



The future of work in mining

What will jobs look like in intelligent mining operations?

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INTRODUCTION

The COVID-19 crisis has exposed the siloed nature of mining companies and highlighted the need for integrated operations. This is likely to accelerate the adoption of digital technologies, artificial intelligence, and analytics in the mining industry. We examine what future mining jobs will be like in intelligent, integrated operations.

The evolution of technology, from advanced data analytics to artificial intelligence (AI), has always had the potential to transform the mining industry by realizing operational efficiency improvements, enhancing productivity, improving safety performance, empowering employees to do more meaningful work and allowing communities to be more prosperous. Has today's crisis accelerated that trend?

In recent years, many mining companies have begun their digital journeys towards intelligent operations. Deloitte's [Tracking the trends 2020](#) report explored the following action points for mining companies to optimize their digital journeys and unlock sustainable value:

- Understand the amount of effort required to clean up data and upgrade technology infrastructure
- Integrate operations and governance by bringing planning and execution together in a closed loop system and integrating data across the entire value chain
- Understand the staffing and skill requirements in moving towards integrated operations centers (i.e., Nerve Centers)

The future of work in mining is not only about introducing new technologies but also about considering what role these technologies will play and what work will look like in a new organization that imbibes these new technologies. To help guide us in these uncharted territories, it is important to keep the end state in mind: "What outcomes drive value for the business?" These key business drivers can help tailor and redesign the organization to ensure that technology and organizational change empower this future organization, rather than debilitate it.

To achieve the desired value-driving outcomes, it is imperative to look out several years and understand and design for how humans could interact with the technology and with each other. Companies that have had successful digital journeys so far have often placed significant emphasis on change management to shift people's behavior and engage with their work in new ways. Mining companies looking to capitalize on these trends will need to consider the future of work as they move towards integrated operations centers (i.e., Nerve Centers) that help guide decision-making across the value chain and reduce siloed behaviors. They should consider what skills and roles are needed to support the Nerve Centers in achieving the desired business outcomes, and whether they will build these capabilities in-house or outsource it to external partners. These organizations will need to consider the desired culture of the teams, defining what success looks like when the culture is in its desired state. The operations culture plan should

be developed in line with the objectives that the organization is looking to achieve through its digital goals and vision.

To support the teams when using digital tools, it is important that principles for decision rights, escalation protocols, and role accountabilities are clearly identified. A transparent and clear understanding as to how each role contributes to the success of the organization provides the best opportunity for teams to tap into the many resources available and the collective situational awareness that this collaborative environment brings.

THE TIME FOR CHANGE IS NOW

Recently, the global pandemic resulting from the novel COVID-19 virus has seen organizations around the globe change how and where work gets done in an effort to curb the spread of the virus. Energy, resources, and industrial companies are among those facing the biggest constraints in offering flexible working and remote solutions. Some operations have, however, rapidly executed secondary control rooms, equipped with the relevant hardware and network capabilities to allow seamless handover between shifts in two separate locations. Some others have executed working-from-home capabilities by creating “dispatch packs” containing laptops and communication tools, enabling workers to operate and maintain control of on-site activities from the safety of their homes. For those performing essential services and therefore unable to work remotely, operations have focused on providing epidemic protection—ensuring sanitation, personal protective equipment, and safety of the workplace environment. Some others—for instance, those working on-site to support power utilities—have halved their operational efficiency to instill social distancing and other health-related measures. Meanwhile, those who have been unable to effectively mitigate the risk have had to shut down during this time.

Nobody knows exactly what the impact of these operational lockdowns will be on the industry, but many are realizing that there is a critical, accelerated need to fundamentally rethink how value is generated and redesign how work gets done. We are now seeing some clients actively revisit technologies such as tele-remote systems, autonomous vehicles, and automation of key areas of their operation. While many of these require significant capital investment at a time when commodity prices have been hit hard, they are weighing this up against the increased flexibility and performance improvement this offers in the midst of a crisis.

Now, more than ever before, an integrated operations center has become critical for any mining organization to provide an integrated single source of the truth built on real-time tracking of operational data across the value chain, enhance decision-making through advanced analytics, enable remote management of resources where feasible, and optimize workforce allocation and utilization, among others.

