Vale is a global mining company with headquarters in Brazil. It has mining operations across iron ore, coal, nickel, copper, and manganese in around 30 countries. It is one of the largest iron ore and nickel providers in the world. In 2017, Vale had a strategic refocus driven by the requirement to competitively differentiate itself and create greater value. Vale's iron ore mines are in Brazil, and the company's customers are primarily in Asia. The commercial reality for Vale is that it has the highest-grade iron ore mines available, but it is located 17,000km shipping distance from its major customers — the Chinese steel manufacturers. This gives Vale the additional challenge of being farther away than the iron ore miners in the Pilbara of Western Australia. To address this situation, Vale sought to position itself as a "premium, flexible, and predictable" supplier, shifting its strategic focus to customer centricity, value in the market and, particularly, value over volume in its operational delivery and management model. This strategic reset has led to an innovation-focused transformation across the business, moving Vale to become a customer-centric mining operation and to exert far greater control and insight across its business as it delivers more value to its customers.

**Q. How did Vale's innovation journey start?**

**A.** Vale has a long tradition of innovation for operational excellence. One of the most recent examples is the truckless operations in the north of Brazil (S11D project), launched in 2017 and designed to produce 90 million metric tons per year. The S11D project reduced diesel consumption by 70% and CO2 emissions; it also introduced dry processing, cutting water consumption by 93% and eliminating the need for tailings dams altogether. Another example of Vale innovation is the Valemax ships. Valemax ships are the largest ore carriers in the world. They are also known as green ships because the second generation of Valemaxes emits 41% less greenhouse gases per ton per mile transported compared with the Capesize fleet and has capacity for 400,000 tons.

In 2017, Vale started its second wave of competitiveness based on further integration of performance improvements through innovation and automation development as well as a clear strategy for supply chain optimization (efficiency and price realization) and pellet production increase. Vale's strategy reset has been driven by the requirement to provide customers with a more targeted product that delivers consistently greater value to them. For Vale, that meant looking across the business and addressing how to execute customer centricity and greater value.
This focus on the customer to deliver a premium product was about not only ore grade but also the requirement to control the operations so that the company can consistently deliver the highest-grade ore (with the minimum impurities) that aligns with customer requirements. This has meant understanding at a far greater level of detail who our customers are and what their requirements are, enabling Vale to be far more integrated within the customers' supply chain. By blending and changing the characteristics of the ore, Vale could make our customers 20% more productive, and for Vale, the outcome has been that the value of Vale ore in the marketplace has increased. Vale has reported that the price per ton of its iron ore in the market has increased from under US$4/ton on average in 2016 to around US$10/ton on average in 2018.

During this time, Vale has been able to create more than US$3 billion in new value by focusing on the following key areas:

- **Prioritizing value over volume.** This has meant changing processes and looking at the organization globally.
- **Managing the Vale supply chain globally.** The shift to global management of the supply chain has meant that the business is able to make much more intelligent decisions, allowing much more of a pull approach rather than a push approach.
- **Having a far deeper understanding of the customer.** This is an ongoing process for Vale and will be a key focus of change going forward.

Vale's rapid digital technology advancement has brought another wave of opportunities focusing on business outcomes for asset performance, maintenance, workforce effectiveness, and supply chain. We have started with strong collaboration with the business on an experimentation approach for equipment predictive maintenance with advanced analytics, and the results were outstanding.

This example inspired the operation to take a similar approach across different regions and assets, resulting in more than 100 projects globally and the creation of an artificial intelligence (AI) center. This AI center is based in Brazil and has a multidisciplinary team that captures the data remotely and creates models for insights in many areas that result in cost savings throughout the operations and corporate areas. As an example, from the AI center in Brazil, data from the haul trucks in Mozambique for coal operations generated a model that resulted in reduction of fuel consumption. Upskilling the team and having key partners were key for that.

Due to those results, an additional portfolio of projects was approved by the board for a Digital Transformation Program in a multiannual view. We are still in the beginning of the journey, and innovation is a critical success factor for sustaining our competitiveness.

**Q. Where does SAP fit into Vale's innovation journey?**

**A.** SAP has been a critical technology partner for Vale for many years. Vale has a very large SAP environment in place, including ERP, HR Success Factors, SAP Master Data Management, and HANA for business warehousing and environment management. In 2014, in a shift to a common platform, Vale introduced a single ERP instance globally for all operations.
As well as being a critical partner for providing the digital core capabilities of the Vale business, SAP is one of the key vendors that Vale is working with in the area of innovation. Part of the digital transformation move is starting to utilize the SAP cloud platform and SAP Leonardo for reinventing business processes. One example of the work that Vale has implemented through the application of SAP Leonardo using design-thinking approaches is the implementation of autonomous purchasing for procuring services, which utilizes artificial intelligence to automate procurement. The purchase requisition is created, and Leonardo does the rest.

