract
- BOOT (including PFI): the supplier build own operate and transfer the project after agreed period. This is a risk transfer strategy.

Examples of Projects

- The Burj Dubai Lake Hotel

•By implementing the contract selection matrix to the project. Due to the high complexity and the high uncertainty of the product, it was expected to have a Cost Plus Contract with a Design & Build agreement

• The agreed Contract was resmeasurement, Build only contract.

•The result was budget overrun from $231 million to $283 million. While the project was delivered 3 months behind schedule.

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Uncertainty of the process	High	Fixed Price Design & Build	Cost Plus Design & Build Alliance	High	Complexity
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		Low	High		
		Ability of the client to intervene			

Successful Example

- The project calls for construction of Ferrari Theme Park. The park will include 24 rides, a driving school, a shopping mall, a museum and a theatre. The area of the park is 250,000 square metres.

- The Ferrari Experience Project was a highly complex project with a substantial uncertainty. The client decided to choose alliance method that served the project for successful completion on time and within budget

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		Ability of the client to intervene			

Risk Management during tender

- Using the rating technique to asses subcontractors. The rating technique will consider different aspects as:
  - Price
  - Technical Abilities
  - Financial Strength
  - Safety Records
  - Performance

Alternative Approach

Drivers for Change: *Rethinking Construction*

- Focus on and Increase Value for Customer

- Integrate Project Processes Involving Design, Physical Execution, Manufacturing of Components, Supply Chain Partnering

- Replace Competitive Tendering with Long-term Relationships Based on Measurement of Performance and Sustained Improvement in Quality and Efficiency

- Eliminate Waste

Drivers for Change: *Accelerating Change*

- Actively use integrated teams and long-term supply chains
- Review and signpost existing process maps
- Add value for all customers, new/experienced, large/small
- Exploit economic and social value of good design
- Keep together successful supply chains from project to project
- Drive out waste during project delivery and life-cycle
- Foster culture of continuous improvement

Lean Production Principles

- VALUE: Created by producer and defined by ultimate customer
- VALUE STREAM: Structure business process from conceptualization to execution so as to eliminate waste, remove unneeded buffers, and shorten throughput times
- FLOW: Arrange production system to facilitate flow of products and information
- PULL: Customer pulls product from producers " Don't make anything until is needed; then make it very quickly"
- PERFECTION: Strive for perfection

Lean Production Methods

•KAIZEN: Team expected to suggest continuously new ways to improve production process

•5-WHY's: Institute use of 5–why's, a problem-solving technique to identify root causes of problems

•JIDOKA: Stop production if problem emerges unless it can be immediately fixed to avoid rework

Lean Production Methods

•JUST IN TIME: Dictate that parts should only be produced at each previous step to supply immediate demand of next step

•REDUCE BATCH SIZE: Make small batches to eliminate carrying cost of huge inventories of parts and make more visible defective parts.

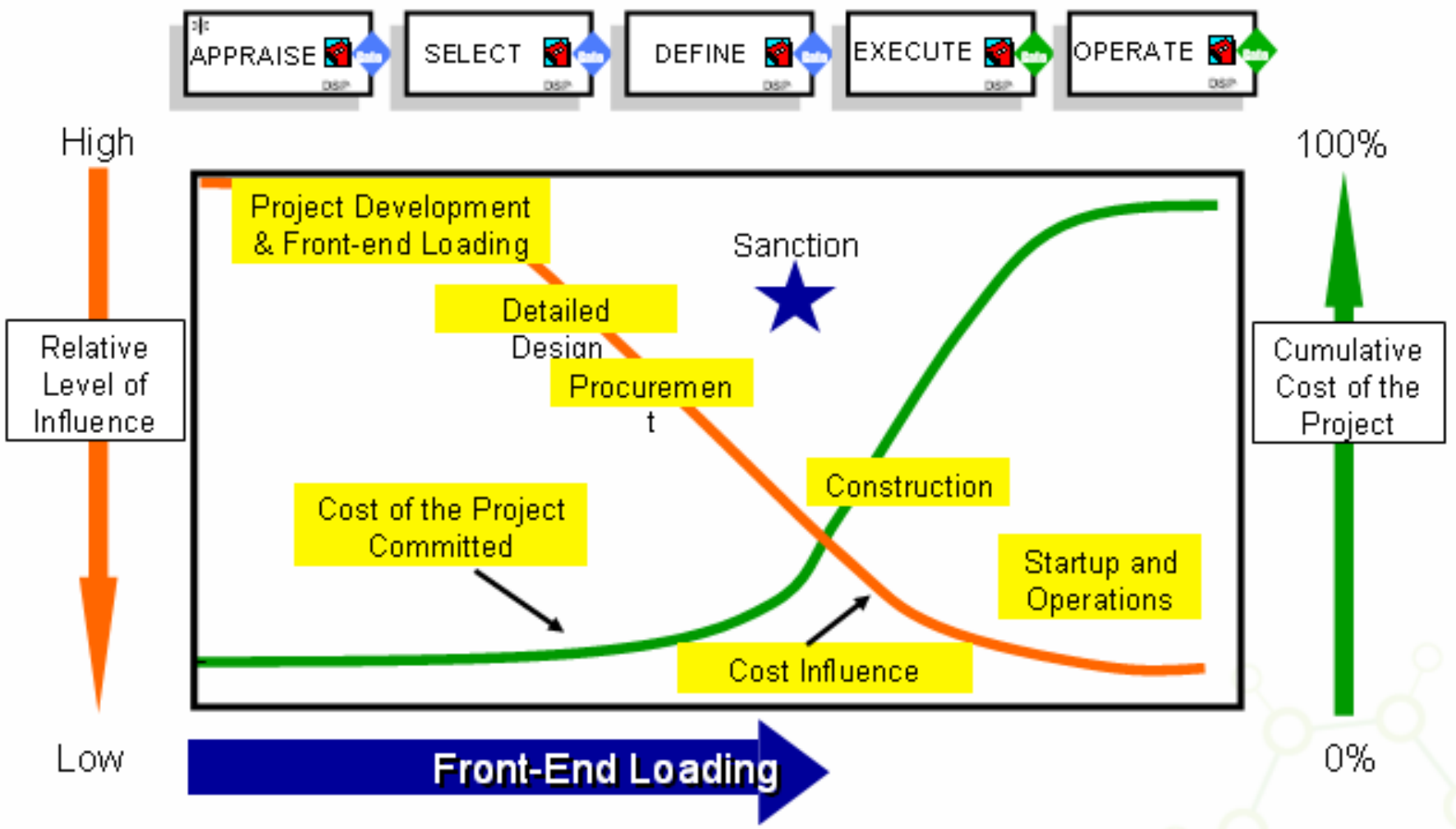
Lean Design and Engineering

- Bring suppliers and subcontractors into product development from early design stages

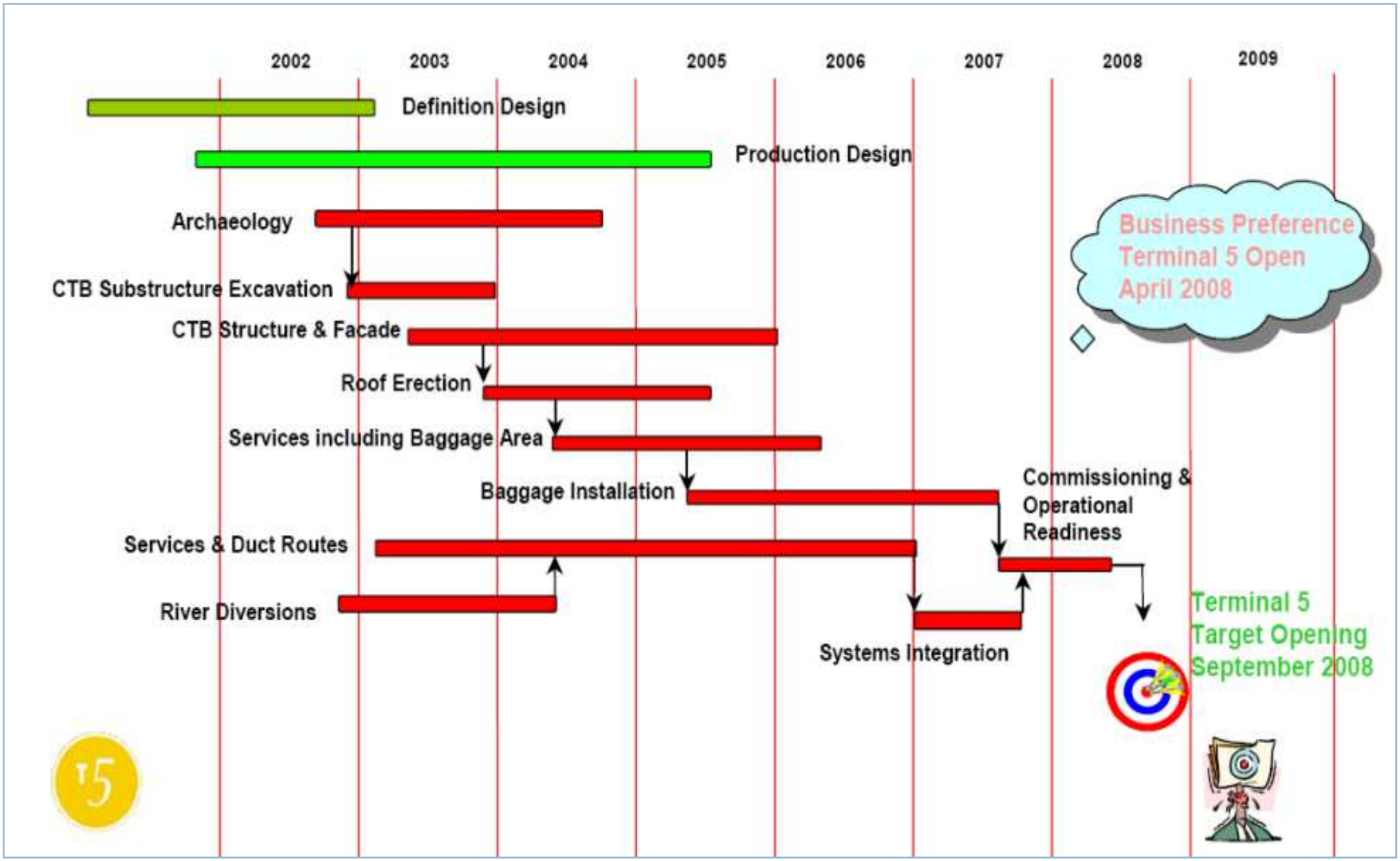
- Let suppliers do significant amount of detail engineering

- Treat customer as integral part of production process

Procurement and Risk Relationship



Procurement and Risk Relationship



Lean Supply Chains

- Invest on long-term relationships with suppliers while reducing number of key suppliers

- Target price: establish price and work backwards to figure how product can be made while allowing reasonable profit

- Suppliers must share proprietary information about costs and production techniques

Trust in Lean Production

- "The Relationship between suppliers and assemblers in Japan is not built primarily on trust, but on the mutual interdependence enshrined in the agreed-upon rules of the game."

- "It [a stable set of rules] keeps everyone striving constantly to improve performance."

(Womack et al. 1990 p. 155)

Lean Construction - Operational Principles

- Consolidate early on materials that will be needed at same time and place: pre-assembly, off-site construction
- Select from alternatives rather then narrow to single-point solutions. Defer commitments to Last Responsible Moment
- Shift design detailing to fabricators and subcontractors
- Design for Procurability, Constructability, Maintainability

Lean Construction - Implementation

- Limit master schedules to phase milestones, special milestones, and long lead items
- Produce phase schedules jointly with team that will do work
- Use multi-skilled teams of workers so they can perform more than just few specialist tasks
- Just-in-time deliveries
- One-touch handling
- Select, size, and locate buffers to absorb variability

Lean Construction Implementation

- Last Planner System of Production Control: Make only assignments ready to be performed to shield production from work flow variability
- PPC or percent plan complete: track percentage of assignments completed in each plan period and act on reasons for plan failure
- First Run studies: actually perform operation in as realistic manner as possible to try out and learn how to best perform work, and identify needed skills and tools and possible interactions with other processes
- 3/4 D Design Systems: Help to better plan construction methods, motivate work crews through visualization, and run tests of construction sequences and virtual product walk-throughs

One Size does not fit all!

