LCC ASIA PACIFIC
CORPORATE FINANCE & STRATEGIC ADVISORY

Mergers & Acquisitions of "Machine Learning" Technology Companies In The Mining Sector

Valuation Traps and Diligence in Deal Making

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Digital Technology's Accelerating Trend

One of the impacts of the COVID-19 pandemic that LCC Asia Pacific (LCC) has observed has been the acceleration of both mining companies and legacy engineering / service providers towards adopting digital mining technologies. Less reliance on labour on mine sites combined with greater transparency/efficiency of operations leads to increased profitability[1].

Within this macro trend, a key focus has been on acquisitions or strategic investments that leverage artificial intelligence and/or machine learning to deliver improvements in areas such as predictive maintenance & productivity.

But it is not a simple process. An example of one complexity in M&A, resulting from this rush to digitisation, is the capacity of the acquiring company (Bidder) to integrate and leverage the technology operations of the target company (Target) in such a way that delivers a positive impact to operations in the combined/integrated company and shareholder value within an acceptable time period. LCC's experience is that the approaches to M&A target identification, due diligence & deal-making have both changed substantially as a result of this accelerating technology landscape – but many acquirers as yet do not appreciate the long term challenges that may accompany a hastily and rushed technology acquisition.

LCC believes that many Bidders do not understand the right questions to ask and as such it is impossible to get the risk and valuation analysis correct – often resulting in valuing Target's too favourably which over time negatively impacts the operations & valuation of the Bidder.

One area of increasing complexity is where a potential target "claims" through its marketing materials to be in predictive maintenance sector for mineral processing or oil & gas. Many are simply mislabelling the use of this expression, often in an effort to align with a "hot sector" for deal activity.

LCC's experience is that a new approach to commercial due diligence needs to be taken in order to understand both the underlying architecture and the true potential of the technology solution – and in particular, whether it is something that will stand the test of time.

This new approach combines the traditional diligence & valuation/risk assessment approaches with a granular focus on numerous topics circling the collection and use of "data" which in machine learning companies invariably is the "hero asset" that underpins corporate value.

1 Assumes favourable commodity conditions

Industry 1.0 & Industry 2.0

The mining sector has embraced technology and innovation from its very beginning. Engineers and technical trades experts have always looked for an improved way to physically undertake a process. Gradually over time this approach of physical improvement has evolved to involve technology and data. But as happens with all industries this is where the lines are becoming blurred on what is truly tomorrow's technology vs yesterdays *(often slickly repackaged)*.

The mineral processing sector has the potential of being a clear beneficiary of this technology shift and provides many examples on how evolution has progressed.

Industry 1.0 wear parts technology has been in place for decades. Typically, it was some form of physical observation of the rate of wear of a consumable *(be that in a transfer chute, conveyor, GET, etc.)* undertaken by physical measurement of that wear part at distinct periods of time. Calculations on wear rate could then be made based on the amount of ore moved, or other anchor data point. The Industry 1.0 "technology" was therefore based on the physical observation of a component within a circuit and the manual recording of change.

The Industry 2.0 predictive maintenance solutions introduced a form of "observation technology". Generally, these were based on a variant of a physical sensor that wears out – with that sensor being "connected" via a wired or wireless solution – depending on the infrastructure in which it was embedded. The "smarts" are generally a software interface that can read each sensor's current state of wear within the overall infrastructure and as such provide a "snapshot". Often as the sensor wears to a level the colour of the specific component / area within the overall processing infrastructure will change colour *(green to red)* and/or send some form of alert on the digital readout.

We use the analogy of the "brake pads" in your car to describe this class of Industry 2.0 technology solutions. Wear them down to a level where the sensor is exposed and an alert sounds.

The Industry 2.0 solutions provided a much more convenient approach to the mechanical and labour-intensive Industry 1.0 manual approach, but from a technology perspective not much had really changed. Both 1.0 and 2.0 are based on simple observation of the current state of affairs, with 2.0 automating and allowing greater transparency in real / near real time.

