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Demystifying Digital Transformation in Building & Construction Material Industry



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The State of Building & Construction Material Industry



Marketplace Trends

The market served by building & construction material Industry has undergone significant shifts over the last few years. One notable aspect is increasing production capacities leading to price wars amongst various local and international supply chains and shrinking margins. At the same time, the demand for cement has contracted globally due to the pandemic - leading to a flattening demand curve across the western markets. There are trends of M&A as well within the Building & Construction Material Industry where mergers of businesses and targeting larger business market is certainly showing acceleration.

Geographic Trends

In this process, the logistics function has demonstrated increased efficiency and reduced costs of international shipping. As a result, markets like the US have seen local suppliers outsourcing from offshore producers, and native manufacturers have been forced to rethink their strategy for creating profitable margins. In some of these markets, profitability has gone down by 50%, while margins have shrunk by more than 14%. At the same time, developing markets have also exhibited a dwindling demand - countries like China and India have given mixed signals, and a sharp fall back in demand isn't likely until the population growth rates stabilize. What's the outlook for this industry during these rather bleak numbers? The demand from developing geographies is growing exponentially and pushing localized supply priorities as well.

Technology Trends

The legacy cement plant might have no place in the cement and building industry of the future - due to pricing, efficiency, and cost-related reasons and increasing pressures from regulatory bodies for the health and safety of workers and reduction of the carbon footprint. In this process, new IT and operational technologies have made inroads into the cement plant. Several manufacturers are already taking a tech-first approach to reimagining their plants and business models - with the use AI, automation, edge computing, cloud, and upcoming communication technologies like 5G and Wifi 6. The typical 1-2% IT budget range of this segment is expanding and creating newer markets for the B2B2C segment. Thoughts are coming in from CIO's for transforming their manufacturing processes and introducing Analytics for enhancing key outcomes.

Top Strategic Business Priorities for Building & Construction Material Manufacturers

Naturally, the leaders in this industry are operating at the intersection of shifting market dynamics, new sources of competition, and an evolving, tech-first approach to the same end goal. What are some of the non-negotiable business priorities for manufacturers in such a business environment?



Cost Efficiencies

To compete in an industry where profit margins are declining and capacity growth has outpaced demand growth, boosting the cost efficiency of the cement plant has become a top priority for manufacturers. This can be achieved in several ways - most notably, by cutting the input costs of keeping the plant running and minimizing the cost of failure and maintenance, regulatory compliance, and logistics. Moreover, preventing revenue (and consequently cost) leakages through a solid ERP strategy and quality control is critical to maintaining an edge over the competitors.



Energy Efficiency

The cement industry contributes 5-7% of the global annual carbon dioxide emissions every year. This, coupled with the fact that energy forms 47% of the input costs in the cement manufacturing process - places a significant premium on the dimension of energy efficiency, the imperative to adopt green fuels, leveraging clinker substitution methods, and pursuing operational optimization from an energy perspective.