- Contracts shape behaviours but…don't expect contractors/suppliers to behave in same way just because they're under same type of contract
- Also don't expect immediate behavioural change
- Cost reimbursable => monitoring costs go up!
  - **Are you capable to monitor? Prepared to monitor?**
- Create sense of competition
  - **More than one supplier per work package**

Supplier Behaviour

- There are no perfect strategies
- Size of contracting organization matters
  - ⇒ **can firm cope with reporting requirements?**
- Concerns of reputation matter

  => is project big enough to engage corporate administrators?

  => is project in strategic sector for supplier?
- Extent to which supplier work is affected by uncertainty matters

Reimbursable (& Ring Fenced Profit)

- Can you make sure supplier puts best people on job?
- Do you have clear design brief to play against change requests?
  - **change of scope => correct maximum profit/GMP**

    vs.
  - **design evolution => maximum profit stays unchanged**
- Client needs to pay attention to scope gaps, and mediate conflict between project teams

Commercial Policy Must be Dynamic !

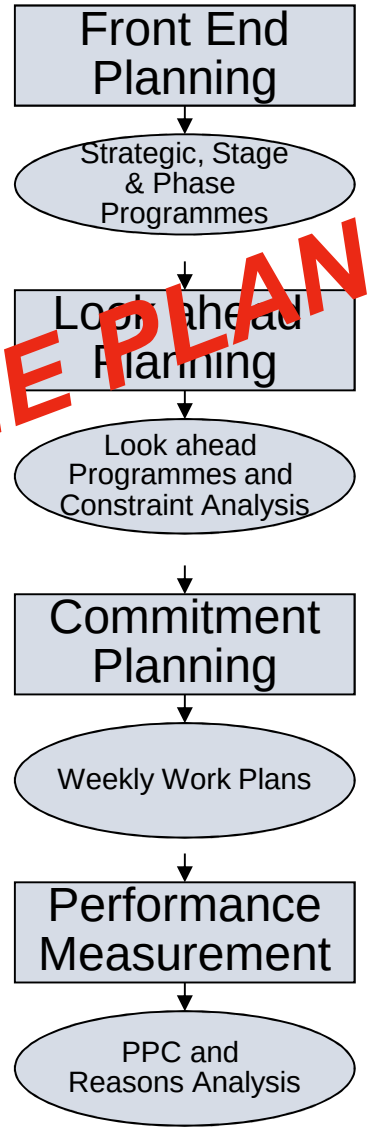
- What works at beginning may not work with late work packages
- Some suppliers have production process more flexible to accommodate variation than others
- To what extent do you force supplier to cascade contractual approach down supply chain?

Constantly Monitor Contractual Effectiveness

- One bad apple can create lots of problems!
- Update system of incentives
- Need to set realistic cost/schedule targets
- Need to distribute incentives rewarding performance close to date when actual work is accomplished

The principal components of the Last Planner

- Strategic, Stage & Phase Programmes
- Look ahead Programmes
- Screening activities using the Constraints Analysis
- Production Control using the Weekly Work Plan
- Performance Measurement
- Percentage Plan Complete (PPC)
- Reasons Analysis



PLAN THE WORK – WORK THE PLAN

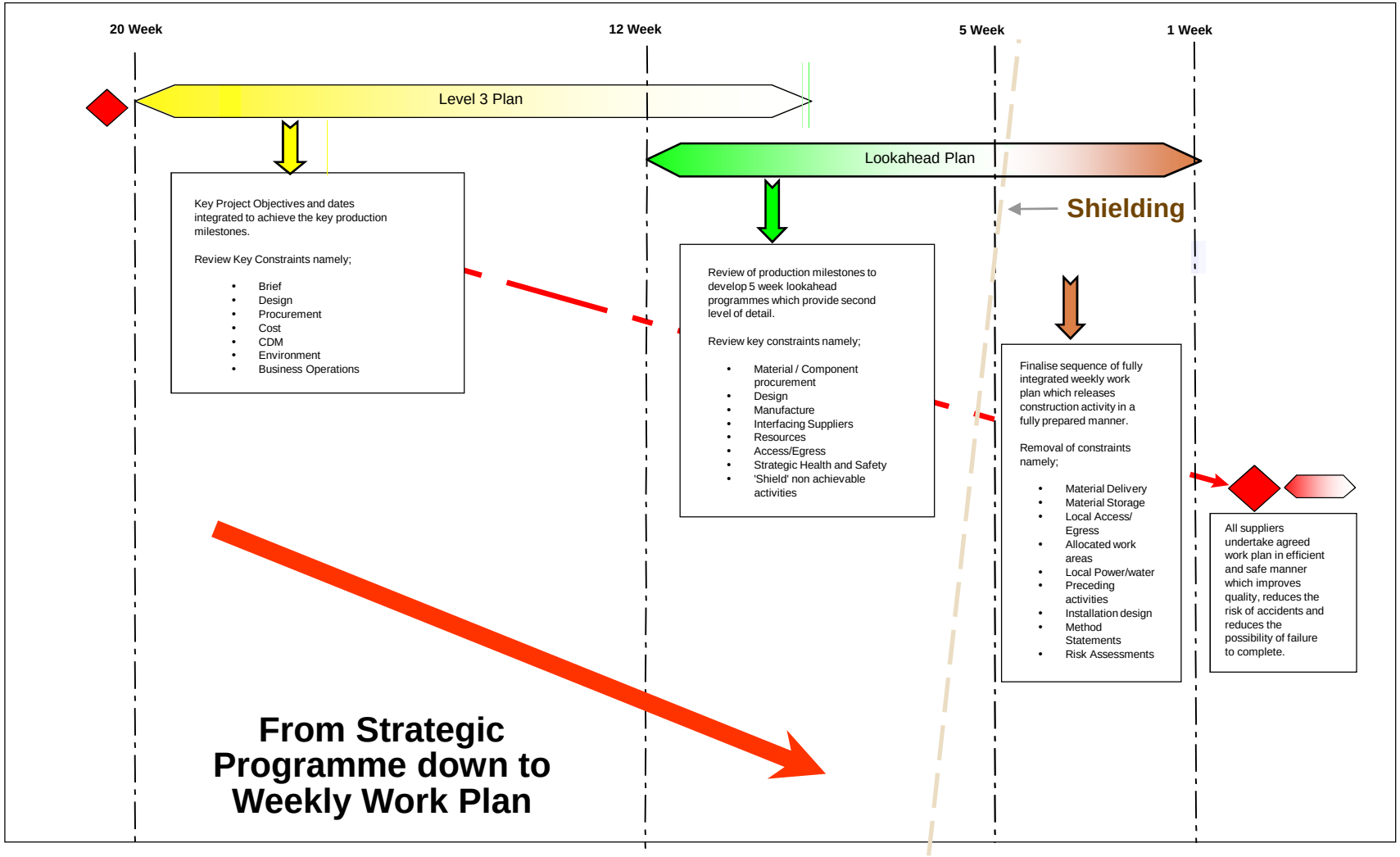
Objectives

- Increase plan reliability
- Improve downstream performance
- Allow suppliers to pull activities into the work environment
- Provide a basis for method improvement

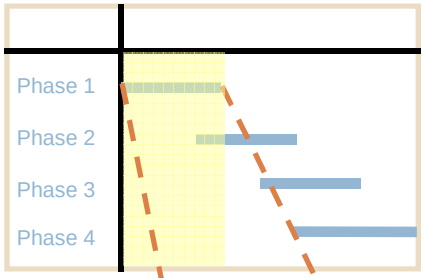
Components

- Weekly work plans
- Percentage plan complete (PPC) analysis
- Lookahead scheduling - Make ready
- Master Scheduling - Schedule Push