To help mining clients prepare for this new normal, we have developed personas for roles we deem important in unlocking the value of intelligent mining (figure 1), enabled through Nerve Centers:

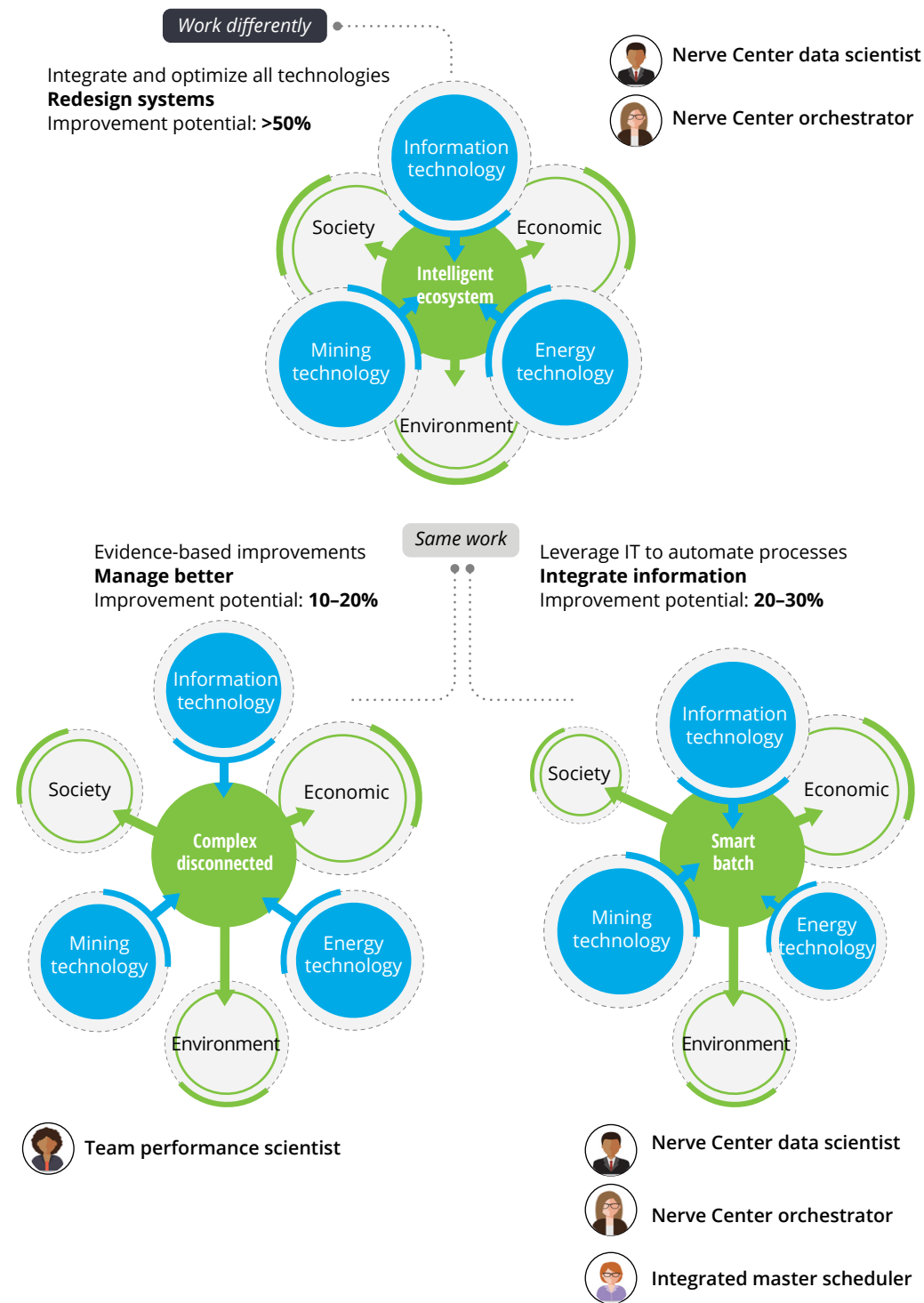
- Nerve Center orchestrator
- Nerve Center data scientist
- Integrated master scheduler
- Team performance scientist

To better understand the roles of the individuals who will be interacting with exponential technologies in an intelligent mine, we explore the following different facets of these personas’ profiles:

- Future roles and responsibilities within the Nerve Center
- Skills needed to achieve new work outcomes
- Relevant digital tools typically associated with intelligent mining and a Nerve Center
- A glimpse into what a typical day in their lives could look like

One of the hallmarks of these roles of the future is that they'll likely draw on familiar components of work but put them together in new ways to create a job that's never been done before. As mining companies continue to progress towards becoming truly intelligent mining organizations, roles will continue to evolve. Understanding how work needs to change to quickly adapt to unforeseen circumstances and leverage technology to ensure more meaningful and safe work can help the industry transform and overcome disruption.

FIGURE 1
Areas in which the mining personas can have the biggest impact



Source: Deloitte analysis.