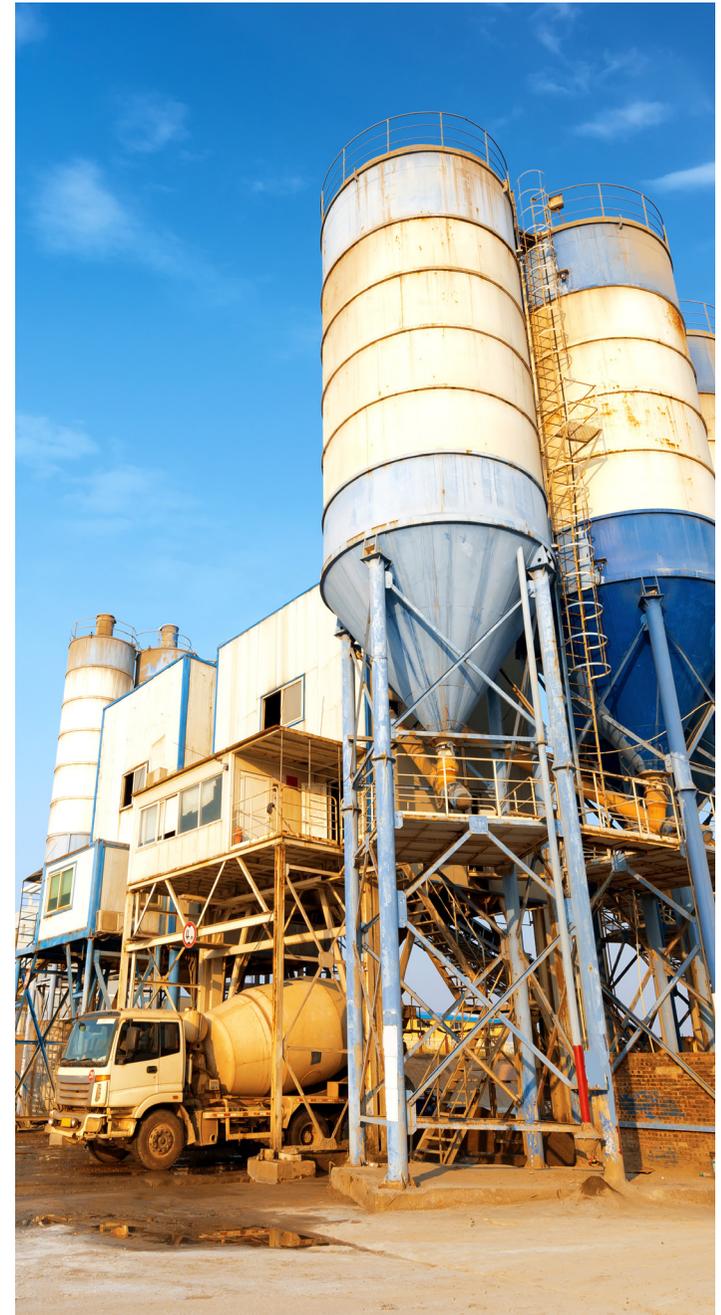
Productivity and Efficiency

Most cement manufacturers of today deploy manual processes, where production and scalability remain a function of human hours input into the process. This direct proportion needs to be unentangled - and manufacturers must embrace end-to-end automation in the entire cement manufacturing lifecycle to significantly outperform their current productivity levels. At the same time, process efficiency must improve, too - a cradle-to-gate assessment of cement plants revealed a significant room for improvement through cement kiln dust recycling, for example.



Collaboration, Visibility, and Governance

The COVID pandemic has already shown the limits of high-contact processes and their sustainability from cost and resilience. As a result, manufacturers must build collaboration and governance through a digital bridge - to be precise, and digital twin technologies have shown great promise in this area. Building end-to-end visibility through secured IoT networks and the use of information broadcast by thousands of sensors in real-time can bring end-to-end visibility into the manufacturing and distribution process. This shift will foster effective remote collaboration and digital governance through the use of cloud computing. Beyond cement production, Building Information Modelling (BIM) techniques can help inject greater visibility into the planning, feasibility, and cost projections of projects and facilitate architects and engineers to collaborate and fine-tune infrastructure projects.





Asset Maintenance and Workforce Safety

Maintenance is one of the biggest cost black-holes that affect a cement manufacturing process today. Further, the plant and workforce safety assurance costs in highly regulated environments like the EU and the Americas - and manufacturers are left grappling with severely declining margins that set them back compared to their overseas rivals from the APAC. However, modern technologies like AI and Machine Learning can help manufacturers downscale these costs while bringing greater predictability and better safety standards into the production environment while detaching maintenance and safety functions from human dependence.



Distribution Management - Dealers, Retailers, Sales

Beyond the cement production plant, the broader cement industry continues to rely on fragmented communication channels connecting suppliers, dealers, and retailers. While the recent pandemic has boosted the acceptance of digital channels for communication, the industry needs to adopt 21st-century methods of distribution management backed by the right tooling. This move will help build visibility into order management systems, achieve self-serviced loading and unloading, automate the middle and back-office tasks, and ultimately inject greater responsiveness within the supply chain.

Lastly, manufacturers need to envision a building & construction material industry that exhibits greater agility, minimizes waste, and is resilient to demand and supply shocks. This is only possible by gaining centralized control, end-to-end visibility, and better predictability - which calls for an agile and economically feasible, 360-degree approach to the digital transformation of the building & construction material business.

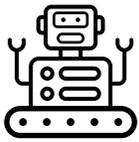


The Case for Digital Transformation in the Building & Construction Material Industry

The building and construction materials industry of tomorrow will be shouldered by cutting-edge technologies and built on the premise of visibility, safety and security, and low-touch operations. Interconnected and interfaced through digital systems to orchestrate a new maximum efficiency, profitability, and sustainability, here is a snapshot of how these technologies will empower the digitally transformed cement plant.