The Last Planner Process

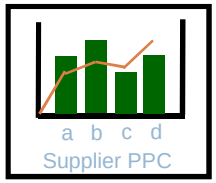


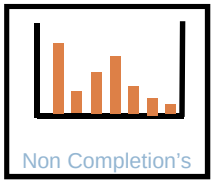
The Last Planner Process

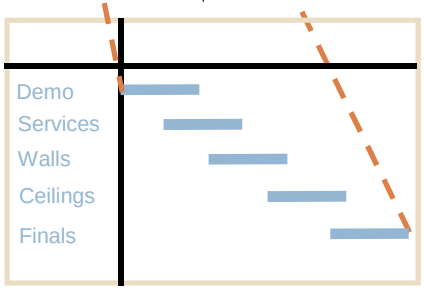


Master Programme
Schedule Push

Performance Reports

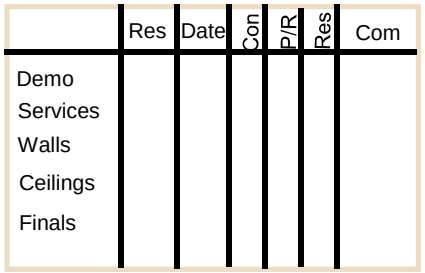






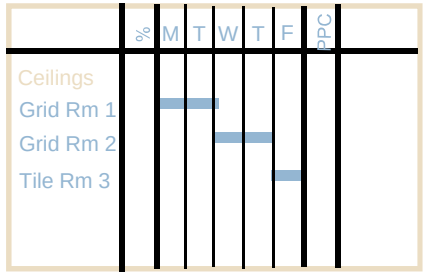
Lookahead
Programme

Shield



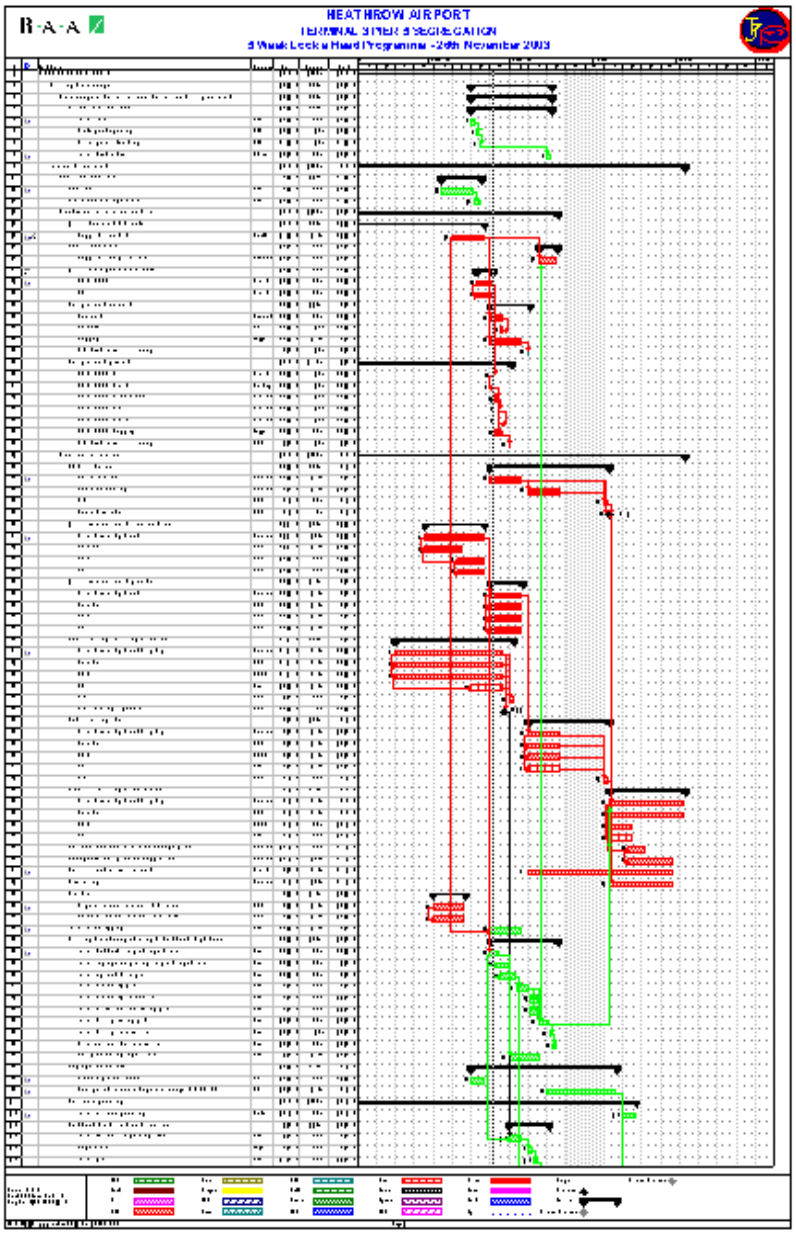
Constraints Analysis
Make Ready Needs

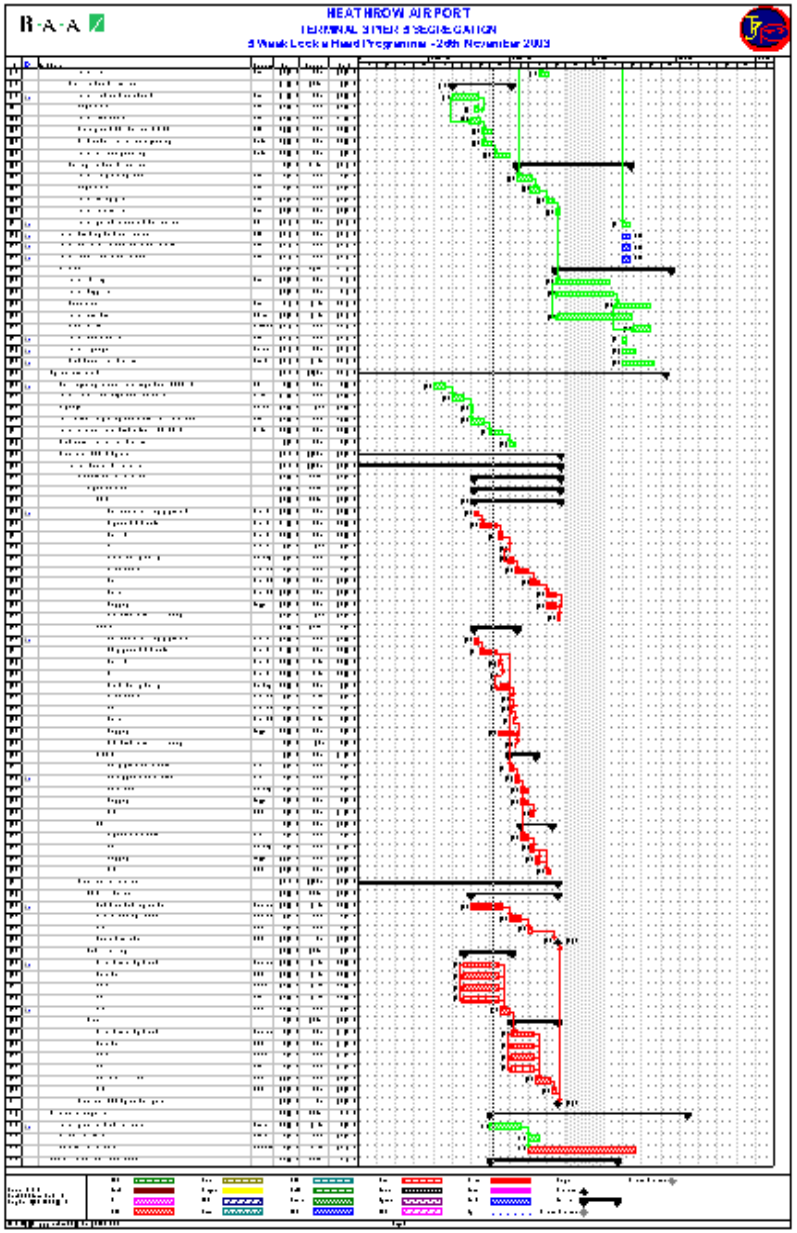
Buffer of Reliable Work



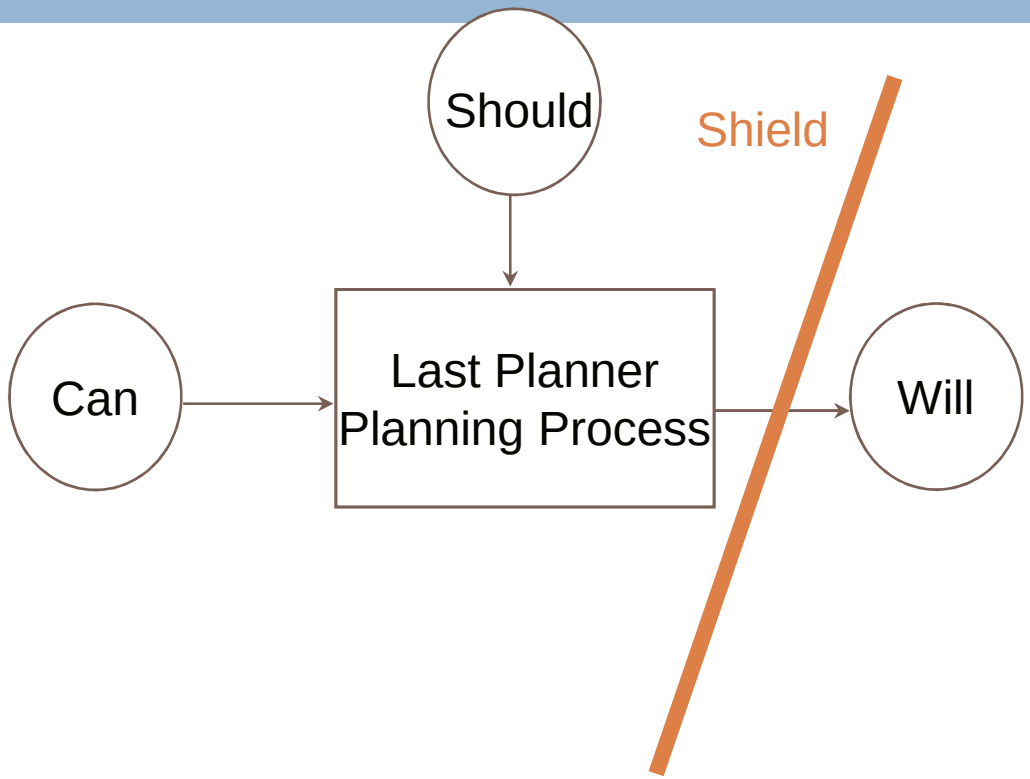
Weekly Work plan
Production Pull

5 Week Lookahead - Example

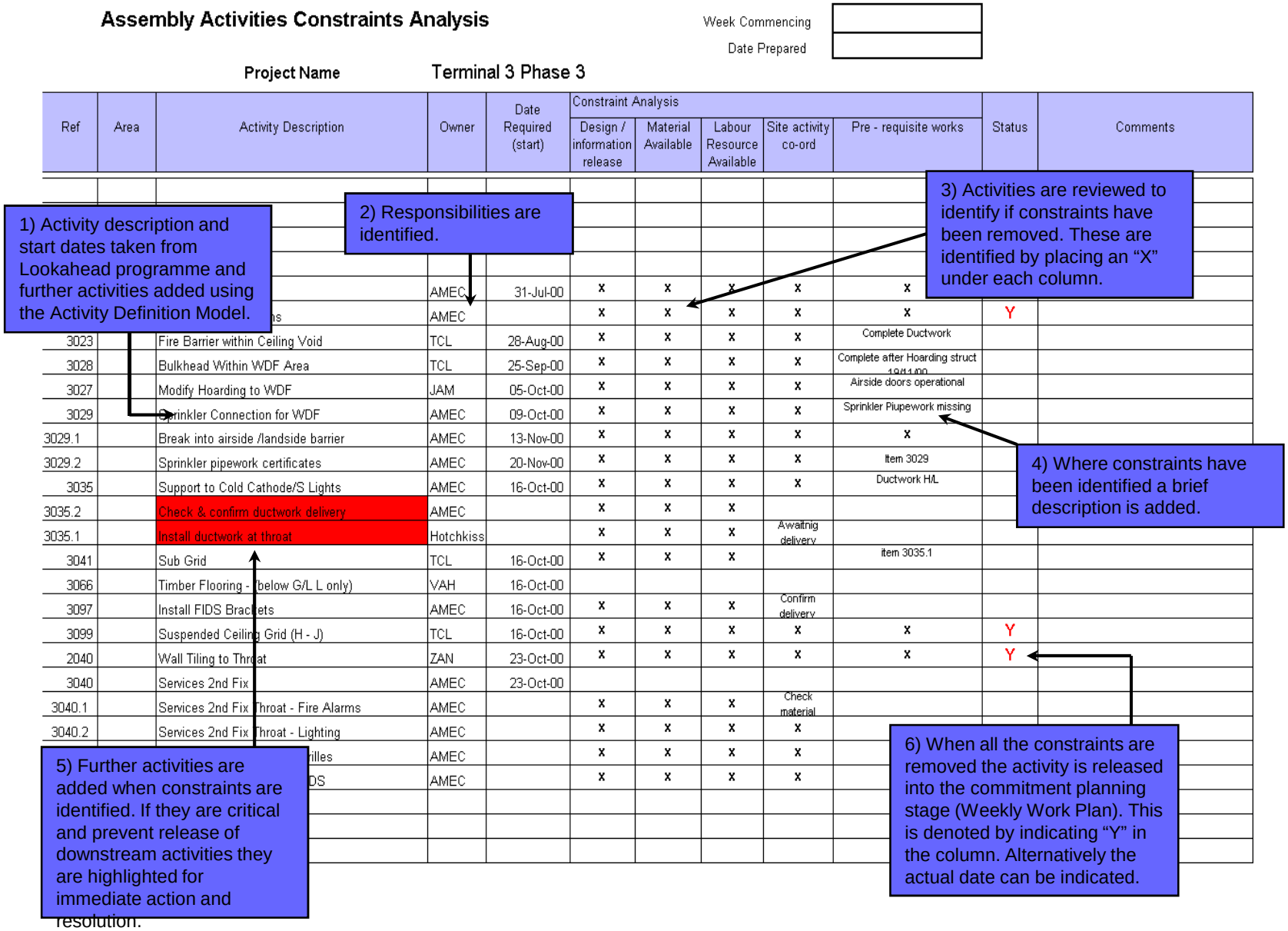




The Last Planner system - the person who assigns the work



Lookahead Programmes and Constraints Analysis



Assembly Activities Constraints Analysis

Week Commencing

Date Prepared

Project Name Terminal 3 Phase 3

Ref	Area	Activity Description	Owner	Date Required (start)	Constraint Analysis: Design / information release	Material Available	Labour Resource Available	Site activity co-ord	Pre - requisite works	Status	Comments
			AMEC	31-Jul-00	x	x	x	x	x		
		ns	AMEC		x	x	x	x	x	Y	
3023		Fire Barrier within Ceiling Void	TCL	28-Aug-00	x	x	x	x	Complete Ductwork		
3028		Bulkhead Within WDF Area	TCL	25-Sep-00	x	x	x	x	Complete after Hoarding struct 19/11/00		
3027		Modify Hoarding to WDF	JAM	05-Oct-00	x	x	x	x	Airside doors operational		
3029		Sprinkler Connection for WDF	AMEC	09-Oct-00	x	x	x	x	Sprinkler Piupework missing		
3029.1		Break into airside /landside barrier	AMEC	13-Nov-00	x	x	x	x	x		
3029.2		Sprinkler pipework certificates	AMEC	20-Nov-00	x	x	x	x	Item 3029		
3035		Support to Cold Cathode/S Lights	AMEC	16-Oct-00	x	x	x	x	Ductwork H/L		
3035.2		Check & confirm ductwork delivery	AMEC		x	x	x				
3035.1		Install ductwork at throat	Hotchkiss		x	x	x	Awaitnig delivery			
3041		Sub Grid	TCL	16-Oct-00	x	x	x		item 3035.1		
3066		Timber Flooring - (below G/L L only)	VAH	16-Oct-00							
3097		Install FIDS Brackets	AMEC	16-Oct-00	x	x	x	Confirm delivery			
3099		Suspended Ceiling Grid (H - J)	TCL	16-Oct-00	x	x	x	x	x	Y	
2040		Wall Tiling to Throat	ZAN	23-Oct-00	x	x	x	x	x	Y	
3040		Services 2nd Fix	AMEC	23-Oct-00							
3040.1		Services 2nd Fix Throat - Fire Alarms	AMEC		x	x	x	Check material			
3040.2		Services 2nd Fix Throat - Lighting	AMEC		x	x	x	x			
		illes	AMEC		x	x	x	x			
		DS	AMEC		x	x	x	x			

1) Activity description and start dates taken from Lookahead programme and further activities added using the Activity Definition Model.

2) Responsibilities are identified.

3) Activities are reviewed to identify if constraints have been removed. These are identified by placing an "X" under each column.

4) Where constraints have been identified a brief description is added.