Nerve Center orchestrator

Day-to-day management and operation of the Nerve Center by interpreting strategic business insights, managing constraints, liaising with business stakeholders, ensuring the implementation of business initiatives identified through analytics, and using analytics and AI to make informed decisions to deliver value for the business

NERVE CENTER ORCHESTRATOR

Summary

The Nerve Center orchestrator plays a critical role in setting the vision and strategy for the Nerve Center team, with a focus on integrated, optimized digital operations and creating synergy between all operations, engineering, processes, and assets within the value chain. Through the holistic view and management of digitized assets, operations, and processes, they evaluate mine and plant performance and contribute significantly to the short-term operational efficiency and long-term strategy. Their decisions are augmented through AI and analytics, and their leadership style drives healthy tensions across teams, with a strong influencing capability across operations. They use their industry experience and understanding of data science to manage core activities and processes within the Nerve Center, with a focus on identifying and addressing bottlenecks. They identify constraints and deviations from plans, interpret trends, and generate insights and business solutions based on opportunities and underperformance. The Nerve Center orchestrator works with business stakeholders to codevelop analytics and data visualization use cases that solve business-related problems by extracting value from the data and drawing on knowledge and experience, and hands the use cases over to the Nerve Center data scientist to develop and implement.

Responsibilities

- Drive collaboration of cross-functional teams, enabling strong situational awareness and decision-making based on knowledge, data, and insights from relevant teams
- Codevelop analytics and data visualization use cases with business stakeholders and the Nerve Center data scientist
- Track production losses and high costs, and work with the Nerve Center team to reduce these
- Classify and delegate decisions, escalations, and recommended actions
- Manage, coach, and work closely with the direct team within the Nerve Center

Time spent on activities

- People management (direct team) and collaboration
- Analytics use case development
- Constraint and interdependency management
- Identification and monitoring of improvement initiatives
- Nerve Center decision classification, delegation, and escalation





JAMIE MCKAY

NERVE CENTER ORCHESTRATOR

Mining Inc.

Jamie is an agile and forward-looking individual. She understands the mining value chain well, both practically and strategically, and she has an appreciation for data analytics. She believes that intelligent operations allow for greater flexibility and mobility to rapidly deliver business outcomes. Her background in engineering and mining, as well as her affinity for building innovative capabilities, helped her become a Nerve Center orchestrator.

Experience

Nerve Center orchestrator

Mining Inc. | Aug 2020-present

Works within the digital Nerve Center, advising and optimizing performance of digital operations and processes

Mining manager

Mining Inc. | Jun 2018-Jun 2020

Managed mining and processing operations to achieve maximum productivity and availability at the lowest cost per ton

Mining engineer

Mining Inc. Technologies | Jun 2014-Jun 2018

Designed safe and efficient mines for removing coal and metals

Education

- BSc, Engineering
- Data analytics foundational certificate/diploma

Toolbox

Nerve Center

A visual display that presents data, live information, and analysis from multiple sources to facilitate informed decision-making

Intelligent Enterprise

A visual display intended for C-suite management that presents data, live information, and analysis in order to make strategic decisions

Skills and endorsements

HUMAN

- + Business performance management · 432
Endorsed by **Jenny** and **Roger**, who are highly skilled at this
- + Strategic application of business insight · 320
Endorsed by **Gina**, who is highly skilled at this
- + Interdependency management · 216
Endorsed by **Lamar** and **Seema**, who are highly skilled at this
- + Communication (empathetic) · 417
Endorsed by **Patricia** and **Jim**, who are highly skilled at this
- + Decision orchestration · 398
Endorsed by **Danny**, who is highly skilled at this
- + Discretionary information thinking · 345
Endorsed by **Jamie**, who is highly skilled at this
- + Leadership skills (influencer) · 278
Endorsed by **Tanya** and **Oliver**, who are highly skilled at this

TECH

- + Digital fluency · 280
Endorsed by **Scott**, who is highly skilled at this
- + Data fundamentals · 143
Endorsed by **Brian** and **Rose**, who are highly skilled at this
- + Data verification · 368
Endorsed by **Pete** and **Meera**, who are highly skilled at this
- + Data interpretation · 510
Endorsed by **Rod**, who is highly skilled at this

A DAY IN THE LIFE

06:30 AM

Logs into the Nerve Center from her tablet to see if there are any urgent matters to attend to that may have occurred during the night shift

07:00 AM

Arrives at the Nerve Center and meets with the night shift supervisor for a handover. The Nerve Center data scientist joins the meeting via video conferencing and the three of them review the dashboards and discuss key issues, including information relating to a potential pipeline failure

08:15 AM

Engages with the reliability engineer to further explore the potential pipeline failure that occurred overnight and was handed to the day shift to continue to support

