The industry’s digital capabilities have significantly increased over recent years, and technology now has the potential to deliver unparalleled operational improvements. Companies that are willing to leap into the digital mining era before their competition have the ability to accelerate past their competitors in the future. In November 2017, the International Data Corporation (IDC) published a report called ‘IDC FutureScape: Worldwide Mining 2018 Predictions’. The report stated “companies that prioritise digital transformation at the executive level by 2019 will deliver productivity, efficiency and/or revenue gains of up to 25%.” Organisations that embrace this digitisation will not only have a more profitable business, but one that empowers employees with the data they need to make decisions with certainty.

A holistic approach to mine planning can create value for any mining company in both existing and new sites. The recent advances in mathematics and 3D computational geometry has enabled software to become more intuitive, comprehensive and robust than ever before. It is now possible to have mine

Frank Grima, RPMGlobal, Australia, talks about closing the gap in mine planning and scheduling solutions.
planning and scheduling solutions that are capable of updating in real time and through an enterprise approach, as well as being able to feed the relevant data across the entire mining value chain.

In the past, mining companies have experienced an array of challenges in the mine planning and scheduling space, which was compounded by the economic downturn. The mine scheduling processes used today are still time-consuming and often rely on a variety of spreadsheets that sit on user’s computers. This manual effort to determine the best approach to planning and scheduling often results in mistakes, inefficient plans or missed opportunities for scenario analysis due to imposing deadlines. By employing the correct software with an enterprise approach, mining companies can eliminate the need for multiple, complicated spreadsheets with one single data source, and can finally answer the elusive ‘what if’ questions with certainty.

RPMGlobal has capitalised on the advancements offered by the digital mining era with its continued development of XPAC Solutions. With 5000 software installations in 120 countries, RPMGlobal has leveraged its worldwide experience to create the most comprehensive mine planning and scheduling solutions for the coal industry. To answer the coal industry’s need for commodity and methodology-specific solutions, RPMGlobal has released the world’s first steeply dipping coal solution. This solution builds upon the core capabilities of the company’s opencast coal and underground coal solutions, but with a focus on the unique demands of steeply dipping coal operations utilising terrace mining methods.

The coal-specific XPAC Solutions are the only solutions in the industry built on the principles of parametric scheduling. By leveraging the power of technology, users have the ability to analyse how changes to one or more key parameters will affect the schedule. By imposing sophisticated mining logic and automated rules on the scheduling model, XPAC Solutions prevent invalid mining sequences and ensure that each schedule is practical and achievable. This enables planners to adjust parameters and produce multiple new schedules within hours. The automated nature of the mining logic allows rigorous, long-term schedules to be developed without spending months building the rules. It removes the need for complicated excel spreadsheets and allows planners to focus on providing real value to their mine site.

**Mining case study**

A tier one mining company was experiencing the usual challenges surrounding mine planning and scheduling amidst tight economic conditions. The company understood that players, large and small, were looking to digital technologies as a vehicle to help increase production, reduce costs and improve operational efficiency. To meet their mine planning and scheduling objectives, the company evaluated five vendors. RPMGlobal’s XPAC Solutions provided a robust, consistent and highly capable technology platform to address their challenges. Prior to their implementation of XPAC, planners were using over 10 separate excel spreadsheets to develop the company’s schedules. The process was not only time-consuming, but the company felt as though they were missing opportunities to optimise their mine planning and the value these plans delivered.

Now, with XPAC Solutions the company has reduced their timeline to create schedules by 85%. It now takes days rather than weeks. Alongside this, users could answer the ‘what if’ type of questions and update their schedules with the revised commodity price in 5 min. By implementing a 100% script-free solution, the repeatable process removed the need for costly consultants and gave the power back to engineers to focus on providing value to their site. The flexibility offered by XPAC Solutions allowed the company to respond to real constraints, in real time and propelled them to an 8% increase in productivity within the first 12 months of implementation.

Engineers can not only schedule the mining sequence, but also schedule dumps automatically, which are directly related to the dig sequence. Performing the dumping simultaneously to the excavation allows the mining schedule to be influenced by the dig schedule. For engineers, it also means that if their pre-existing dump designs or landforms have been created in a third party package, the design can be incorporated into the schedule to determine the viability of the dump designs.

XPAC Solutions also features integrated haulage modelling program capabilities. The program
automatically connects all the main haulage roads to every mining block with the mining reserve. This is distinctly different from other solutions because it is spatially aware when it comes to mining blocks and haul roads. In a more practical sense, the software can turn ramps on or off based on scheduling interactions at any given period. Therefore, post-schedule haulage analysis is no longer required, saving both time and money, and in just two hours an accurate view of fleet interactions is visible to the user. After the schedule has been completed, travel time, truck hours, fuel burn and tonne-kilometres per hour will be reported out for every block mined.

**Overcoming challenges**

In the past, it has been extremely difficult to manage interactions between planning horizons. A wide range of planning applications being used by different planning departments have resulted in data siloes. Using an enterprise approach, users can view, analyse and approve mine plans from the ultra-short-term all the way through to the life of mine. This plan can be published in a variety of formats (ISA-95, B2MML) up to the enterprise level. The consolidated mine plan can then be consumed by enterprise financial systems, process control and fleet management systems, before being analysed through corporate business intelligence systems. This breaks down the rigid data siloes and ensures that the right data is reaching the correct decision makers.

All of the effort can be futile if coal blending processes and quality monitoring are not able to meet the requirements of the coal’s intended application. The XPAC Solutions Product Optimiser runs simultaneously, and removes the need for pre-schedule or post-schedule blending strategies. XPAC Solutions’ specific in-built features allow users to easily set quality targets or production targets to achieve the desired outcome and ensure accuracy. Planners now understand the mines blending strategy by using available linear programming, and can ensure that the site is blending the most suitable product based on their objectives.

The true potential of growth for the coal industry will only be realised if these industry leading solutions are partnered with an enterprise approach. Most mining companies have realised the value in implementing an integrated strategy into corporate functions, such as finance and HR, but this has not been extended to their technical mining operations. Consequently, technical mining operations is a complex web of point solutions, data sources and siloes that deliver complicated structures and inadequate functional collaboration. Effectively, information remains trapped in these isolated systems and will only be freed by the adoption of open standards, such as ISA-95. Through the adoption of ISA-95, users can plug and play with a variety of solutions from a variety of vendors and still achieve the same seamless communication. This recognises that the modern mining ecosystem consists of a number of different solutions, and companies need the flexibility to use different vendor’s products to meet the unique demands of their mine site. This initiative is already being driven by global mining companies and leaders in the mining vendor system, including Caterpillar, Modular Mining Systems, Schneider and RPMGlobal.

**Conclusion**

Adapting to the changes that are occurring to the industry and harnessing the best technology on offer will allow mining companies to emerge as industry leaders. At the core of every mining operation is planning and scheduling. To become one of these leaders in mining, companies must implement a strategy that unites operations into one single platform across the mining value chain. For example, by integrating opencast coal, underground coal or steeply dipping coal XPAC solutions with an enterprise approach, the coal industry will be able to achieve the consistency it requires in the modern mining era. Technology has presented the coal industry with the opportunity to experience unparalleled gains in productivity, safety, efficiency and profitability. However, to achieve these gains, the industry must employ the most efficient planning and scheduling solutions that are unlike anything currently available in the market.