Another use case in procurement using Leonardo was for purchasing spare parts for maintenance. Vale was able to prototype this capability in the cloud in four weeks. One of the lessons learned from the implementation of this example was determining who the end beneficiary was as the capability was scaled out; in this case, the process transformation was requested by the procurement team because it had to rework its claims, but change in the processes undertaken as a consequence of the design-thinking approach has meant that the benefit is now realized by operations due to process redesign at the source. Despite the success of the prototype, it was a challenge to prioritize the project across the operations and scale the results given the number of priorities the operational teams already had.

The capabilities that SAP and Vale are working on are changing the relationship between the two companies. What started as a transactional relationship is developing into a true partnership. Key for both parties is that the partnership is for the long term. It is also taking a different shape, with a greater focus on design thinking and innovation-led implementations across different parts of the Vale business.

Q. Can you talk about the benefits the business is seeing from the changes that have been made?

A. Vale has driven a great deal of change in its organization over the past two years, and the business is now realizing that value in several key areas. Major operational components have been put in place that are contributing to the value being delivered to the business:

» Vale opened its global operations center in September 2017. The center is responsible for long-, medium-, and short-term planning for the whole Vale supply chain, aiming to optimize results and minimize deviations. The teams at the operations center undertake monitoring of each process step, including dynamic monitoring of Vale vessels. The integrated operations center delivered US$400 million in savings in 2017.

» Another area is the analytics group, which was formed in 2015. The strategy has been to pair with the business to show business units (rather than tell them) the value that analytics can deliver. One of the first projects was to extend the life cycle of tires and thereby reduce maintenance costs, which saved US$5 million in a few weeks. The group has already implemented 43 analytic models and delivered US$30 million in savings, and it expects that 300 models will be implemented by 2020.
Our center of excellence has focused on asset groups for the entire supply chain. Vale selected top engineers from operations and organized them by asset groups globally (mining, ports, rail, etc.), paired with IT teams to use a data-focused approach to optimize the entire supply chain.

We have also enhanced our journey toward open innovation and created an innovation network across the operations. We actively participate in the Mining Hub in Brazil, connected to the innovation ecosystem for solving challenges for the entire mining industry. The innovation network has established hubs inside the operations globally with multidisciplinary teams applying the best of engineering and user-centric design to accelerate innovation and business value for Vale. This approach has enabled the mindset change and created an environment where digital experimentation can be facilitated within the Vale organization.

Within Vale, the move to becoming a premium, flexible, and predictable provider of commodity products has led to the requirement for a shift in mindset and a new management model. Vale has placed a very big focus on mindset change, culture change, and the way that (and the speed with which) the organization learns. This new model, sponsored by leadership, is also supported by key human resources practices within Vale that have empowered a lot of changes, including how leadership is measured on specific behaviors for collaboration, innovation, and agility. One outcome has been that Vale’s operating model is far more integrated than it was previously.

Q. What's next for Vale in this journey?

A. Vale is increasing its focus on customer centricity and operational excellence for best-in-class safety in mining. Vale sees the future of its business as constantly creating prosperity and sustainable development by being a learning organization for higher innovation on the entire value chain. It is working toward an optimized operation business model built on artificial intelligence, robotics, and autonomous operations. A key component of that is expanding the upskilling of the workforce, not only for new skills and metrics but also — mainly — for the mindset within the organization. These elements are critical for the business going forward.

About the Analyst

Emilie Ditton, Associate Vice President, IDC Energy Insights and IDC Manufacturing Insights

Emilie Ditton is Associate Vice President for IDC Energy Insights and IDC Manufacturing Insights and is the Head of IDC’s Asia/Pacific Energy and Worldwide Mining practices. She has been leading IDC’s mining sector research for the past five years, and her core research coverage focuses on the evolution of technology strategies of mining and energy companies as they respond to changing marketplaces, the requirement to create operational excellence, and changing customer expectations.
This publication was produced by IDC Custom Solutions. The opinion, analysis, and research results presented herein are drawn from more detailed research and analysis independently conducted and published by IDC, unless specific vendor sponsorship is noted. IDC Custom Solutions makes IDC content available in a wide range of formats for distribution by various companies. A license to distribute IDC content does not imply endorsement of or opinion about the licensee.

External Publication of IDC Information and Data — Any IDC information that is to be used in advertising, press releases, or promotional materials requires prior written approval from the appropriate IDC Vice President or Country Manager. A draft of the proposed document should accompany any such request. IDC reserves the right to deny approval of external usage for any reason.

Copyright 2019 IDC. Reproduction without written permission is completely forbidden.