08:30 AM

Checks in with the Nerve Center data scientist to ensure the Nerve Center and operations are running smoothly, and supports any queries on Nerve Center notifications that have been raised

09:00 AM

Receives a request from the CEO to add an additional KPI for community engagement, and liaises with the Nerve Center data scientist to start preparing the data visualization and its requirements

10:30 AM

Liaises with the exponential geotechnical engineer and integrated master scheduler to evaluate the implications on the mine plan resulting from ground deterioration identified through the AI-enabled analytics built into observation reports

11:15 AM

Receives feedback from the reliability engineer that the pipeline had a minor weakness that could have led to a leak but has since been repaired. Jamie assesses the video footage received indicating the pipe weakness prior to repair

12:00 PM

Receives a notification on her Nerve Center dashboard that there is a deviation from the plan that cannot be corrected without intervention. She arranges a virtual conferencing meeting with the relevant site personnel, Nerve Center data scientist, integrated master scheduler, and an engineer

12:15 PM

Leads the meeting and asks for and supports everyone's input and knowledge to understand the implications of the deviation. They review the information together and run a simulation to show the impacts of different scenarios. A collective decision is made on how to resolve the issue and is executed

02:00 PM

Uploads information into the real-time shift log to capture the plan deviation and the corrective actions the teams will be taking

03:00 PM

Reviews the latest mining trends and identifies a new data visualization use case to be discussed with the Nerve Center data scientist the next day

A DAY IN THE LIFE

03:30 PM

Reviews dashboards and short-interval control tools and updates the handover log, ready for the night shift staff to take over

04:00 PM

Completes a walk-around and check-in with the team. The scheduler requests some leave the following month. Jamie asks the scheduler to enter the leave details in the leave request app, which she will review the next day

04:15 PM

Holds handover meeting with the incoming shift staff. They review the dashboard and shift log together, and any issues that could impact the night shift are communicated

04:30 PM

Ends her shift and heads home for the day

Nerve Center data scientist

Development and management of KPIs; management of data integration, data integrity, and verification; as well as development of advanced analytics through the coding of algorithms and maintenance and direction of AI machine learning

NERVE CENTER DATA SCIENTIST

Summary

The Nerve Center data scientist is a hybrid role playing the critical link between digitized operations, processes, and assets; short-term operational efficiency; and long-term strategy. They use their core understanding of data science to marry cutting-edge technology and business operations. Using their operational experience and analytical insight, they align mining operations with strategic intent through KPI dashboard visualization, developing and updating advanced analytics algorithms, providing direction, maintaining machine learning paths, and auditing cognitive automation decision paths. They conduct technical activities such as data management and develop analytics solutions that solve business-related problems by extracting value from the data. The Nerve Center data scientist uses a platform with data analytics tools to develop algorithms and visualizations that will drive business decisions, and builds in business logic and smart workflows to enable exception-based monitoring and preconfigured automatic escalations. They are directly involved in training, tuning, and testing data for machine learning algorithms to increase accuracy and integrity of data outputs. The Nerve Center data scientist acts as the data ethicist for integrated operations by maintaining compliance with government regulations and follows an ethical approach when working with data. They regularly conduct audits on the decision paths followed by the algorithms informing the Nerve Center notifications and make the necessary adjustments in consultation with the Nerve Center orchestrator and relevant site personnel.

Responsibilities

- Generate, aggregate, and prepare data, as well as ensure data governance
- Develop algorithms and data visualizations with built-in business logic and workflows to enable decision-making and exception-based monitoring
- Receive requests and instructions from the Nerve Center orchestrator regarding new analytics and data visualization use cases
- Engage with stakeholders to formulate algorithms and test its accuracy
- Ensure the integrity of data and algorithms through regular audits and apply ethical approaches when working with data

Time spent on activities

- Operational and strategic insights development
- Coding of algorithms
- Exception-based monitoring
- Machine learning database maintenance and direction, and coding
- Data aggregation, visualization, storage, verification, and interrogation





ALLAN MISTRY

NERVE CENTER DATA SCIENTIST

Mining Inc.

Allan is a decisive, hard-working individual. He is a fast learner and has developed a strong interest and passion for data science. He believes that one never stops learning in analytics. His background in engineering and mining, as well as his affinity for big data, created the opportunity for him to become a Nerve Center data scientist. He loves to work remotely although he connects with his colleagues regularly through video conferencing and social platforms.