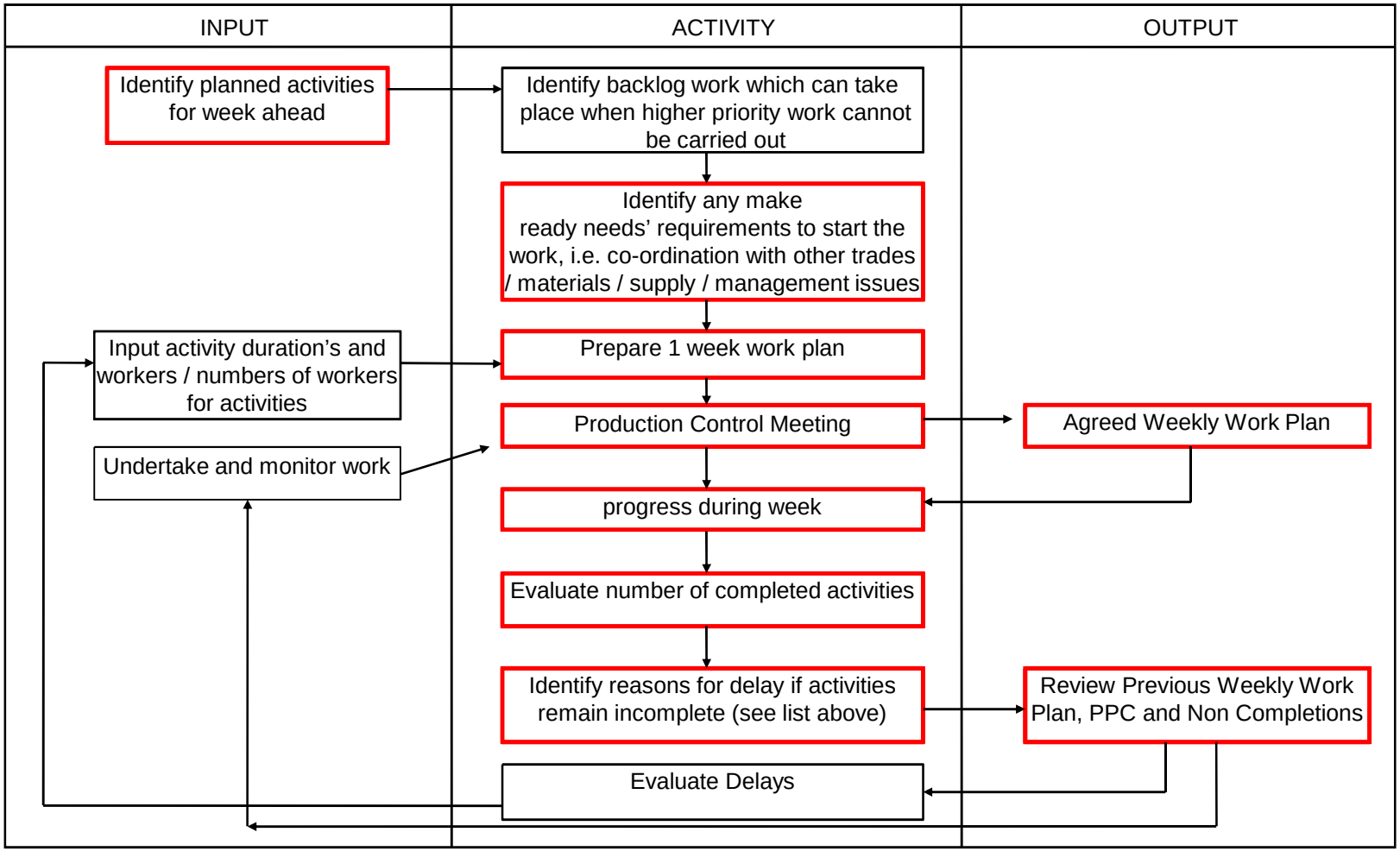
5) Further activities are added when constraints are identified. If they are critical and prevent release of downstream activities they are highlighted for immediate action and resolution.

6) When all the constraints are removed the activity is released into the commitment planning stage (Weekly Work Plan). This is denoted by indicating "Y" in the column. Alternatively the actual date can be indicated.

Entry Rules

- Rule 1: Allow activities to remain in the master schedule unless positive knowledge exists that it should not or cannot be executed when scheduled.
- Rule 2: Allow activities to remain in the look ahead window only if the planner is confident that it can be made ready for execution when scheduled.
- Rule 3: Allow activities into weekly work plans only if all constraints have been removed.

Weekly Work Plan - Process



Weekly Work Plan - Example

Weekly Work Plan

Project Name: Heathrow Terminal 3 Pier 5 Segregation
Stage:
Area:

Company: Mansell
Prepared By: Jim Tipple

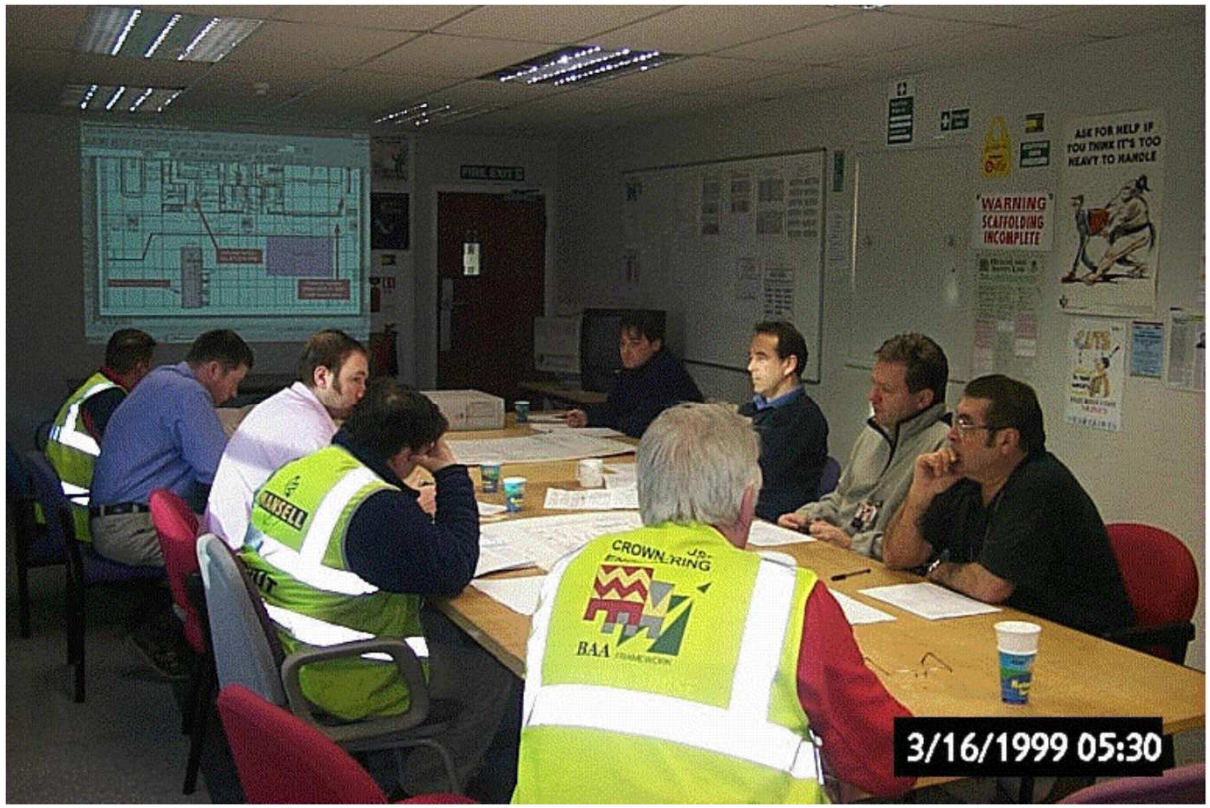
Week Commencing: 24th November 2003
Date Prepared: 21st November 2003

Resource Quantity	Activity Description (Quantified) Remember the Five Criteria for Release of Assignments Defined - Sound - Proper Sequence - Right Size - Able to Learn	Final Make Ready Needs Work that must and can be performed prior to release of this Assignment	Method Statement etc. Issued	Method Statement etc. Accepted	Period to Perform the Work							PPC Analysis		
					M	T	W	Th	F	Sa	Su	Y	N	Reasons for Variance
	Irvine Whitlock													
	Remove temporary covers GL C	Praters request	44		D	D	D	D	D					
	Fit boxes to stubs as required	Praters request	44		D	D	D	D	D					
	Fit film to windows in V bridge		IW15			D	D							
	Blockwork to 323 splayed corner		IW09		N	N								
	Blockwork infill to doorway 323		IW09				N	N	N					
	Decorate water damage in Hillingdon suite		IW13		N	N	N	N	N					
	Hoarding for asbestos removal 327 & 325		IW03			N	N							
	Decorate Honeywells office		IW13		N									
	Grout column bases in Hillingdon	Rowens handover	IW12					D						
	Make good slab in Hillingdon	Rowens handover	IW12						D					
	Make good around columns at roof in Hillingdon	Rowens handover	IW12					N	N					
	Decorate lift shafts				D	D	D	D	D					
	Form new door opening 323 departures level						N	N	N					
	Chisholm & Winch													
	Weather protection and water monitoring				D/N	D/N	D/N	D/N	D/N					
	Completion of hoardings 331				D									
	Soft strip 331					D	D							
	Provide escort for Parson Brinkernoff				D	D	D	D	D					
	Reinstate pier walls after rain water pipe	Maxglow request			D	D	D	D	D					
	Openings for flexiduct GL 52>53 A	CHE to mark out holes			N	N	N	N						
	Remove hoardings GL53A	Maxglow completion				N								
	Form additional door in plenum shed				N									
	Form access holes for new stubs				N	N	N							
	Attendance to Rowens for holes 101>112	Rowens confirmation			N	N	N	N	N					
	Ply protection to redundant plenum window				D									
	Air Inidan window works							N	N					

Workable Backlog

Weekly Work Plans and Production Control Meeting

Production Control Meeting



Key Points:

- Open forum, every supplier attends having completed their respective weekly work plans.
- Suppliers are clear of their key **make ready needs**.
- Area by area graphical representation utilised to ensure for all parties clarity.
- Meeting is focused solely upon production issues.
- Creation of team ethic.

MEETING LASTS NO LONGER THAN 1 HOUR !!!!

Measuring Performance – PPC

Following the Production Control meeting the Percentage Plan Compete (PPC) results, together with the reasons for non completion are recorded on the measurement system.

PPC graphs show the production performance achieved by each Supplier, relative to the number of activities planned. Workable backlog activities are excluded from measurement, as they did not account for critical planned work.

The graph below illustrates a typical PPC chart, indicating overall Supplier performance and planned activities.

PERCENTAGE PLAN COMPLETE

$$PPC = \frac{\text{NUMBER OF COMPLETED ACTIVITIES* 100\%}}{\text{TOTAL NUMBER OF ACTIVITIES}}$$

Percentage Plan Complete (PPC)

- PPC is a measure of productivity.
- Only activities completed 100% are assessed as being successfully completed.
  This means being fully snagged.
- Only planned activities are included in the PPC result.
- Workable backlog are not included in the PPC result.

Weekly Work Plan - Review

Completing the Weekly Work Plan

Weekly Work Plan

Project Name: **Heathrow Terminal 3 Pier 5 Segregation** Company: **Company X** Week Commencing: **18-November-2002**

Stage: ***Assembly*** Prepared By: **A N Other** Date Prepared: 15-November-2002

Area: DAY / NIGHT (Please circle one)

Resource Quantity	Activity Description (Quantified) Remember the Five Criteria for Release of Assignments Defined - Sound - Proper Sequence - Right Size - Able to Learn	Final Make Ready Needs Work that must and can be performed prior to release of this Assignment	Method Statement etc. Issued	Method Statement etc. Accepted	Period to Perform the Work M	T	W	Th	F	Sa	Su	PPC Analysis Y	N	
JRL	Metal Panel Setting Out				X	X	X	X	X			X		
JRL	Ceiling Amended	Request for Info from CHE as minuted 12.02.01			X	X	X	X	X			X		
CHE	2nd Fix Lighting Booms 4 - 8	Scaffold over baggage chute 42 - 40			X	X	X	X					X	55% Suppliers Pre-requisite
CHE	Connection to Desk L42	Desks in position					X	X	X			X		
CHE	Glanding to 20 PIZ Cables	J.B. boxes fitted			X	X	X					X		
CHE	Cabling to Door 01:05:42	Containment installed			X	X	X						X	20% Design Change
Gent	Cable Tie to Phase 1 Roof Area					X	X	X					X	0% Lack of Resource
Gent	Testing Circuits Arrivals Level				X	X	X	X					X	20% Suppliers Pre-requisite
Design Rationale	Lids to R40 / R42 Trunking	CHE completed w iring					X	X				X		
Design Rationale	S/Steel Panels to North Escalator				X	X	X					X		
Design Rationale	S/Steel Panels to South Stairs						X	X	X			X		
PAN	Departures P1 Riser + Ceilings	Cables to be removed					X	X	X				X	0% Late Release of Info
PAN	L33 Baggage Chute Sound Proof	Scaffold removed				X	X	X	X			X		
SGB	Dismantle LV Switch Room					X	X					X		
SGB	Dismantle Scaffold Over L33 Baggage Chute				X							X		

Workable Backlog 10/15 x 100 = 67%

Complete end of week review of activities

Define reasons for non completions from non-completion list.