Additionally many Industry 2.0 sensors that we have reviewed have only been able to collect limited amounts of data *(in terms of scope),* with some offering reduced convenience as the data was actually stored within the sensor – still requiring manual retrieval from time to time.

Industry 3.0 & Technology Debt

The temptation for companies to brand themselves as Machine Learning or Artificial Intelligence technology can often be too much to resist – at a time when these expressions are still widely used and somewhat blurry. However, many are simple variations of the Industry 2.0 evolution. Often based on statistics interpretation, these fringe solutions are trying to manually calculate *yesterday's* physical data observations to gain insights.

At its core the shift to machine learning/ artificial intelligence is not centred on physical observation of a "widget" but rather centres on the analysis of large sets of data to identify patterns which are material to future performance of both single asset units and wider mineral processing circuit ecosystems. This fundamentally different business and technology foundation results in far richer approaches to consider predictive maintenance other than the "snapshot" observation of a specific underlying part at a specific time.

Examples on the evolution to alternate approaches include technologies that look for:

- acoustic anomalies in conveyor belt performance, where things such as loose wear plate can be immediately identified via a change of sound output recognised against a large sample of data which have analysed normal conveyor belt performance
- particle sizing technologies that can identify and separate oversized ore in real time across mineral processing circuits
- corrosion failure in pipelines in the oil & gas sector where changes to infrastructure can be observed much earlier than previously possible due to sophisticated regression analysis and pattern recognition of large samples of data

Where in the Industry 2.0 model the sensor is the primary tool by which wear or fatigue is monitored, in the Industry 3.0 a sensor is simply a tool for collecting the real "value asset" – large quantities of targeted but raw data.

Deal Valuation Needs To Consider the Data Foundations Of Any Machine Learning Technology

Sample Areas for Specific Investigation

Harvesting Process	Scope of Collection	Scalability	Cybersecurity	Transmission & Storage	Data Set Separation
How is data collected ?	Is it the correct data ?	Challenges to growth ?	Site Authorisation ? Access ?	Bandwidth ? Network Access ?	Training & Testing Sets ? Sample Size ?

Analysing A Machine Learning Company

From an M&A perspective, the approach to identifying a suitable acquisition target in the Mining Technology space requires a different approach to a more traditional "industrial based" engineering or service provider. This is because the shareholder value in the Target *(and ultimately what the Bidder needs to leverage post deal closing)* is not based in any physical element or elements. Even the sensors themselves are likely of little value as they can be replicated simply – sensors will just be another consumable.

Therefore, from a valuation perspective unpacking the operations of a machine learning company needs to focus on granular technology elements of the "data operations", including:

1. Data Sample Size.

All machine learning applications are based on the interpretation and observation of unusual events when compared to large data sets of normal operating conditions *(usually through some form of regression analysis)*. Mining conditions, however, are anything but standard ("homogeneous"). Diligence investigations, therefore, need to consider such things as operating conditions, time period since last shut / maintenance, age of various components *(proximity to "asset failure"),* various OEM performance factors *(some more robust than others)* and even the track record of individual plant operators *(in the case of mobile plant wear)*. With the options for data collection being so wide there needs to be a detailed investigation as to why the specific data points collected are the optimal for translating into the analysis of the end software that is being produced. We have seen instances of "narrow data collection" and small sample sizes that have resulted in the ultimate software producing educated guesses as opposed to rigorous analysis based on data samples that are material *(in terms of size)* and on point *(in terms of wide ranging relevance).*

2. Data Collection, Security & Scrubbed Data.

Diligence also needs to uncover how the data has been randomly gathered, then classified and "cleaned" in order to arrive at the sample data sets. The risks of not fully understanding this include:

- Standard machine learning approaches see the data samples split into 2 "sets". The first is generally classified as "Training Data" and the second generally "Test Data". The importance of these sets being randomly collected and divided without bias is fundamental. The Training Set is used for the initial prediction analysis and the Test Set for subsequent refinement and validation. On a recent engagement LCC inquired of a Company their approach to collection and classification – only to be presented with a single set of data that had not been randomly selected. As such the "predictions" for the preventative maintenance software were simply not correct – an example of what was really an Industry 2.0 company trying to achieve an Industry 3.0 valuation.