Experience

Nerve Center data scientist

Mining Inc. | Aug 2020 - present

Works within the Nerve Center to develop advanced analytics algorithms and monitor digital operations as well as report real-time data to inform day-to-day operations

Data scientist

ABC Mining Technologies | June 2018 - Jul 2020

Applied data preparation and data mining techniques, performed statistical analyses, and built predictive algorithms

Mine planning engineer

Mining Inc. | Jun 2015-May 2018

Directed and managed all mine production activities, including planning, budgeting, staffing, cost control, and profitability

Education

- edEx | The future of mining
- Udemy | Python for data science and machine learning bootcamp
- World University | BSc, Data analytics
- World University | BEng. Mining

Toolbox

Nerve Center

A visual display that presents data, live information, and analysis from multiple sources to facilitate informed decision-making

Nuance

A software package that performs semantics and text-topic clustering

DNAi

Automated supervised learning to create predictive models through hyper acceleration and automation of key modelling process steps, i.e., feature engineering, feature selection, and algorithmic selection

Skills and endorsements

HUMAN

- + Business acumen · 200
Endorsed by **Lee** and **Jamie**, who are highly skilled at this
- + Strategic thinking · 138
Endorsed by **Samara**, who is highly skilled at this
- + Critical thinking and problem-solving · 360
Endorsed by **Amy**, who is highly skilled at this
- + Insight development · 397
Endorsed by **Sarah** and **Matt**, who are highly skilled at this
- + Communication (empathetic) · 405
Endorsed by **Dave** and **Alex**, who are highly skilled at this
- + Inquisitive trend spotter · 348
Endorsed by **Ira** and **Anjali**, who are highly skilled at this

TECH

- + Multilingual program coding · 245
Endorsed by **Kevin**, who is highly skilled at this
- + Data analysis · 358
Endorsed by **Sana** and **Craig**, who are highly skilled at this
- + Machine learning and AI · 468
Endorsed by **Jacob**, who is highly skilled at this
- + Data visualization · 560
Endorsed by **Luke**, who is highly skilled at this

A DAY IN THE LIFE

07:00 AM

Decides to work remotely via his tablet. He joins the virtual meeting with the Nerve Center orchestrator and outgoing night shift supervisor via video conferencing to understand any issues that occurred overnight. He begins his day by reviewing the report that the Nerve Center has produced while on autopilot during the night shift

07:30 AM

Dials in to another meeting with the engineering staff to provide them an update on the latest algorithms and analytical models, as well as an overview of the additional tool on the analytics platform he recently added, which they will be required to use when actively modelling likely outcomes during night shifts and over weekends, when the Nerve Center data scientist is not on active duty

09:05 AM

Notices a predictive safety flag for site #01 relating to a potential pipeline failure and identifies Tumelo as the responsible maintenance officer. This risk is triggered by means of predictive analytics, based on the correlation between Tumelo's work performance, wearable device (indicating lack of sleep), and the high-risk work area. He checks to ensure that the system sends out a notification to the safety health environment and quality (SHEQ) manager and the team performance scientist

09:15 AM

Researches an online analytics platform that uses AI to explore the possibility of generating a predictive safety score for operators. He sets up a virtual meeting with the team performance scientist who may have a better understanding of human behavior with regard to safety

11:00 AM

Notices that the autonomous driving truck #05 indicator is changing color to red with the warning that excessive vibrations are being picked up on the suspension, and sees that the AI he developed last week is notifying the supervisor to investigate and rectify loading practices as this may be the cause

02:00 PM

Notifies his colleague that he is taking his scheduled break from his work day to pick up his daughter from school, as he does three days a week

03:30 PM

Receives a pop-up from LinkedIn Learning about a new course on hardware-in-the-loop (HIL) and software-in-the-loop (SIL) technologies. He enrolls for the course, which he plans to attend virtually the following week

04:15 PM

Dials into a Nerve Center meeting room to hold a handover meeting with the incoming engineering supervisor who reviews his shift log and provides an update on his data checks. They agree that if the engineering team on night shift has time, they will start to compile and analyze the data, for him to continue the next day

07:15 PM

Logs off for the day, in time to tuck in his daughter into bed and read her a bedtime story

Integrated master scheduler

Traditional mine planning role evolved to ensure compliance with mineral resource management through digitally enabled integrated planning (from Life of Mine to daily shift allocations), scenario rationalization enabled by predictive analytics, and utilization of asset reliability and employee data to do the overall, integrated master schedule (i.e., mine, plant, assets, people, logistics, etc.)