Evaluate PPC% (No of completed activities / Total No. of planned activities).

Review Performance & Agree Next weeks WWP in the Production Control Meeting.

Measuring Performance – PPC

Following the Production Control meeting the Percentage Plan Compete (PPC) results, together with the reasons for non completion are recorded on the measurement system.

PPC graphs show the production performance achieved by each Supplier, relative to the number of activities planned. Workable backlog activities are excluded from measurement, as they did not account for critical planned work.

The graph below illustrates a typical PPC chart, indicating overall Supplier performance and planned activities.

PERCENTAGE PLAN COMPLETE

$$\text{PPC} = \frac{\text{NUMBER OF COMPLETED ACTIVITIES* 100\%}}{\text{TOTAL NUMBER OF ACTIVITIES}}$$

Percentage Plan Complete (PPC)

- PPC is a measure of productivity.
- Only activities completed 100% are assessed as being successfully completed.
  This means being fully snagged.
- Only planned activities are included in the PPC result.
- Workable backlog are not included in the PPC result.

Reasons for failure should be obtained using the **“five whys”** technique. This is a practise of asking “why” five times whenever a problem is encountered, in order to identify the root cause of the problem.

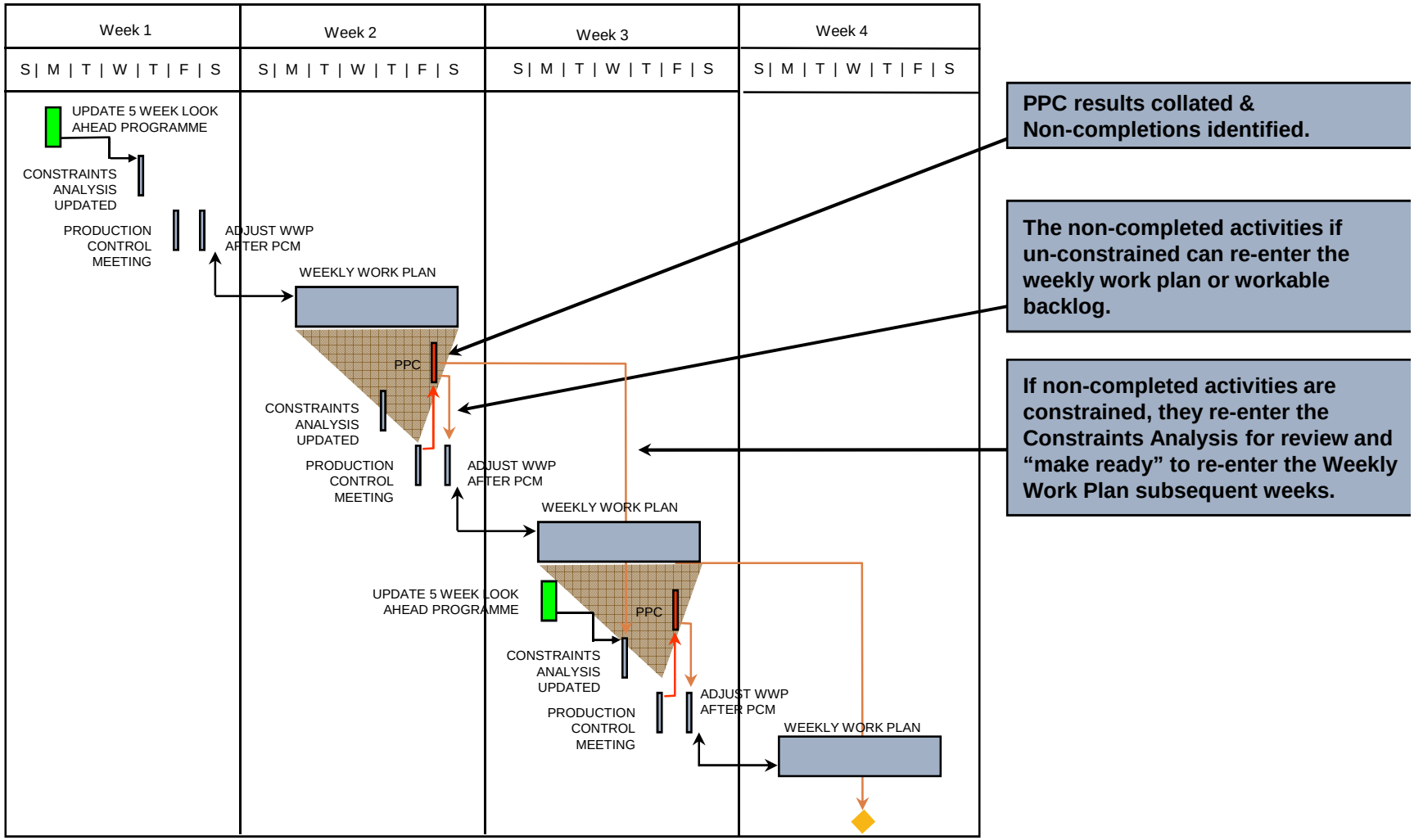
Reasons for not Completing the Work

- Materials (i.e.... late or defective)
- PM/CM M*anagement team failures*
- Supplier Management failures
- Interface Supplier Pre-requisite work
- A change in priorities to other areas of work
- Manpower (Absenteeism or accident)
- Under-estimation of resource required
- Having to re-work areas
- In-accurate design information
- Items outside influence of the project
- Weather
- Miscellaneous/Non controlable issues

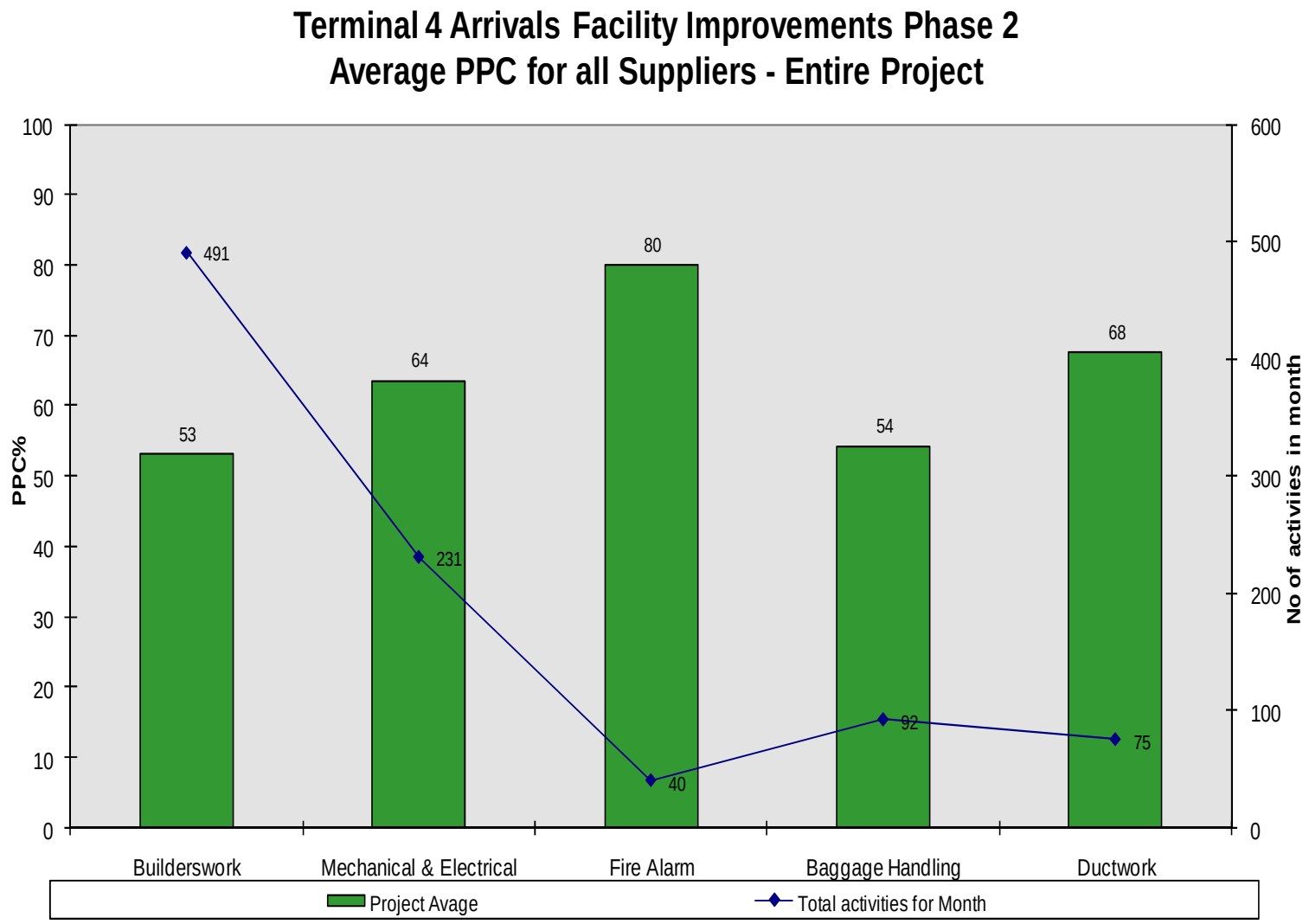
Weekly Work Plans and Production Control Meeting

Weekly Work Plan - Work Plan Cycle.

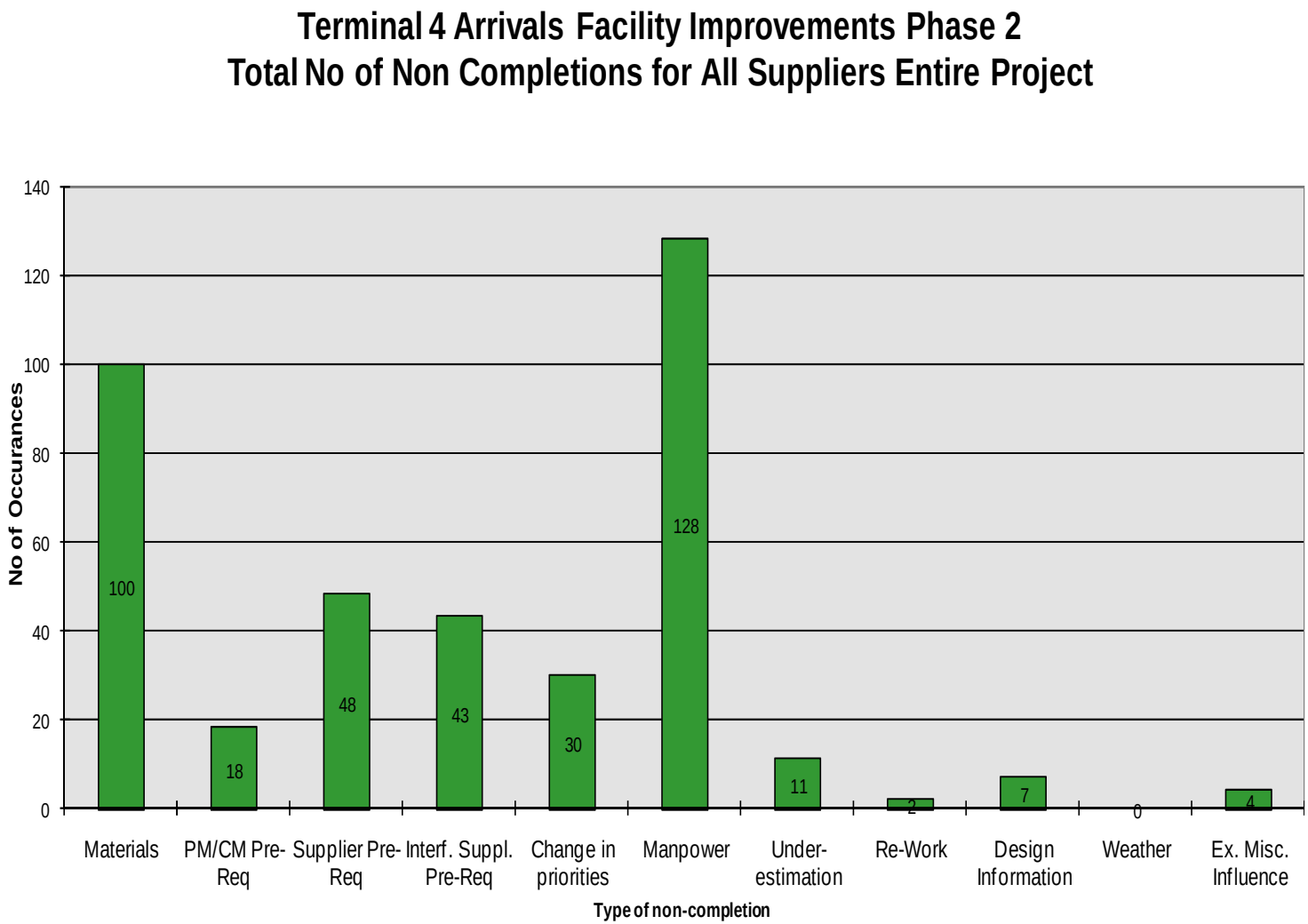
The following work cycle is repeated each week to produce Weekly Work Plans and evaluate them at the Production Control Meeting.



