Well Delivery Process

A Proven Method to Improve Value and Performance While Reducing Costs.

IADC/SPE 128716

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Performance consultants to industrial organizations

To day I will cover the following

- Purpose of a WDP
- Stage Gate Processes
- Distinction of type of operations
- Overview of WDP
- Key tools for WDP
- Lessons learned from application
- Success factors

Well Delivery traditionally called a process

- Process is a series of actions directed to some end (ref. flowchart)
  - the completion of a well for data acquisition or hydrocarbon production.
- But it is a system ……

Characteristics of a System

- Defn: Set of detailed methods, procedures and routines established or formulated to carry out a specific activity

- Structure
  - defined by parts and their composition;
- Behavior
  - which involves inputs, processing and outputs of information, energy and material;
- Interconnectivity
  - the various parts of a system have working as well as structural relationships between each other.

The purpose of the WDP is to:

- Maximize the value of a well
- Minimize the risk in constructing and operating the well
- Align goals through the value chain
- Gain multidisciplinary input
    - internal and external to the organization
- Optimize the front end workload
- Deliver reduced & predictable costs

The WDP is managed through stage gates

- Define the stages
  - Usually matched to Capital Value or Opportunity Realization process
- Balance the stages
  - Sufficient for the decision or action
- Define the gates
  - Deliverables
  - Approvals

Typical WDP Stages

	Identification & Assessment	**Evaluation & Selection**	**Planning & Procurement**	**Execution**	**Hand Over / Close Out**
	Will we undertake it?	What will we undertake?	How will we undertake it?	Undertake it.	How did we undertake it?
Risk & Uncertainty	Major risks & uncertainties	Narrowed options, Critical early decisions	Risks addressed, contingencies planned	Discipline to manage against plan and contingencies	Analysis
Design and program	Concepts	Selected design	Detailed design	Execution program	Report and Lessons Learned
Other aspects					
Cost range	+50% to – 30%	+25% to - 15%	Budget +15% to – 10% AFE +10% to – 5%	Actual	Planned vs. actual

Definition of the stage gates is critical

Deliverables, forward plan, decision criteria

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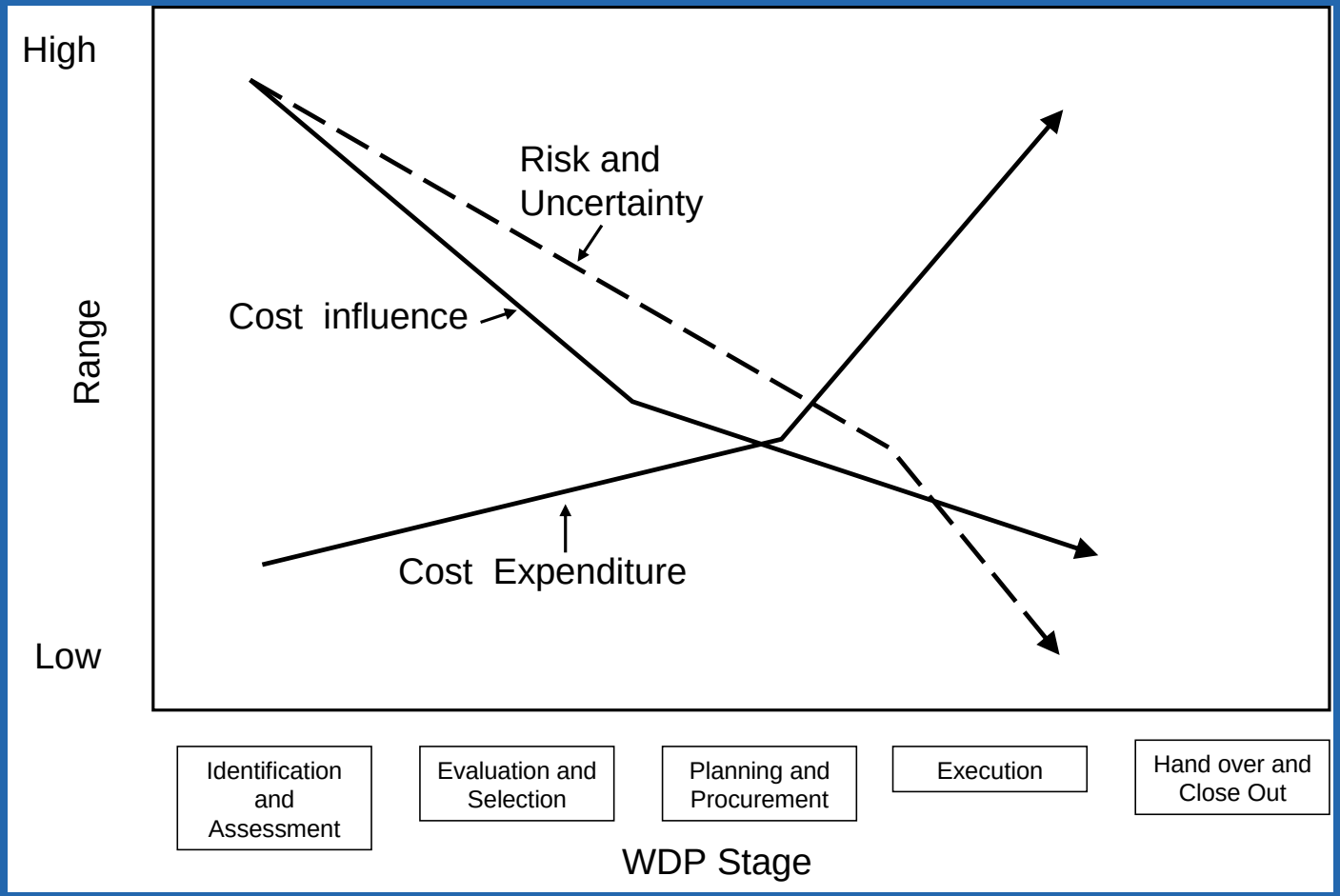
Overview