INTEGRATED MASTER SCHEDULER

Summary

The integrated master scheduler is responsible for determining the best way for a mining company to extract a resource from the ground by sequencing waste removal and ore extraction to ensure continuity of production output and sustainability throughout the life of a mine. The traditional monthly mine plan is enhanced through integrated systems and production measurements, which enable the quick generation of short-term, medium-term, and long-term plans, considering various scenarios for those plans. They champion integrated operations scheduling and its associated tools, routines, and positions at site during project implementation and adoption monitoring. The integrated master scheduler collaborates with the Nerve Center orchestrator and Nerve Center data scientist to ensure integrated work management is linked to the master operations schedule that integrates production, maintenance, development, and support schedules into one master schedule. They use throughput knowledge from the Nerve Center to integrate and inform maintenance, workforce, mining, and business plans and schedules, as well as to understand the nature of variability and interdependency within the systems. The integrated master scheduler develops short-term production schedules using existing business plans, taking into account the multiplicity of production objectives, constraints, resource requirements, planned maintenance, resource availability, consumables, human assets, machines, and equipment needed to do the scheduled work.

Responsibilities

- Review existing Life of Mine plan and provide alternative parameters to generate multiple technical planning alternatives for financial and logistical feasibility testing
- Manage integration of plans across functions to identify and resolve conflicts
- Run scenario models based on compliance to plan trends and conduct business plan impact modelling to assess the financial impact
- Apply throughput insights from the Nerve Center to integrate various plans and schedules, and to understand interdependency within the systems
- Develop a short-term master production schedule that adheres to the planning framework

Time spent on activities

- Scenario modelling
- Integration of maintenance, workforce, mining, and business plans/schedules
- Compliance with plan tracking
- Collaboration





PAM JONES

INTEGRATED MASTER SCHEDULER

Mining Inc.

Pam is a realistic individual who sees the business value in collaborating with others. The Nerve Center provides Pam the opportunity to have access to multiple sources of data. She likes to plan ahead and enjoys being a part of a digitized work environment—attributes that created the opportunity for her to work within the Nerve Center.

Experience

Integrated master scheduler

Mining Inc. | Aug 2019 - present

Works within the Nerve Center to ensure compliance to the mineral resource management (MRM) plan and is the custodian of the master schedule

Master scheduler

Mine AB | Jul 2017 - Jul 2019

Reviewed productivity rates to determine ways to increase efficiency

Materials planner

Colliery | Jun 2015 - Jun 2017

Planned all procurement demands for sales and production

Education

- Logistics, materials and supply chain management degree

Toolbox

Nerve Center

A visual display that presents data, live information, and analysis from multiple sources to facilitate informed decision-making

Integrated Mine Planner

A tool that provides an integrated plan coordinating activities across the internal value chain of the business

Skills and endorsements

HUMAN

- Complex planning and forecasting ·342
Endorsed by **Kelly** and **Jeremy**, who are highly skilled at this
- Attention to detail ·250
Endorsed by **Rob**, who is highly skilled at this
- Process improvement ·374
Endorsed by **Adil**, who is highly skilled at this
- Communication (empathetic) ·236
Endorsed by **Blythe** and **Joanna**, who are highly skilled at this
- Collaboration ·467
Endorsed by **Edward** and **Ruby**, who are highly skilled at this

TECH

- Scheduling ·414
Endorsed by **Samia**, who is highly skilled at this
- Data modelling ·368
Endorsed by **Sylvia** and **Julian**, who are highly skilled at this
- Data analysis and interpretation ·565
Endorsed by **George**, who is highly skilled at this
- Statistical analysis ·486
Endorsed by **Rose**, who is highly skilled at this
- Data visualization ·324
Endorsed by **Michael** and **Holly**, who are highly skilled at this

A DAY IN THE LIFE

07:15 AM

Arrives at the Nerve Center and reviews the MRM overview on the Nerve Center dashboard

07:30 AM

Attends the daily shift start-up meeting to review the KPIs of the operation and understand any issues that the operation is currently facing

08:10 AM

Reviews and tracks the progress on daily team production planning and notices that the eastern section is in the red and below-target for the afternoon shift

08:30 AM

Investigates the above-mentioned issue by seeking to understand the amount and quality of raw material. This involves contacting the correct individuals. Findings suggest that waste was blasted. Follows the standard template to collect material from each area ahead of the weekly site alignment meeting scheduled for 01:00 PM. Each area should provide baseline data in the online site alignment meeting to demonstrate plan variance (both positive and negative) week by week and show the impact on the schedule

10:00 AM

Conducts business plan impact modelling to assess the financial impact of the missed production targets on the eastern section due to the waste blasted

11:30 AM

Adjusts the short-term schedule to match the required production targets after understanding the impact

11:45 AM

Updates the geological grade model according to sampling carried out by geological testing