- As more data is collected, and the data set scales over time and "learns", the purity of the data will be questionable if it has not been set up the correct way and/or scrubbed for data imperfections. Essentially this means rather than collecting data in a random but purposeful range *(credible),* the data is too broad ranging *(wide and shallow)* and as such predictions based on it are relatively inaccurate to those based on the narrow dataset.
- The actual method of collecting the classified / refined data also needs to be understood – including the specific technology which transmits / transfers the data to a storage point *(e.g. cloud or server)*. Collecting large quantities of data means the underlying hardware needs to be capable of dealing with numerous issues – including battery life when sensors are used in remote mineral processing operations.
- Collecting large streams of critical data requires a focus on available wireless network bandwidth. Many technologies today are RFID enabled, which can also raise questions of transfer rates on wireless networks on mining sites. LCC has seen this raise other issues including fundamentally who owns the data transmitted across those networks *(including the risk of having to buy back one's own data from specialist mine site wireless network operators).*

The differentiator of machine learning from other statistical and data driven technologies is the capacity of the underlying algorithm to "learn" as more data is fed into it on an ongoing basis. This "learning" data information loop results in a tightening data framework, which presents an improving set of data analysis – allowing "predictions" to be made. As such this "collection of data" issue is an ongoing one and not a once off. In diligence one needs to be clear that the capacity and rights to collect and commercially benefit from the application of data are ongoing.

- Cybersecurity at mining operations, including firewalls, can slow or prevent the transmission rates of data. Understanding how the Target's technology integrates with both local wireless networks and the cybersecurity protocols is critically important. This is a clear area of "challenge" for technologies that move from pilot phases (*often requiring lower data capture*) through to commercialisation. Other issues include indemnities with wireless network operators that may need to be navigated to ensure the Target is not held accountable for any no cyber breach into the mineral processing circuit via its technology – where the breach results in economic loss for the mine site *(for example production shut down).* This area of cybersecurity is rapidly changing, and these are just threshold examples of where diligence needs to be focussed.

3. Standardising & Scope of Data.

Mining operations endure the harshest conditions. Any training data set will, therefore, need to provide observation across that spectrum of conditions given mineral processing plants can be subject to varying levels of performance & failure – exacerbated by extreme heat or extreme cold through the weather seasons. Diligence therefore should also focus on whether the data has been standardised / refined or alternatively how there is a sufficient sample size catering for multiple climate conditions in order to form a credible training set. In one recent engagement we uncovered that the data being used did not capture temperature change, which subsequently explained why "predictions" were far less accurate on days when the climate was extremely hot.

This all leads into another key issue that LCC has observed - the capacity of mining technology companies to scale their data capabilities. It is not as simple as going to AWS' "cloud" and buying more virtual rack space. Pilot programmes may work fine in the field, but the underlying technology is neither bug free nor alternatively able to handle larger data flows. As such it is not commercially hardened to operate at scale. Diligence needs to focus on the technology ramp up plan – and any additional investment required to deliver that *(capital and professional resources)*.

This can also mean that the "technology debt" that the Bidder was trying to avoid may not be avoided at all. The Target's required investment *(contingent liability)* in achieving commercialisation passes through the M&A deal from Target to Bidder. If this investment is substantial or the project complex, any timing advantage *(build vs buy)* can be quickly lost as the subsequent commercialisation of the Target's technology is rarely on budget / time *(in fact it is often the reason they are selling – they cannot make the jump from pilot to commercialisation)*.

M&A Valuation Risks Include

- ➔ Poor Architecture
- ➔ Industry 2.0 not Industry 3.0 Technology
- ➔ High Ongoing Capital Investment Required
- ➔ Failure to Scale
- ➔ "Shooting Star" Technology : Obsolescence Risk
- ➔ Mine Site / Customer Resistance / Market Size Errors

Getting the analysis wrong in a Mining Technology deal can set the Bidder's strategy back in both terms of additional capital required (so the value of the deal increases) and time lost.