High
Range
Low
Risk and
Uncertainty
Cost influence
Cost Expenditure
Identification and Assessment
Evaluation and Selection
Planning and Procurement
Execution
Hand over and Close Out
WDP Stage

It is very important to distinguish types of operations

- Projects
  - Non repetitive with unique goal
- Ongoing business
  - Repeated processes to deliver products and services
  - Multiple types

Features of different types of ongoing business

	Job Shop	Batch	Repetitive	Continuous
Description	Customized	Semi standardized	Standardized	Highly standardized
Advantages	Handles wide variety	Flexibility	Low unit cost, High volume	Very efficient, Very high volume
Cost Estimation	Difficult	Somewhat routine	Routine	Routine
Scheduling	Complex	Moderately complex	Routine	Routine
Wells analogy	New designs of wells Infill wells	Groups of infill wells with similar characteristics	Large number, identical wells	None

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Projects through ongoing business

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Desired transition

Reduced stages of WDP, less detail of WDP, shorter planning duration

Revised well design, increased uncertainty sub surface

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There is an industry trend that enables transition to repetitive operations

Reducing uncertainty sub surface

Key WDP Tools

- Risk and Uncertainty management
  - Qualitative – identification and ranking
  - Quantitative - modeling
  - SPE 97269

An example of a risk assessment matrix

HSE	Schedule	Capital cost	Operating cost	Functionality	Production	Reputation					
Fatality or serious permanent injury	1 week	$ 1 mill		Loss of >50%	PI Reduction 50%	Prosecution Possible loss of operating license	25	25	50	75	100
Serious injury	1 day	$100,000		Loss of 10 to 50%	PI Reduction 25%	Regulator involvement	10	10	20	30	40
Lost Time Incident	6 hours	$25,000		Loss of <10%	PI Reduction 10%	Complaints from local community	5	5	10	15	20
First Aid	1 hour	$5,000		Little impact	Little impact	Little impact	1	1	2	3	4
								1	2	3	4