01:00 PM

Joins the weekly online site alignment meeting focusing on integrated planning via video conferencing and follows up on actions arising from the waste blasting identified earlier that morning. Spends time integrating the Life of Mine, medium-, and short-term plans with colleagues. Coordinates feedback from all areas to uncover potential conflicts. Records action items during the meeting, reviews action items at the end of the meeting, and distributes captured actions after the meeting

03:00 PM

Compiles and updates daily, weekly, and monthly statistical reports related to the integrated plan

04:00 PM

Collaborates with the Nerve Center team to help attain MRM goals and objectives and commits to achieving targets for her area of responsibility

04:30 PM

Ends shift and heads home

Team performance scientist

Maximizes individual and team performance, productivity, and safety by understanding drivers, triggers, and levers of human behavior to drive high performance and safe work execution

TEAM PERFORMANCE SCIENTIST

Summary

The team performance scientist plays a strategic role using digital tools and applications to maximize individual and team performance and productivity, compliance, and safety. This role focuses on creating a human experience in daily work life by understanding the drivers, triggers, and levers of human behavior to drive high performance and inform strategy. They leverage technology to generate performance-based and strategic insights on what drives and maintains high levels of productivity and engagement amongst individuals and teams. They are usually up to date on future-of-work trends, and they research relevant themes and design content to input into the various digital tools and applications used for performance management and workforce engagement. The team performance scientist applies human skills such as complex problem-solving, sensitivity, creativity, and judgement to make ethically informed decisions that augment and refine the elements of the tools they use. They codesign advanced safety analytics with the Nerve Center data scientist to ensure behavioral science and people-related information are used in an ethical manner to produce proactive safety analytics. They monitor all people-related analytics use cases, such as production targets, safety incidents, engagement with employee platforms, and compliance with mandatory learning, and are particularly focused on the integration and correlation among these various data points to optimize productivity and safety through applied behavioral science, at the individual and team levels. They facilitate design thinking to capture end-user requirements and use these requirements to inform user interfaces for digital workforce engagement, performance management systems, and other relevant digital collaboration tools.

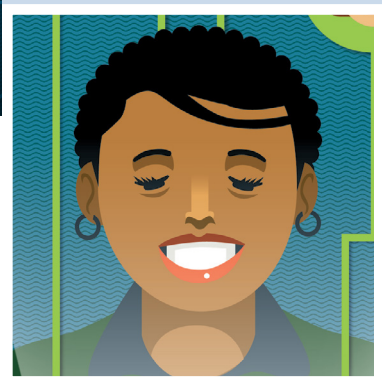
Responsibilities

- Generate performance-based insights and recommendations on how to maintain high levels of engagement through various digital tools and channels
- Make changes to content on digital workforce engagement tools and applications used for productivity and safety based on insights and outcomes
- Conduct analyses on people performance and levels of productivity
- Use advanced analytics to identify patterns in safety data, leading to a more proactive safety approach

Time spent on activities

- Data analysis/insights generation
- Researching, self-development
- Human-centered content development
- Reporting to and collaborating with upper management





JENNA MKHIZE

TEAM PERFORMANCE SCIENTIST

Mining Inc.

Jenna is a dedicated performance specialist who is passionate about understanding human behavior within the context of Industry 4.0. She knows that performance and human behavior are multifaceted and complex, and she strives to understand this through a human lens.

Experience

Team performance scientist

Mining Inc. | Feb 2020–present

Applies understanding of human behavior to maximize individual and team performance, productivity, and safety

Manager business planning and performance

Mine Incorporated | Jul 2019–Jan 2020

Monitored production against targets

Gig worker

(HR) | Apr 2017–Jun 2019

Worked as a freelance organizational design specialist across a variety of human resource and organization development gig platforms

Part-time horse trainer and contractor in organizational design

Sep 2015–Mar 2017

Education

- **University of Digital Intelligence**

Graduate certificate in advanced analytics (online)

- **OpenLearnOrg**

Website and applications design

- **Community College**

Masters, Industrial psychology

Toolbox

Nerve Center








A visual display that presents data, live information, and analysis from multiple sources to facilitate informed decision-making

Gamified Performance Management






Preconfigured performance-enhancing use cases delivering business value by connecting all employees with their KPIs, performance tracking, compliance adherence, and rewards

Skills and endorsements

HUMAN

- + Behavioral awareness and insight ·216
 Endorsed by **Tom**, who is highly skilled at this
- + Business acumen ·304
 Endorsed by **Maria**, who is highly skilled at this
- + Active listening ·215
 Endorsed by **Sam** and **Kiara**, who are highly skilled at this
- + Decision-making ·372
 Endorsed by **Melissa** and **Thomas**, who are highly skilled at this
- + Critical thinking and problem-solving ·218
 Endorsed by **Miriam**, who is highly skilled at this
- + Communication (empathy, influence, persuasion) ·288
 Endorsed by **Sonya** and **Karen**, who are highly skilled at this
- + Innovation ·342
 Endorsed by **Ryan**, who is highly skilled at this