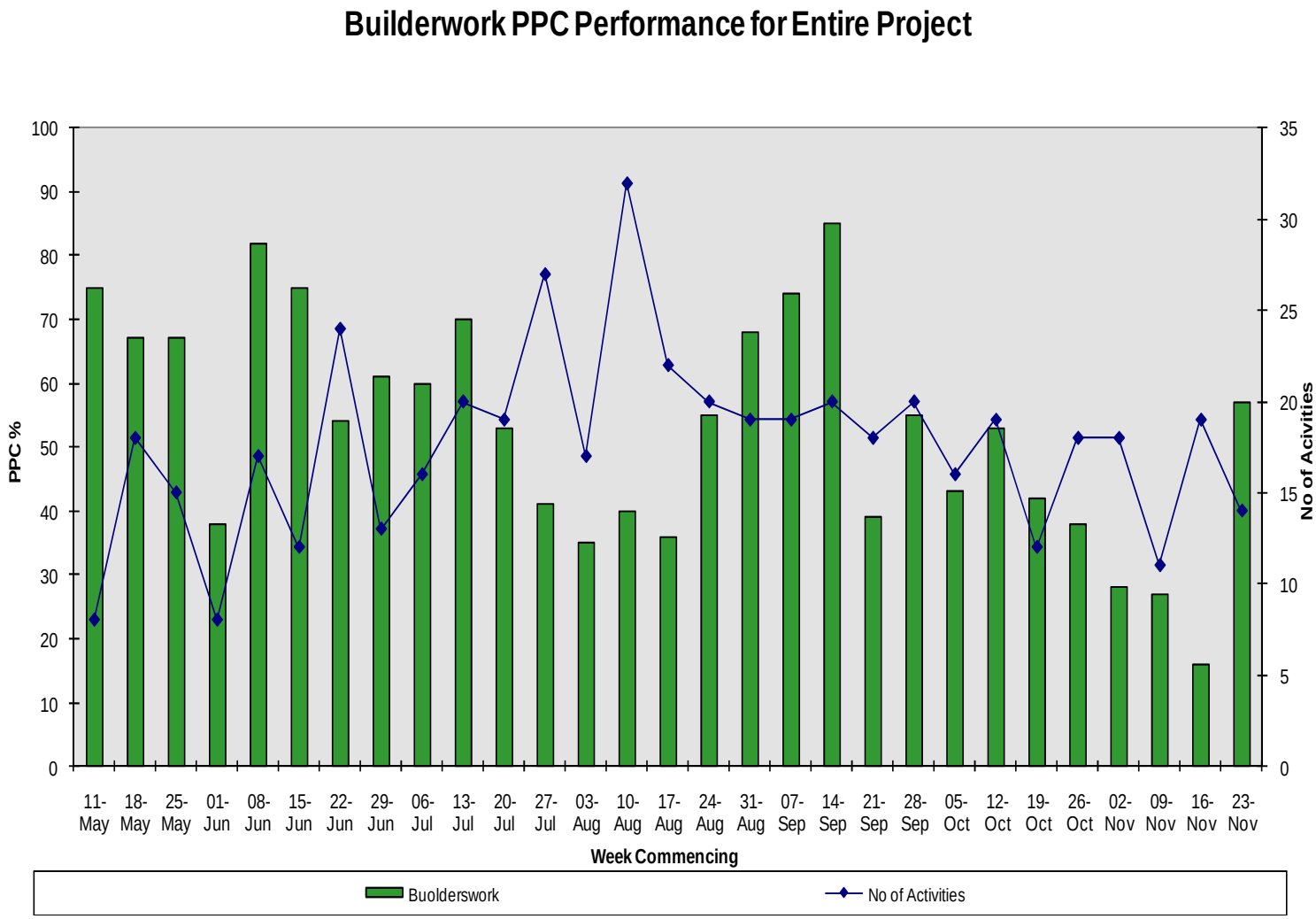
Project Results - Project Performance



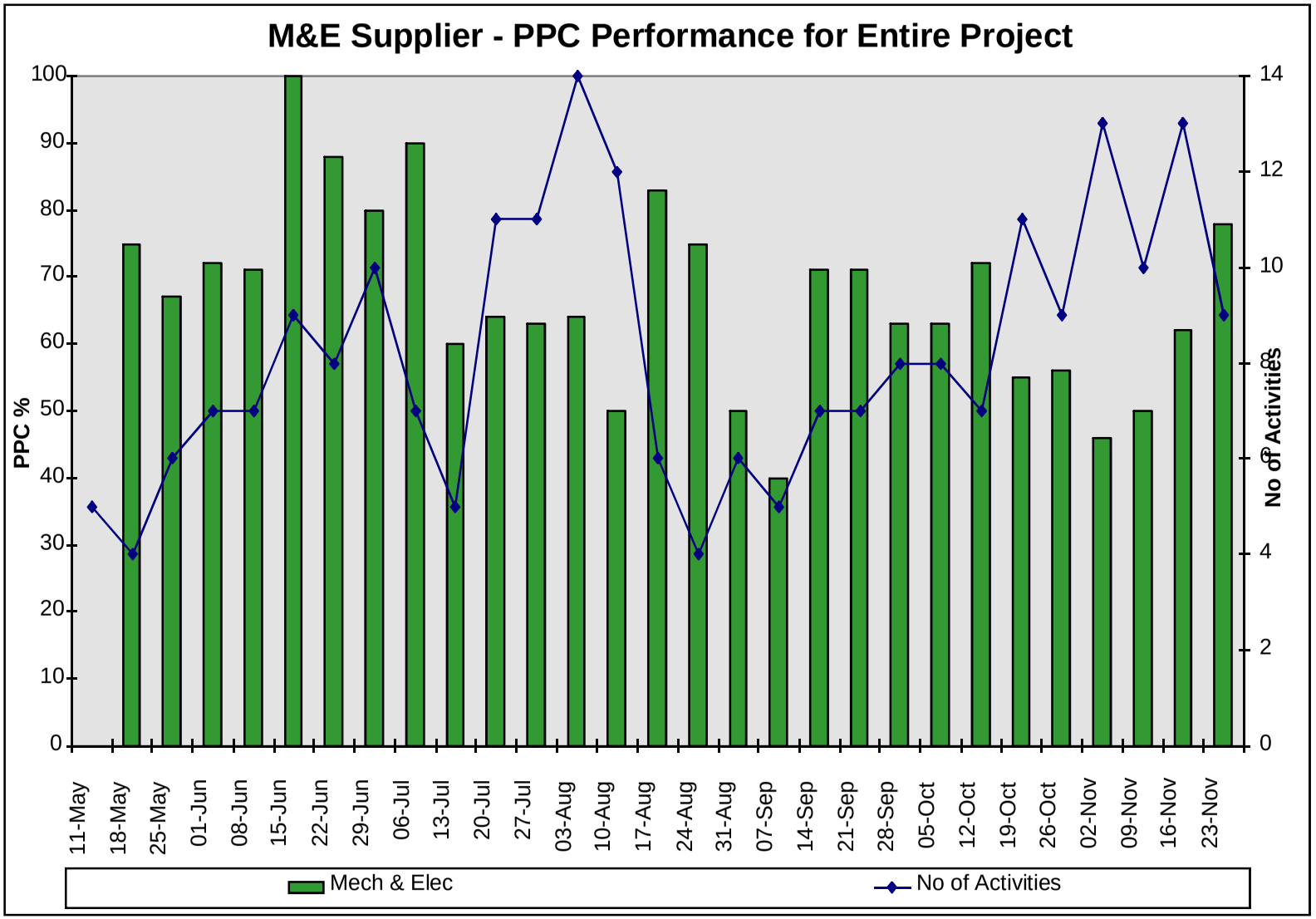
Project Results - Reasons Analysis



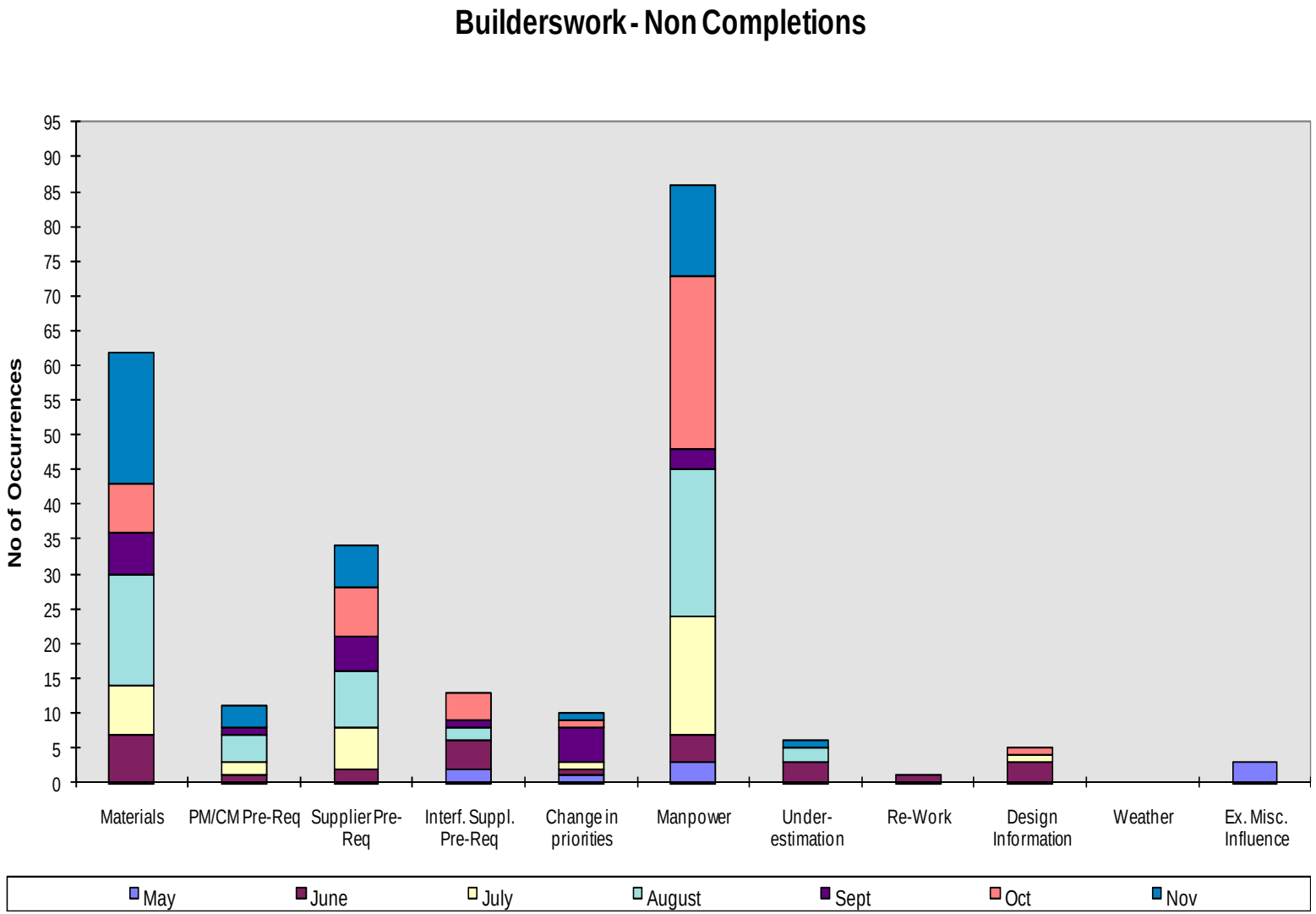
Project Results - Output Trend



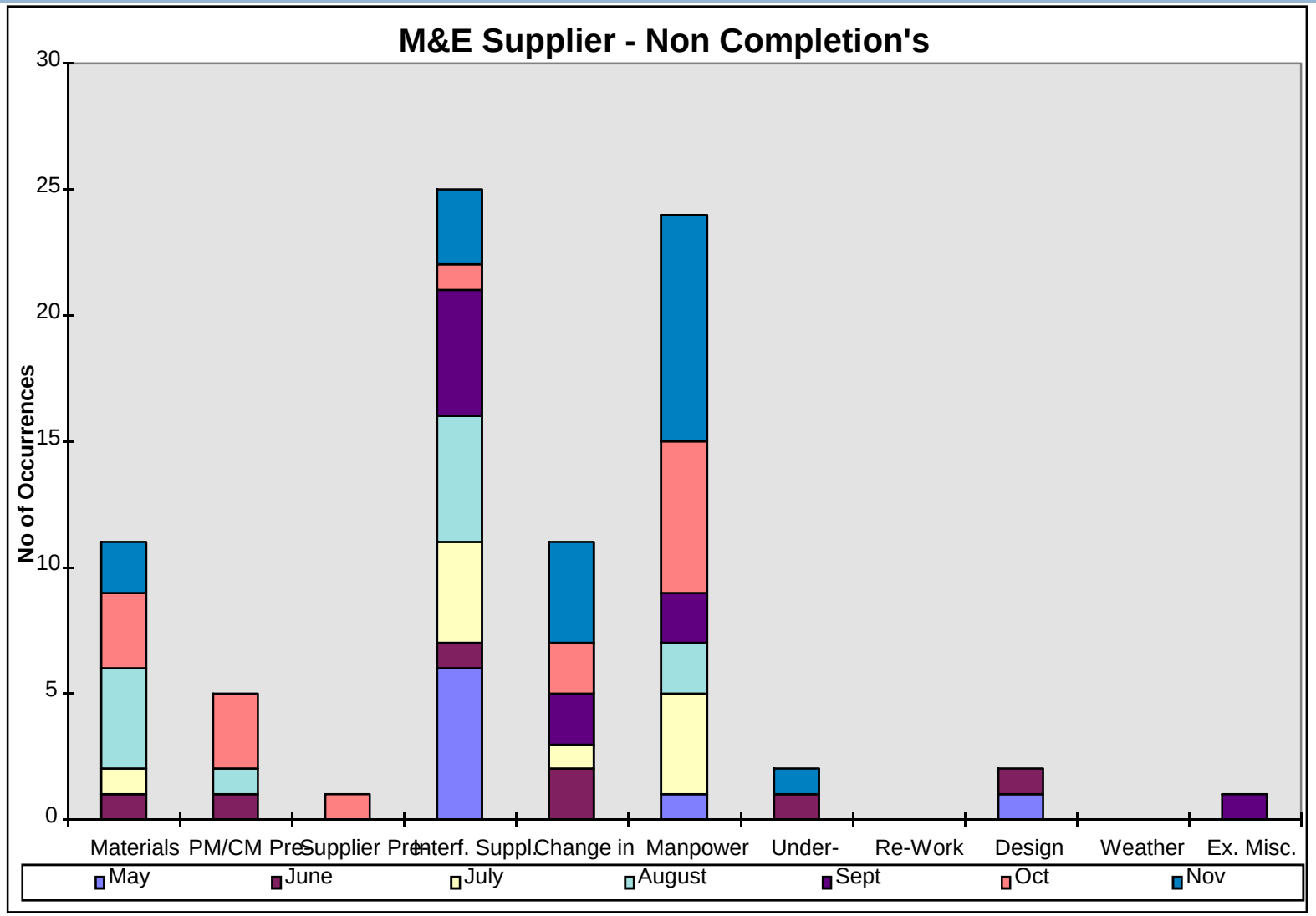
Project Results - Output Trend