Impact

Probability / Frequency

> 5 years	1 year	6 months	< 14 days
< 5%	5 - 25%	25 - 50%	> 50%

Risk ID	Project sub group	Project phase	Description of event	Description of cause	Risk or Uncertainty	Impact type	Impact rating	Probability rating	Risk rating
1		Proj Specification	NAPIMS approval later than scheduled	Delays beyond expected duration	Risk	Schedule	25	3	75
2			Poorly understood process requirement	Uncertainty of process rate and stream conditions is interpreted as chnages in design parameter	Uncertainty	Functionality	10	4	40
3			Work not completed according to schedule	Resources assigned late, insufficient resources assigned	Risk	Schedule	25	4	100
4	Subsurface	Proj Specification	Gas volumes are larger than base case used in FEED	Oron production	Uncertainty	Functionality	5	1	5
5	Subsurface	Proj Specification	Gas volumes are larger than base case used in FEED	Additional upside production	Uncertainty	Functionality	5	2	10
6	Facilities	Proj Specification	Current structures unable to take additional loads of risers, etc	Structures inadequate for additional use	Risk	Capital cost	10	2	20
7	Facilities	Proj Specification	Loss of oil production	Shut down required for interfacing the CPU 2 to current production	Risk	Production	10	3	30
8	Facilities	Proj Specification	Insuffiicient reserves to meet sales contract	Non associated gas less than expected					0
10									

- Risk identifier
- Project phase
- Risk event
- Risk cause
- Estimate of risk probability (from the matrix)
- Estimate of risk impact
- Identification of type of impact
  - (safety, cost (opex / capex), schedule, functionality)
- Risk ownership
- Mitigation actions
  - Plan it out, develop contingency
- Cost / benefit of mitigation
- Timing of mitigation