TECH

- + Data interpretation ·124
 Endorsed by **Anna**, who is highly skilled at this
- + Statistical analysis ·345
 Endorsed by **Philip**, who is highly skilled at this
- + Tech fluency ·148
 Endorsed by **Isabel** and **Kim**, who are highly skilled at this
- + Data analysis ·456
 Endorsed by **Laura**, who is highly skilled at this
- + Digital communication and content design ·525
 Endorsed by **Greg** and **Farida**, who are highly skilled at this

A DAY IN THE LIFE

07:00 AM

Returns from her horse-riding lesson, when her smart watch reminds her about a 9:00 AM online meeting with upper management on performance analysis

09:00 AM

Joins an online call where she discusses performance statistics for the month. She reports to and collaborates with upper management on requests for analytics on the current workforce's performance metrics

09:30 AM

Uses AI-enabled modelling tools to gather data from multiple internal and external sources, and runs analyses of the factors that distinguish the organization's most effective performers and leaders. Insights such as production levels, cost management, compliance, and safety are churned out by the tool, and are put into a table format that provides insights in the form of a dashboard. This, along with specialist inputs from Jenna, enables management to have strategic conversations

11:15 AM

Returns to her desk and notices that two individuals have not been participating on the gamification app. She accesses the dashboard and analyzes the data presented. She notices a trend of declining performance of the two individuals after they dropped in position on the leaderboard. She had earlier predicted, after months of analysis, that some employees may feel embarrassed and disengaged after seeing themselves at the bottom of the leaderboard and may therefore opt out of the "game" completely. She reports this finding to upper management and suggests tweaking the application to only show the top five performers on the leaderboard

01:00 PM

Before heading off to lunch, a prompt appears on her laptop screen dashboard reminding her to schedule a meeting with management. Jenna clicks on the option and immediately receives confirmation that a meeting has been scheduled for the following day at 4:30 PM

02:30 PM

Designs and updates content to be uploaded into the gamification app based on trends she read in the latest research on talent performance and management

04:45 PM

Decides to get a head-start on updating the leaderboard to show the top five high scorers

05:00 PM

Wraps up her work and heads to her favorite restaurant to meet some friends

About the authors

ANDREW SWART is both the global and Canadian leader of the Mining & Metals practice as well as the global leader for the sector. In his global roles, Swart leads a team from around the world and sets the strategic direction and go-to-market strategy for the global practice. With 20 years of industry and consulting experience, he is passionate about client service, having worked across many major mining and metals geographies, including Canada, Chile, Russia, Ukraine, Kazakhstan, Brazil, Germany, India, South Africa, the United Kingdom, and the United States. Swart's areas of expertise include corporate and competitive strategy engagements, digital and innovation systems, and large organizational transformation programs.

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JULIE HARRISON is Deloitte's global co-lead for the People & Diversity pillar of the mining and metals group, and Deloitte Australia's Human Capital lead for Energy, Resources & Industrials. Harrison has worked extensively in consulting for the past 25 years and within the ER&I sector for nearly 15 years where she has led many transformation programs with a strong focus on people-centered transformation. Her areas of expertise include global transformations, organization redesign, workforce optimization, HR transformation, leadership and culture, and global talent programs. Passionate about the future of work, Harrison is a regular speaker at local and international conferences.

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JENNA WING is an industrial psychologist with two years of experience within the Energy and Resources industry. Wing has worked with the Future of Work team on developing the digital Nerve Center solutions for the intelligent mine. She focuses on the future of the workforce, the change in skills and capabilities, how roles will be deconstructed, and the business case for reskilling/repurposing people. Through creative ways of working and learning, Wing wants to continue to be a part of, and build, high-performing teams by challenging everything we do from a personal, work, and mindset perspective.

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Deloitte Consulting's Mining & Metals practice has helped clients transform to integrated operations through the adoption of digital technologies, artificial intelligence, and analytics solutions. Our future of work assets examine what future mining jobs will look like and enable the fundamental redesign of work, workforce, and workplace. Our work in intelligent mining includes the realization of operational efficiency improvements, enhanced decision-making and productivity, improved safety performance, remote management of resources and optimization of workforce allocation. Contact the authors for more information or read more about the future of work and intelligent mining in our mining and metals services on [Deloitte.com](https://www.deloitte.com).

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