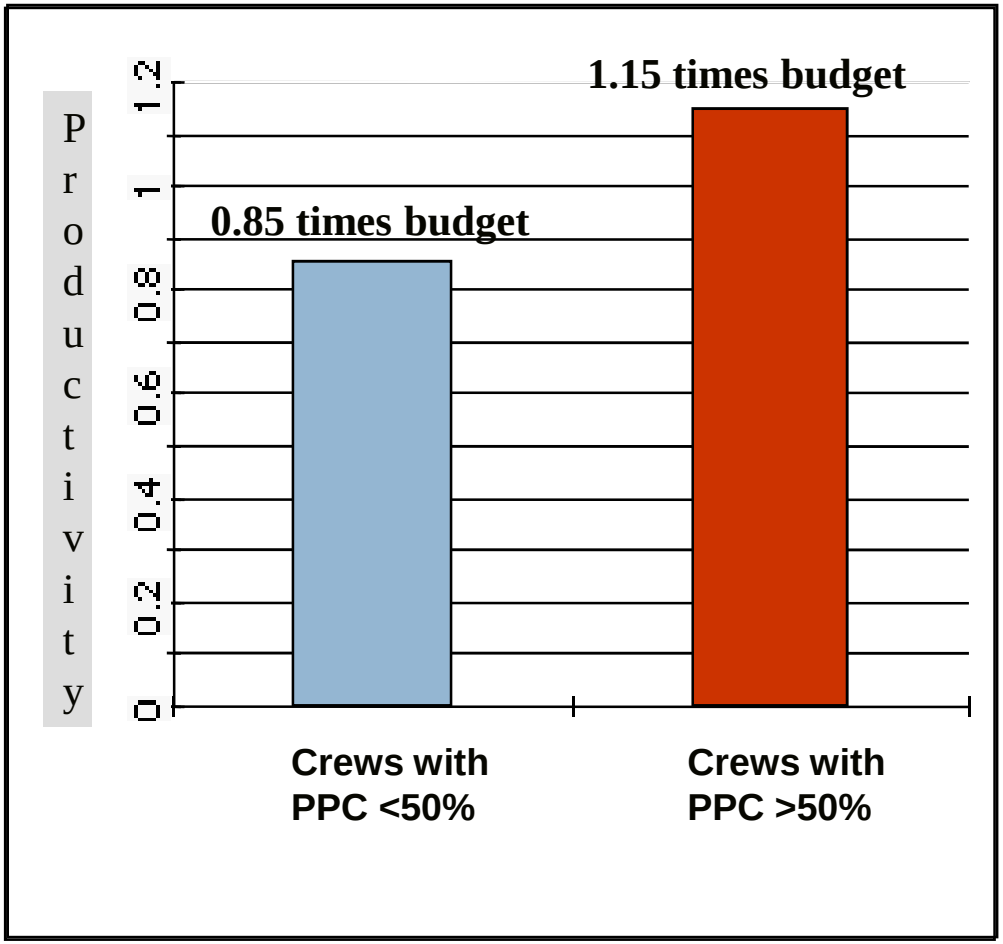
Project Results - Reasons Analysis



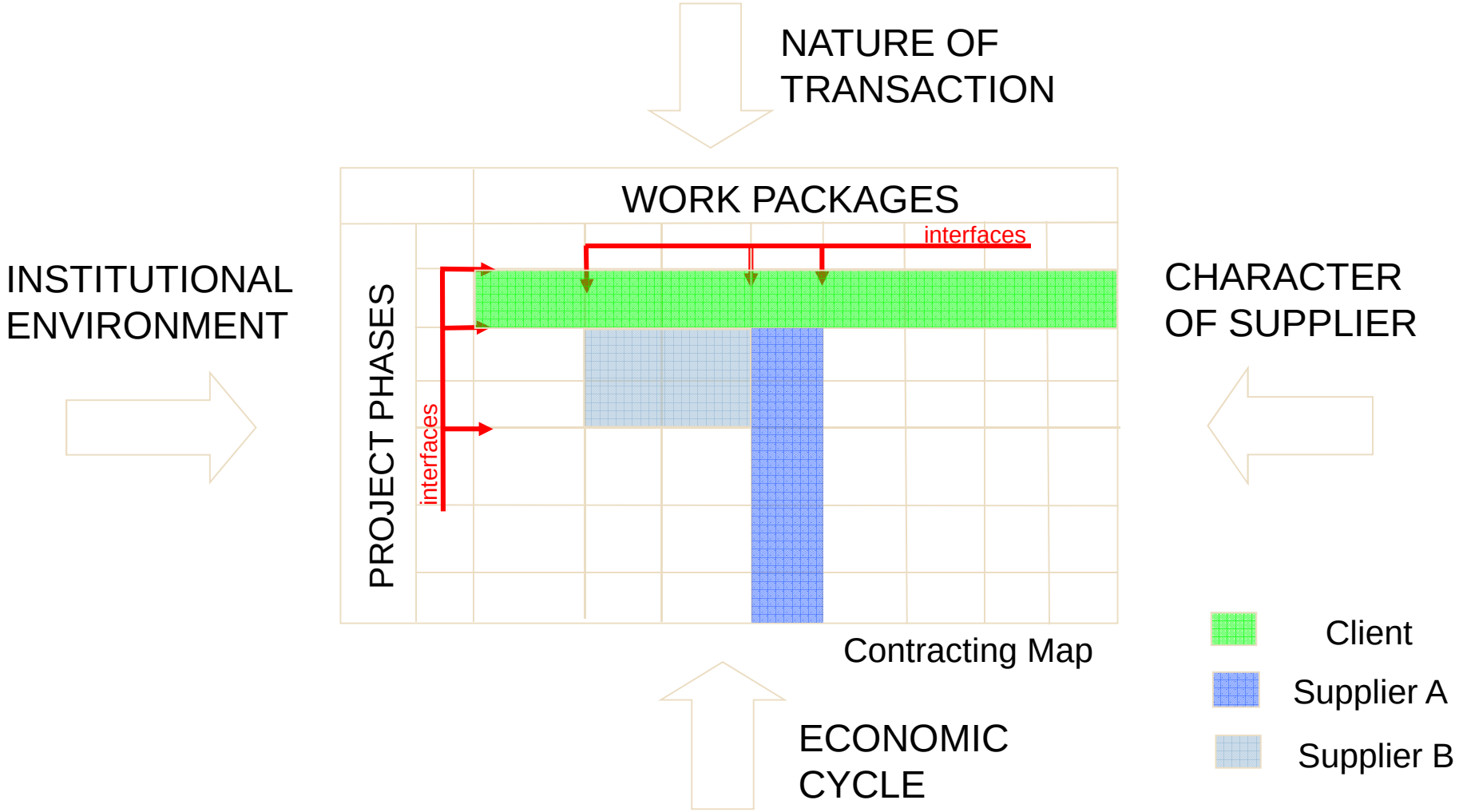
Project Results - Reasons Analysis



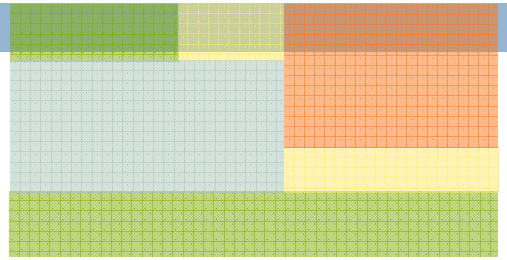
Percentage Plan Complete & Productivity



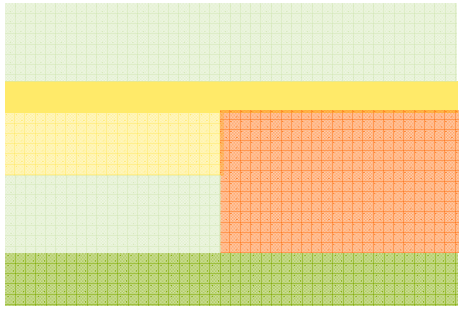
Four-force Contracting & Procurement Model