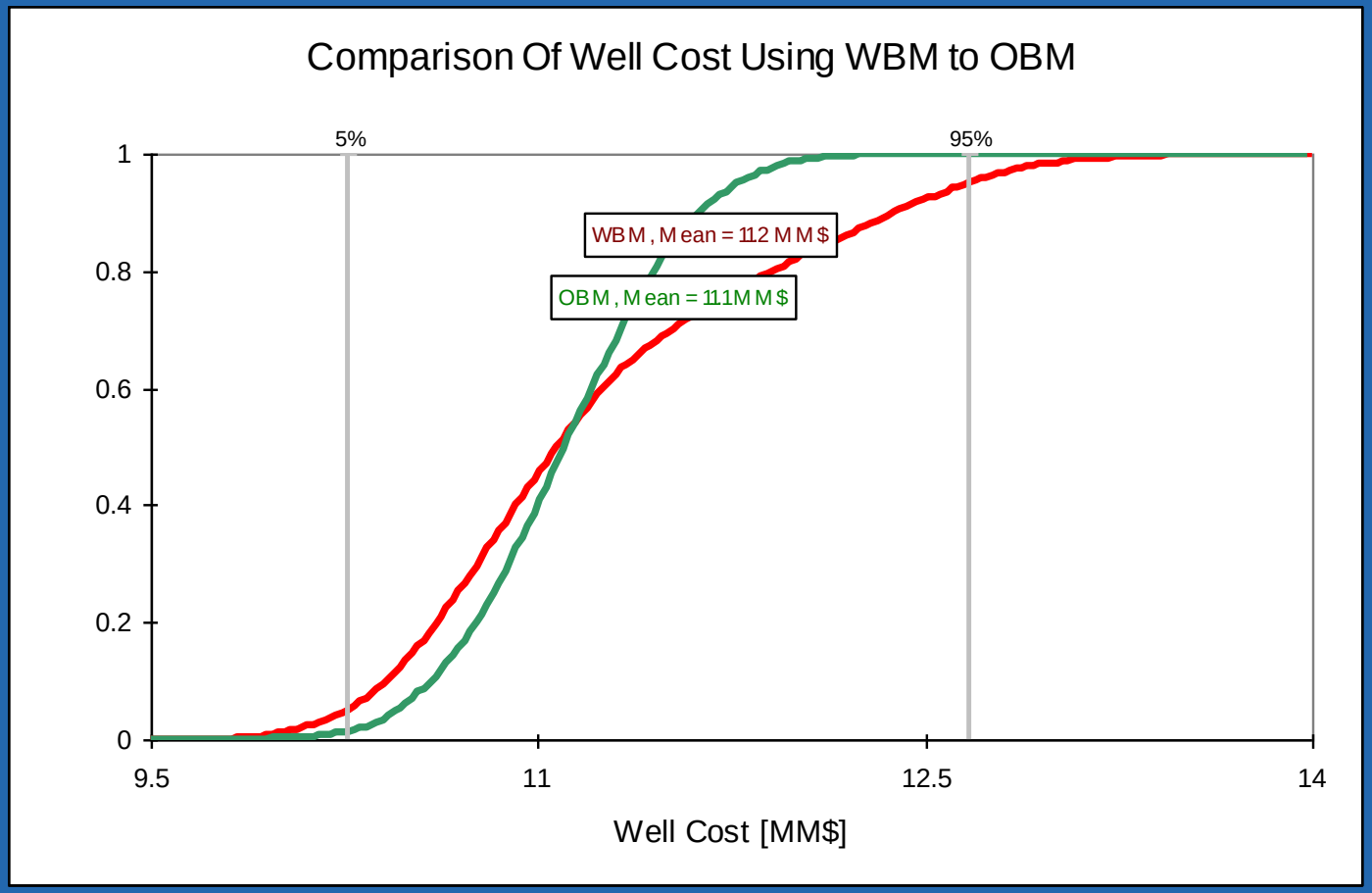
Key WDP Tools

- Detailed scheduling
  - Planning and preparation activities
  - Linked schedules with lead times
  - Detailed – 1000 vs. 40 activities
  - Daily update, auto look ahead
- Technical Limit Process
  - Addresses Invisible Lost Time (+NPT)
  - Early stretch goals (BHAG's)
  - Schedule, functionality and cost

