Productivity Improvement Through Collaborative Shift Planning and Tracking
The challenge of short term planning – maximizing value

- Long term plans are designed to maximise value from the mines
- The short term plans determine what is actually delivered

⇒ Aligning the short term plan to the long term plan is critical

- The underground operational environment is inherently high variability
- The easiest headings are the opposite of the critical path (max value)

⇒ Monitoring spatial compliance to plan is key
The challenge for Gold Fields Australia

- Large, complex underground mines
- Critical paths with multiple constraints
- Increasing depth:
  - Just-In-Time (JIT) mining
  - Geotechnically constrained sequences
  - Higher potential for unplanned interruptions
Why did Gold Fields decide to target Short Term Planning and Execution?

- In 2014 the MOS (Management Operating System) project was initiated to align mine planning and management processes across the sites.

- Short term planning and execution was identified as the highest value project.
Context: where we were

Short term plans manually created and updated in Excel.

This process has inherent issues with:

- Aligning operation to medium and long term plans
- Loss of information from long and medium term plans
- Excel isn’t a scheduling tool, creating errors and missing interactions
- Time consuming and repetitive process
- Quality is dependent on the individual planners
A good plan is the basis for optimised productivity in the operation.

✓ Achievable / practical / understandable
✓ Reflects capacities of equipment and headings
✓ Fully exploits critical path
✓ Respects activity relationships, manages interactions
✓ Presents an appropriate level of information
✓ Spans the entire value stream, managing leading activities
✓ Smooth and consistent, sets up for future continuity
✓ Incorporates learnings from previous cycles
How do you execute a good plan well?

- Bring together people and process
- Communication and collaboration
- Agreement on the goals of the plan
- Shared understanding of the drivers of value in the plan
- Monitoring and tracking progress to plan – interaction between operation and planning teams
- Having the lead time and detail needed by the operations
- Being able to dynamically change during the week to pull the operation back to plan
Short term planning and execution – sources of variance

**Planning Inputs**
- Wrong data / lack of detail
- Not reflecting operation status
- Wrong rates
- Resource constraints - people, equip, headings, vent, power
- Not connected to LTP / MTP
- Stopping front catching development front, continuity of production
- Adequate headings / fronts / horizons.

**Planning Process**
- Missed interactions (interactivity/ interlevel)
- Missed physical constraints
- Lead tasks not adequately planned / completed
- Lack of practicality
- Don’t understand how job is executed
- Don’t understand / check status
- Overburden / underburden of resources
- Variability not managed

**Planning Outputs**
- Not long enough period
- Not detailed enough
- Not done early enough
- Not communicated effectively
- Not communicating priorities / intent
- Leading / preparatory activities

**Technical Activities**
- Planned maintenance
- Major services
- Infrastructure works
- Electrical interruptions (sub checks, fan maint)
- Mill / paste

**Cross Functional Activities**
- Interactions / clashes between activities
- Breakdowns / equipment availability
- Manning / absenteeism
- Hole cleaning, oversize, re-entries etc.
- Haven’t got everything lined up for the job - people, plans, equipment, tools, site prep
- Wrong task / instructions / interpretation
- Misunderstood priorities, change of priorities
- Unforeseen delays

**Operational Factors**
- Not identifying or reacting to variance
- Not foreseeing clashes evolving due to variance
- Spatial compliance to plan vs delivery
- Chasing wrong metrics
- Conflict / lack of connection between STP + LTP
- Availability vs priority

**Response to Change**
- Not putting out plans / instructions early enough
- Impractical plans - not checked down the hole
- Wrong plans / interpretation
- Geo / survey delays, unprepared sites

Variance to Plan
Requirements of a short term planning system

Format designed to support both planning and short interval control functions

- Identify critical path activities
- Activity tracking and compliance to plan (by heading, over total week)
- Structured decision making to manage variability
- Productivity analysis and efficiency management
- Learning and feedback to MTP and LTP
- Easy to read format on projector for meeting
- Plan support activities (cleanouts, rehab)
- Manage interactivity and interlevel interactions
- Co-ordinate preparation activities (power and services)
- Balance equipment / manpower / heading utilisation
- Functional action plan to meet targets
- Printouts for supervisors to use down the hole
- Rolling 2 Week Plan & Daily Meeting

Planning

Control

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- Activity tracking provides the foundation for structured decision making.
- Location based format for spatial compliance
- All activities for a stope are planned collectively to manage interactions
Engaging the plan- managing execution

- The daily meeting is the key engagement point for managing plan execution.
  - Plan ahead
  - Compare performance to plan
  - Short Interval Control

- The plan and daily meeting deliver sustainable performance improvement by:
  - Reinforcing essential behaviours, e.g. planning and problem solving
  - Enabling short-interval control of critical processes and activities
  - Providing accurate and timely management information with which to make decisions.
Limitations of the spreadsheet based system

This was a big step forward, but it’s a very manual process. The long and medium-term plans capture many relationships, dependencies and practicalities which were lost in the spreadsheet solution:

- Activity cycle relationships: development -> modelling -> rising -> drilling -> production
- Spatial relationships: stoping retreat back to cross cuts, top down, multiple lodes
- Co-dependent working areas: maximum rates out of a stope vs a cross cut
- Identify and manage inter-activity conflicts (e.g. can’t drill in a remoting area)
- Identify and manage inter-level conflicts (drilling in to bogging on the level above)
- Makes “mining sense” (avoid stop / start or dramatic changes of rate in activities)
- Overall rates matched to equipment and personnel resources
- Continuity of production now and later, economic optimisation
To supersede the spreadsheet, the new system needed to build on and improve capability:

- Align the operation with the LT plan
- Have enough practical detail to show how it should be implemented, enable us to manage & minimise interactions
- Pull as much information through from the MT schedules as possible
- Provide a consistent and easy to use system
- Be understandable and accessible to the operators, support team meetings
- Provide a visual structure that supports good decision making
- Ability for spatial compliance tracking required for managing delivery of the LT business plan
Deswik had been developing a new module in the planning software chain aimed at operational planning.

The system design aligned with the spreadsheet providing us the opportunity to capitalise on the work already done driving spatial compliance in the MOS project, while moving away from Excel.
Schedule Integration – building operational detail

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Benefits

- Immediately see impact of changes to plan, gives us the ability to see the effect of different options.
- Provides the operations management team full visibility of factors that directly influence decision-making.
  - Can plan, control and measure each individual activity in the mining process.
  - Understand the impact of delays to the schedule and take corrective actions.
  - Understand and efficiently manage equipment and heading utilization.
- The direct integration with Sched keeps operational plans in line with business plans.
  - Consistent structure and level of detail in plans.
  - Better plans = more robust delivery.
- Get the big picture view: Deswik.OPS provides a single user interface to review the combination of mine planning and production data captured from multiple sources, including automatic import from third-party fleet management systems.
Productivity improvements have been achieved by:

- Holistic approach - an evolution of process and systems over four years
- The progressive work done on culture to shift focus from delivery metrics to planning, spatial compliance, monitoring and proactively looking ahead
- Change of perception from operations about planning driven execution
- Change of perception from planning about engaging with operations to help deliver the plan
- Appropriate software is a key enabler to support collaborative shift planning and tracking
To be the global leader in sustainable gold mining