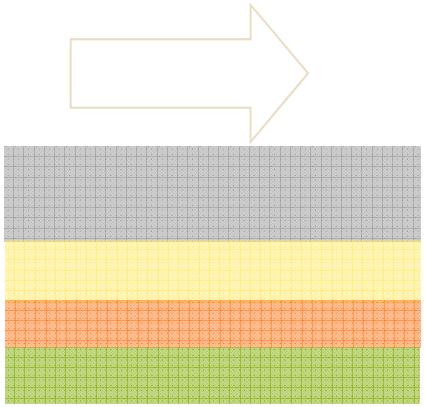
Contracting Map: Clarify Interfaces, Resource Needs



NATURE OF TRANSACTION



INSTITUTIONAL ENVIRONMENT

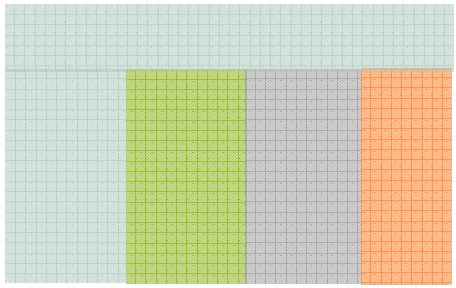


PROMS DIVISON OF WORK OPTION I

	Civil		E & I		DCS		
	Build.	Infrastr.	Infrastr.	Field Instr.	ESD	Infrastr.	Applications
Project Management							
Feed							
Detailed Engineering							
Procurement Equipment & Materials							
Prefab Application Development Configuration Applications							
Construction / Installation							
Training							
Testing							
Demolishing							
Commissioning							
Handover							
Operate							

CHARACTER OF SUPPLIER

Contracting Map



ECONOMIC CYCLE

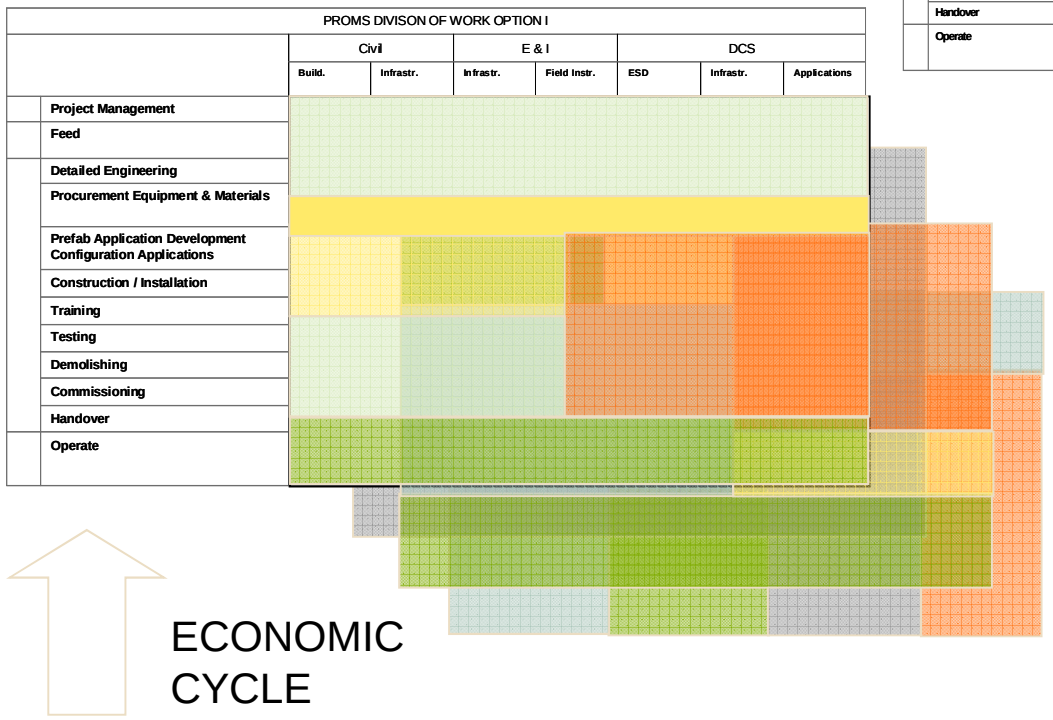
What are the trade-offs? What are the risks incurred? What are the behaviours induced?

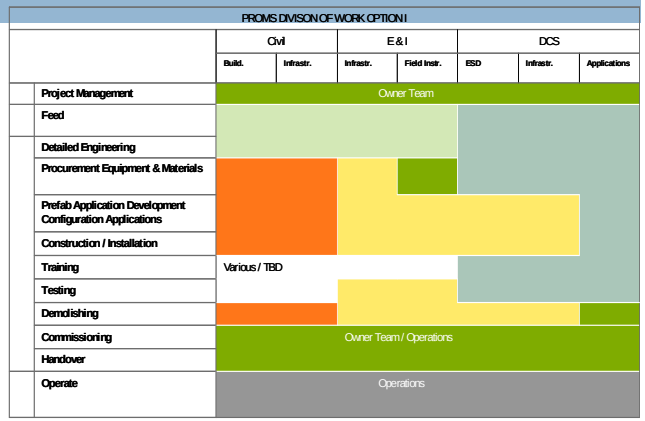
NATURE OF TRANSACTION

INSTITUTIONAL ENVIRONMENT

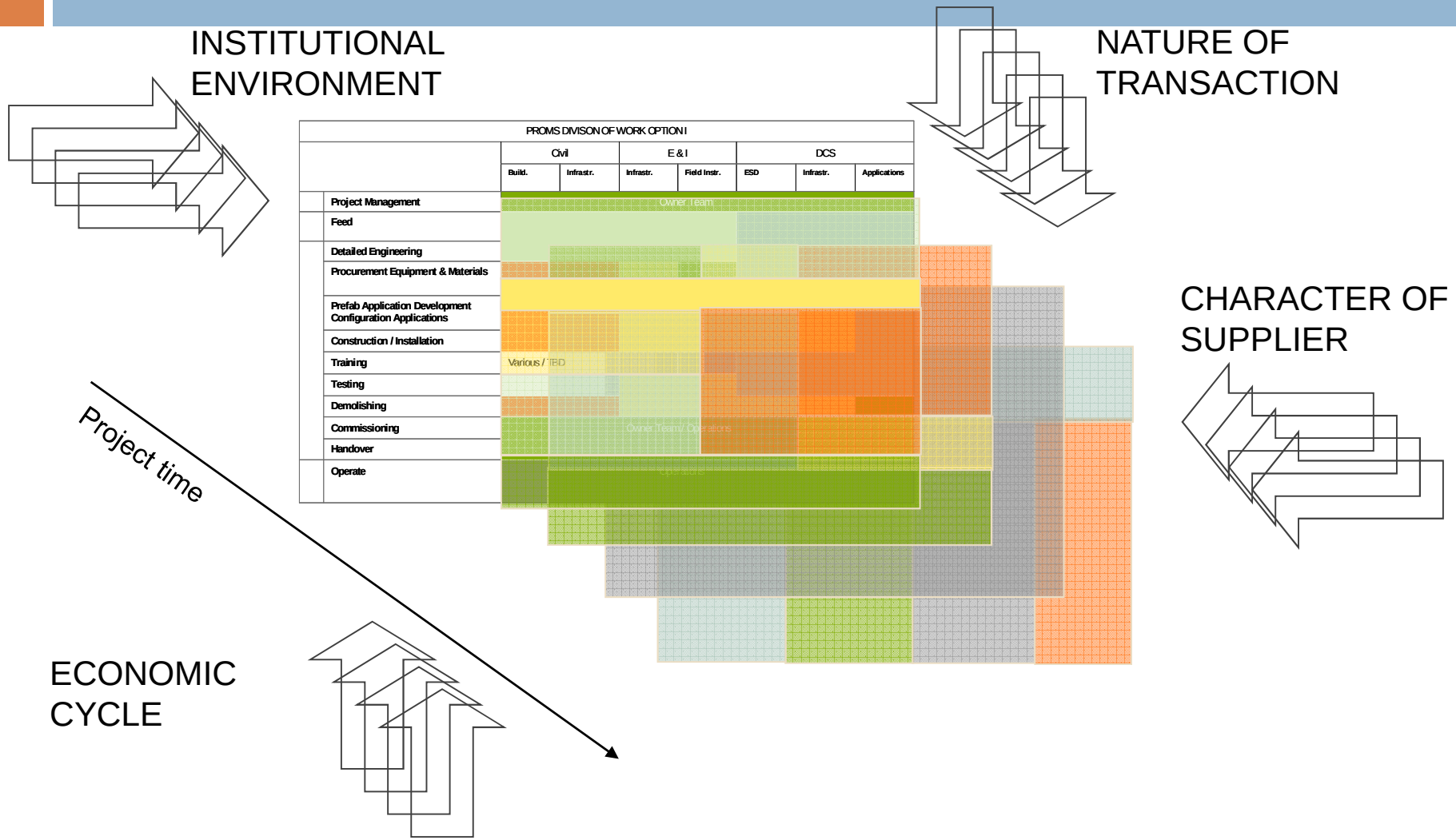
CHARACTER OF SUPPLIER

ECONOMIC CYCLE





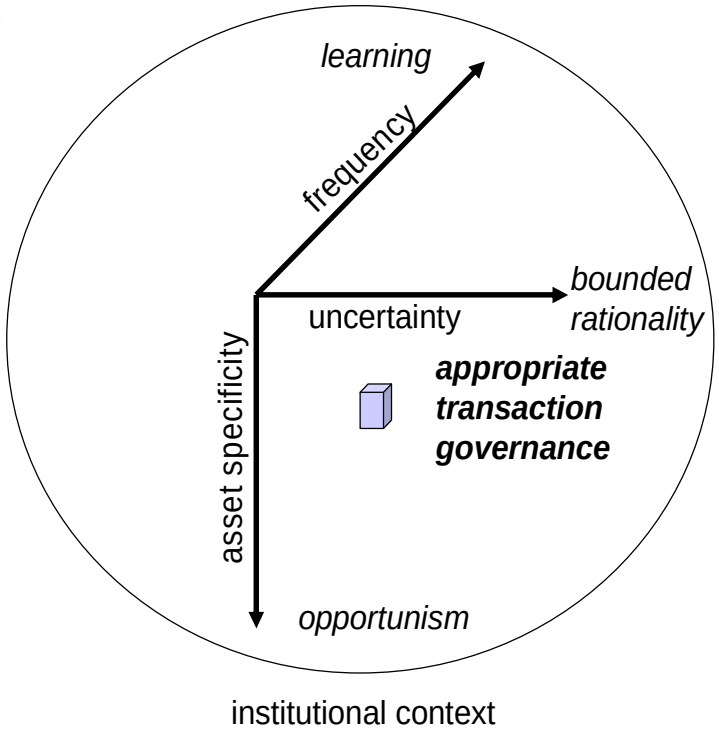
And be prepared to adapt strategy over project time !



Effects of Nature of Transaction

(Williamson 1985)

- Transaction cost economics maps contracting types to governance arrangements that minimize transaction cost
- Transaction cost: cost incurred in making economic exchange
- Determinants of transaction costs: Frequency, Asset specificity, Uncertainty



(Winch, 2001)

Actual Proposition for Main Concourse Building

	Baggage Handling System	Excavation & Foundations	Steel Superstructure	Roof	Facade	Escalators & Lifts	Mechanical and Electrical Systems	Most Fit Out packages	
Project management	BAA								
Conceptual Design	Vanderlander reimbursable	ARUP/Richard Rogers/DSSR/reimbursable contract							
Design Development		Arup/Mott McDonald/ reimbursable	Arup/Pascal Watson/reimbursable			Schindler/ Kone reimbursable	AMEC/ Hotchkiss reimbursable	Pascal/Watson/ reimbursable	
Production Design		Laing O'Rourke/ Morgan/ Vinci/ reimbursable contract	Rowen Watson Steel/ reimbursable contract	Rowen Watson Steel/ Hathway/ Reimbursable contract	Schmidlin/ Reimbursable contract			One Supplier /Lump Sum	Many Suppliers / Lump Sum
Procurement									
Install & Commission									

Conclusion

- Decide on the procurement strategy (Make-Or-Buy)
- Analyze the risks associated with each package
- Asses the Complexity of each package
- Apply the Procurement maps along with Contract selection matrix to select the most appropriate procurement method for each package
- Plan the Work – Work the Plan
- Keep continuous monitoring on the progress