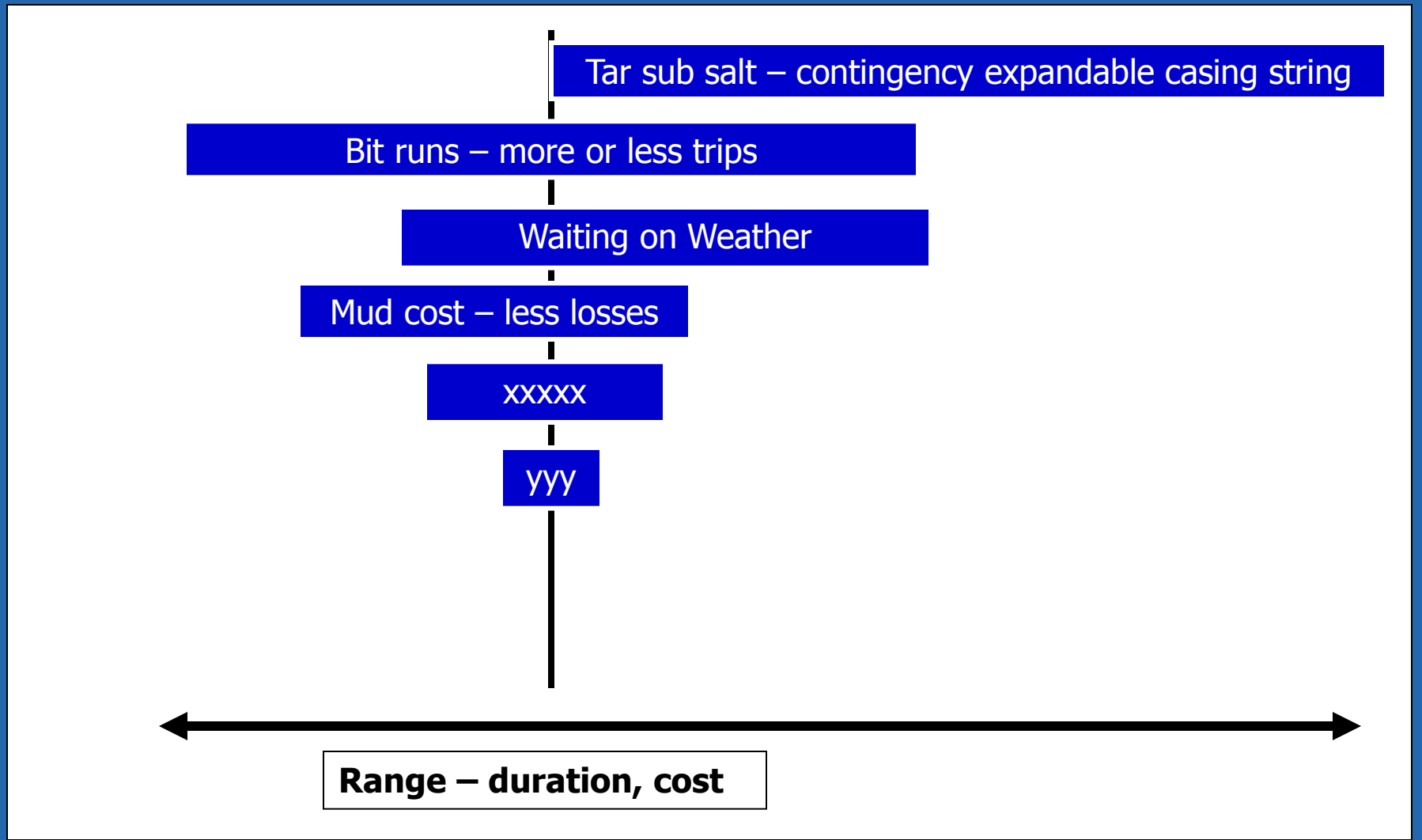
Key WDP Tools

- Probabilistic cost estimating
  - Risks / uncertainties in schedule & cost model
  - "S" curve – shows range of costs
  - Tornado diagram – ranking uncertainties

“S” curves enable visual comparison of mean cost / time vs. spread



Tornado diagrams rank the drivers of uncertainty in cost / schedule



Key WDP Tools

- Simulation / Table top exercises
  - DWOP / CWOP / TWOP / …..
  - Minimize critical path time
    - » Essentially rotary table
  - Optimize preparation
  - Minimize risks
    - » Full identification
    - » Manage, mitigate
  - Gain ownership in the plan
    - » Input from all sources

Some of the Lessons Learned

- Arbitrary 10% contingency is without foundation