"Just Because It Is Technology Does Not Mean It Will Scale"

LCC believes that certain technology deals completed in sector over the last 12 to 18 months will *(disappointingly)* fail to deliver substantial operational or shareholder value benefits to the Bidder.

Future acquirers can minimise their risk of a failed or substandard deal by focussing on critical deal making issues including:

1. **Not assuming all data is the same.** There is a real need to ask detailed and granular questions in order to truly assess the long-term potential of any data-driven mining technology company. Machine learning technology's fabric is pure, well classified data in sufficient quantities that allow "prediction" of future events to be made.
2. **Understanding the ongoing investment.** Any acquisition will not mean the end of technology investment. Often the springboard for the Bidder leads to a dive into the deep end. That being said, with the right acquisition strategy the opportunities that are unlocked are immense. The "stickiness" of a compelling technology offering for mining companies and service providers remains highly attractive.
3. **Integration risk is high.** Thought needs to be undertaken upfront on the technology path that will have to be progressed post deal in order to integrate and leverage any acquired mining technology company. Whilst this paper has not covered it, the IT integration risks of bringing many disparate systems together quickly are high *(in terms of capital cost and operational harmony).*
4. **Focus on the tangible, observable value benefits.** There are many mining technology start-ups and emerging technology companies operating in similar spaces. **Whilst most Bidders don't appreciate it, they are in fact spoilt for choice on their acquisition possibilities in the digital mining technology sector.** Great care needs to be taken in analysing and acquiring the right company. The risk of a poor decision is not only lost capital – but importantly lost time as the business landscape continues to rapidly evolve. *Your competitors are never standing still.*

How LCC Asia Pacific Supports Its Clients In The M&A Process

LCC Asia Pacific has specialised in delivering strategic advice and counsel in the mining services and engineering sectors for over 17 years. Through that time, we have seen many changes in the M&A and strategy landscapes. We believe that none is more challenging than this rapid evolution towards the *digital mine.* The potential impacts are far reaching – from dramatically increasing the prospect of future retention "stickiness" of both clients and operating mine sites *(positive)*, through to social issues including certainty of employment and future opportunities for mine site employees *(often not so positive).*

For Engineering, Mining Services and Oilfield Services companies seeking to evolve and capitalise on this new digital frontier both the opportunities and the challenges are immense. **The abundance of venture capital combined with bright industry talent means that there is no shortage of potential acquisition candidates for aspirational Bidders.**

As a "hybrid" investment banking/management consulting firm, LCC Asia Pacific helps its client in specific ways in coming to grips with the changing dynamics of technology driven business models:

- For companies seeking to grow we support the design of future-proofed business strategies *(M&A and Organic),* navigate technical / commercial diligence, provide data driven opinion on valuations and deal structures and close risk balanced acquisitions which can deliver near to medium term benefit for both operations and shareholders.
- For mining technology companies LCC assists in ensuring what is being created will be robust and of significant value when the time comes to exit. We have found that entrepreneurs whilst driven to deliver a technology outcome, often do not understand the importance of critical issues that the Bidder will ultimately need to consider.

2019

Boutique Investment Banking Firm of the Year

2018

M&A Deal of the Year
SUB $USD $100M

2017

Asia Deal of the Year

LCC ASIA PACIFIC
CORPORATE FINANCE & STRATEGIC ADVISORY

LCC Asia Pacific

Aurora Place 88 Phillip Street Sydney NSW 2000 AUSTRALIA
T: +612 9262 2121 F: +612 8088 1239

Author:

Nicholas Assef LLB (Hons) LLM MBA Grad Dip LP AIMM SA Fin MAICD
Head of Engineering, METS & Technical Services Sector

Direct: +61 2 9262 2121
Email: naa@lccapac.com