- Inadequate and poor tools:
  - DWOP is just a 2 hr presentation
  - Over application distributions = central limit theory
  - Risk ranking illogical
- Poor application of tools
  - Risk log dormant
  - Skipped risk log because supervisor felt it was routine
- Failure to listen
  - Ignore the input from suppliers

Some of the Lessons Learned

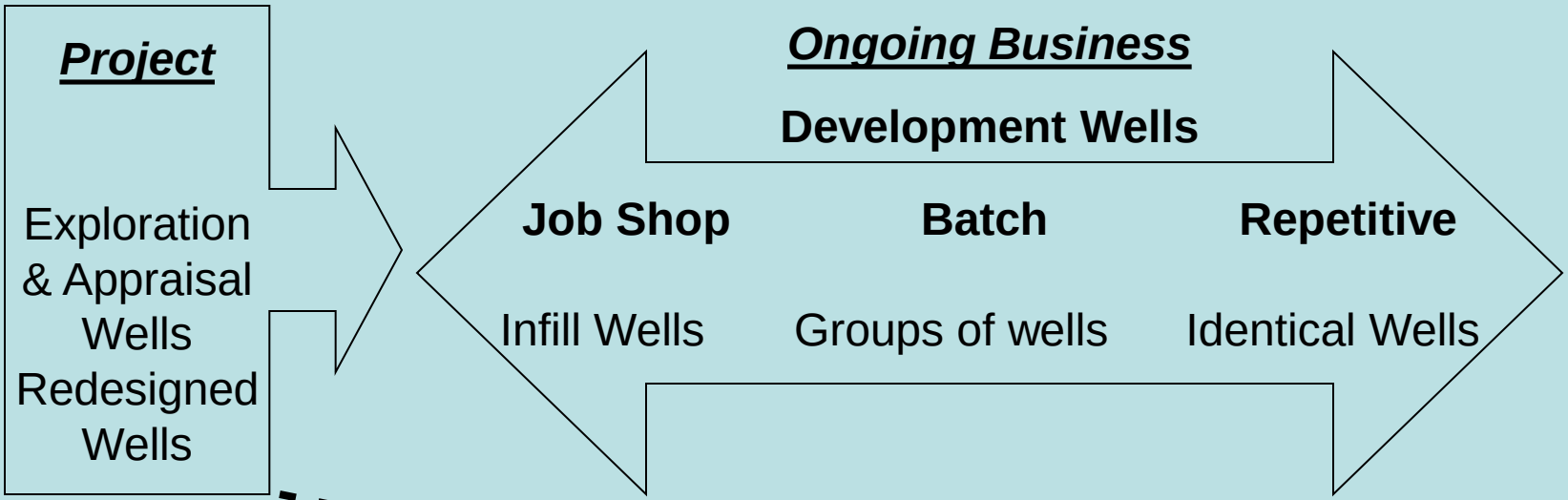
- Inadequate time to plan
  - Compressed drilling sequence led to operational failure
- Failure to maintain WDP integrity
  - Take short cuts
  - Failure to audit application
- Lack of management commitment
  - Unable to invest in planning time and effort
- Check lists are 'tick the box"
- Failure to correlate to type of operation

Application benefits (detriment)

- West Africa- marginal fields / complex wells:
  - Best in Class industry benchmark
  - NPT from 33% to 7%
- Two cases poor application:
  - Performance vs. benchmark dropped (2x)

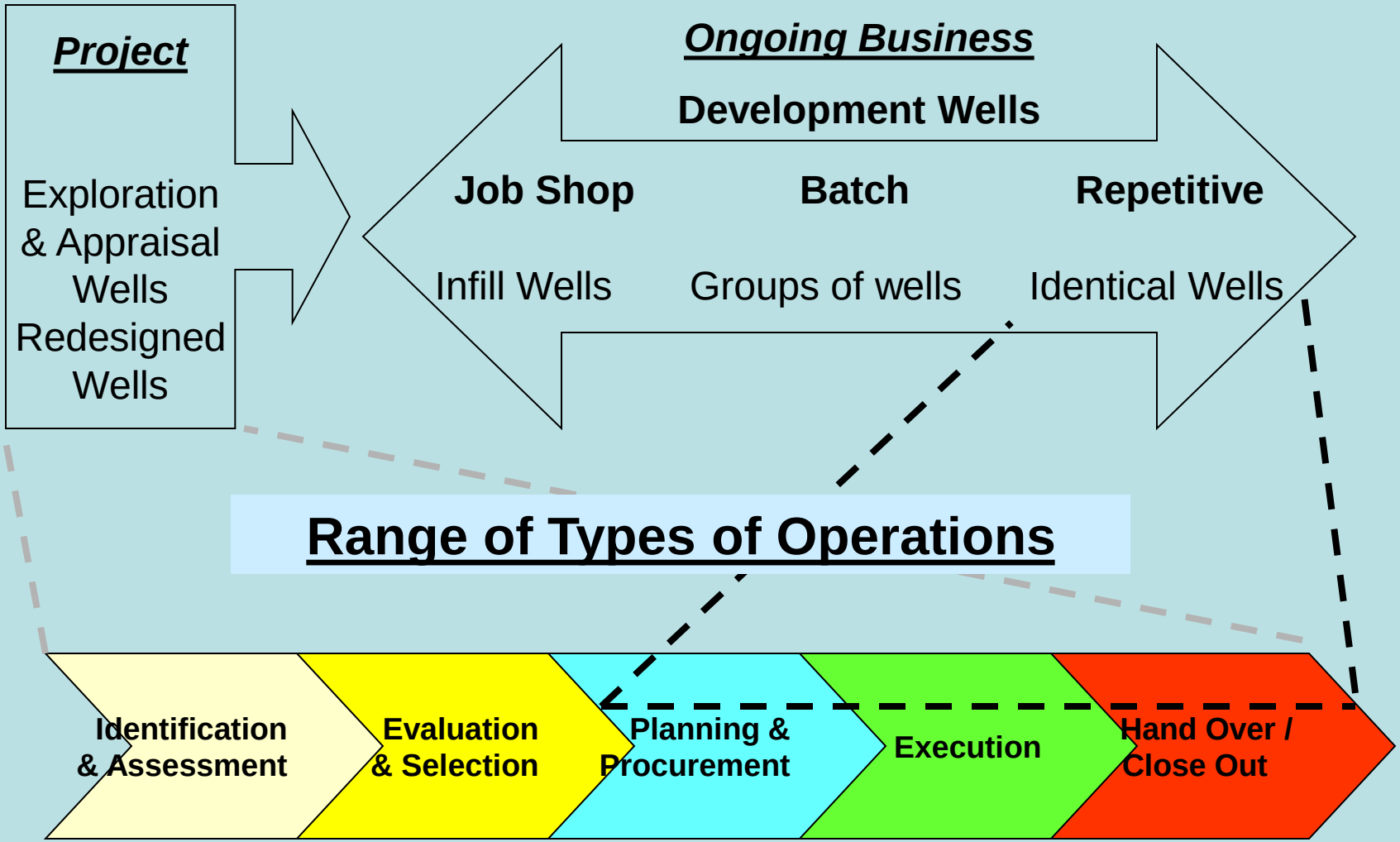
WDP success factors

- Well defined and relevant to end user
  - Built in house rather than copied from outside
- Leadership drives implementation
  - Discipline to manage the gates
- Process tools are carefully selected & applied
- Scalable application (adjusts to operation)
  - Large effort for Project type wells
  - Lower effort for Repetitive type wells
  - Scale the use of tools
    - » New risks vs. routine risks
  - Maintain rigor
- Benchmark performance
  - Ascertain and monitor results



Range of Types of Operations

Well Delivery Process - Stages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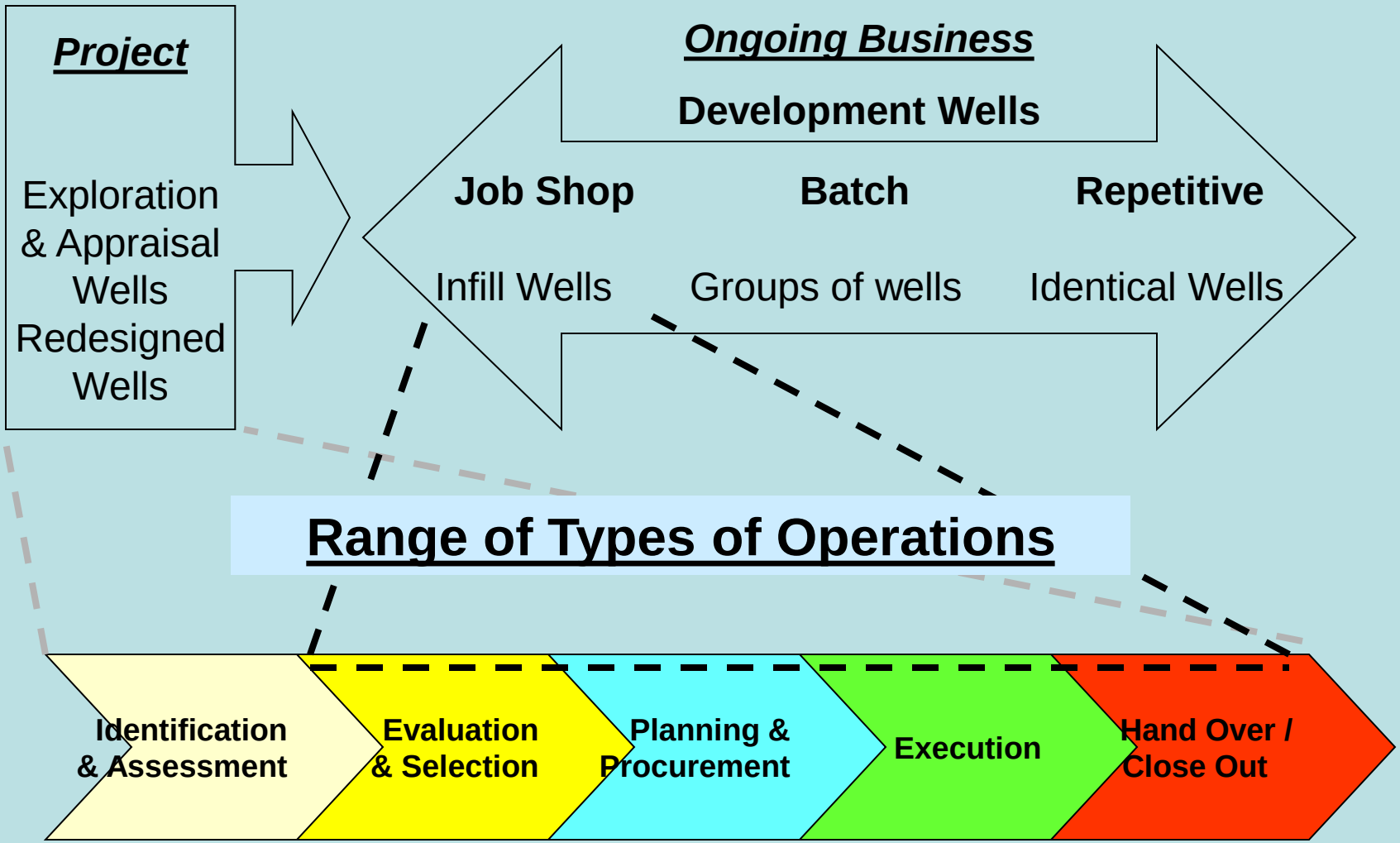
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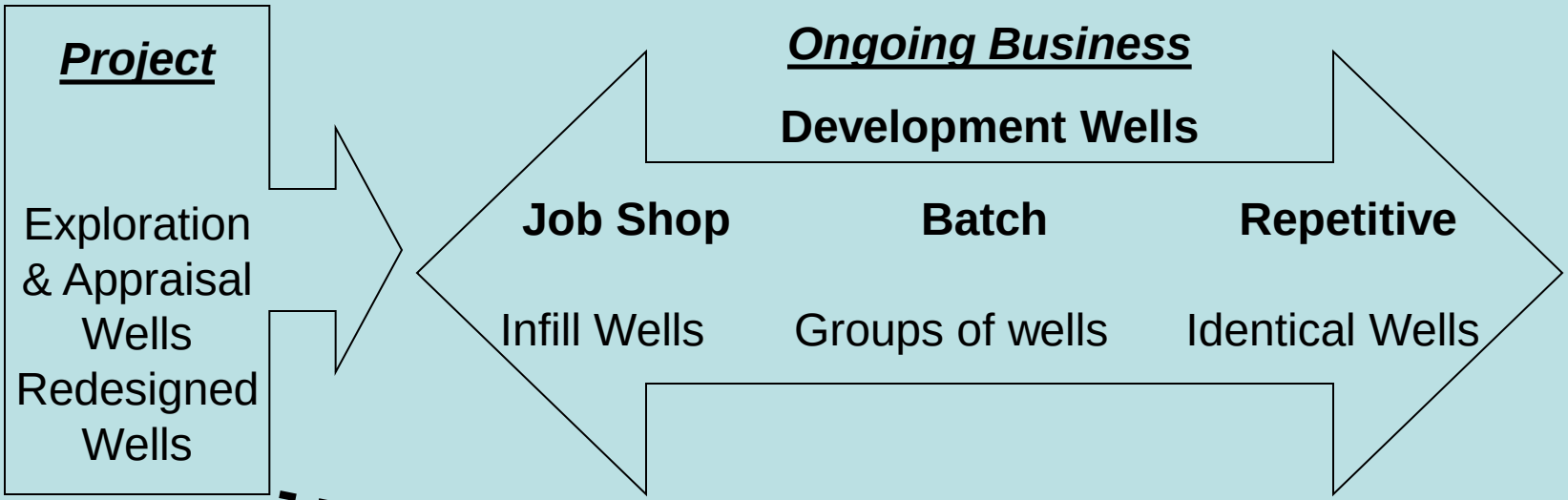

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The Well Delivery Process

Thank You

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