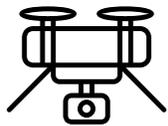


Health, Safety, and Environment (HSE)



Robots in Hazardous Areas Mines, Sites

The first step in modernizing your approach to safety is to leverage robots in hazardous areas, like mines, unguarded, high-risk situations. In such areas, there is a possibility of interfacing with hazardous chemicals. Further, in these zones, the environmental variables cannot be predicted - robots can also prove safer and faster in monitoring the production sites while empowering the move to zero-injury operations.



Drones, UAVs based Mining, Construction Site Inspections & Analytics

Beyond on-ground robots, drones and other unmanned aerial vehicles can be used to ensure a continuous mapping and inspection of mining and extraction sites, automatically sensing sudden changes and speeding up emergency responses in urgent situations.



Monitoring, Green Energy

Sustainability imperatives are becoming increasingly urgent for cement manufacturers because of the growing regulatory focus on the industry's contribution to the global carbon footprint. Some manufacturers have already moved over a quarter of their production to alternative fuels by leveraging data on kiln performance, running simulations using calorific prediction models, followed by multiple-scenario analyses, and optimizing the types of fuels used through trained models.



Worker Health Monitoring Through Healthcare Patch and Fitness Wearables

Beyond the use of passive safety assurance mechanisms like protective wearables and workers' safety education sessions, cement manufacturers can also leverage real-time healthcare monitoring through wearables that monitor the vitals and lightweight algorithms constantly on the lookout for anomalies.



Mining, Construction Site Worker Safety with IoT Wearables

Mining, extraction, and construction workers are especially exposed to many hazards - like fire and explosions, structural collapse, flooding, etc. IoT wearables can be leveraged in such environments to speed up the evacuation process, monitor injuries, and send pre-emptive signals in case scenarios involving interfacing with heavyweights, extreme locations, and hazardous machinery parts.



Driver Analytics & Safety

Driver analytics solutions can detect fatigue, sleepiness, and abnormal driving behavior - and in response, generate alerts to take safety precautions, and broadcast such information to pre-configured emergency touchpoints that can send help to a driver, ensuring their safety while also preventing materials wastage and avoiding potential lawsuits in case of a mishap.



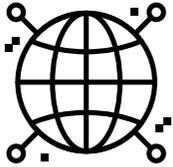
Pressure Monitoring

From crushers, conveyor belts, and clinker coolers to compressors, cement silos, and delivery trucks – pressure monitoring can help workers operate within the prescribed limits of various systems and cut the guesswork out of the equation - this can help avoid higher costs, like the loss of life and expensive repairs down the line while also ensuring better health of the equipment.



Production optimization and manufacturing excellence

Here are the five pillars of achieving manufacturing excellence and pushing the frontiers of optimization:



Connected Robots and Drones For Inspection

Driver analytics solutions can detect fatigue, sleepiness, and abnormal driving behavior - and in response, generate alerts to take safety precautions, and broadcast such information to pre-configured emergency touchpoints that can send help to a driver, ensuring their safety while also preventing materials wastage and avoiding potential lawsuits in case of a mishap.



Utilities & Energy Management

Cement production remains an energy-intensive process. As a result, gaining granular and plant to enterprise-wide visibility of power consumption statistics and their analysis and the ability to benchmark performance based on consumption, perform a root-cause analysis of overconsumption. Schedule peak and valley hours to optimize by power input - are critical capabilities that manufacturers must have at their fingertips. Moreover, building plant, line, and workshop-level KPIs using this data can further sharpen cost projections, build predictability, and pinpoint sustainability metrics for the regulators.



Digital Twin/Smart Manufacturing for Cement Leveraging IoT, Machine Learning

Digital twin technologies bring physical elements, materials, and processes onto the screen in real-time. This helps identify the moving variables that undergo a process to output the result and optimizes the end-to-end process using machine learning algorithms. This optimization can be fine-tuned along several dimensions - like minimizing costs, maintaining the baseline quality of the final product, and other such parameters.



CBM and Predictive and Prescriptive Asset Management

By attaching sensors to the thousands of moving parts that must function perfectly within a plant to output the expected end product with the right quality parameters, cement producers can eliminate high costs from manual maintenance audits and downtimes resulting from a reactive approach to maintenance. Condition-based, predictive, and prescriptive maintenance systems can notify operators of a need to schedule a replacement or repair before a part wears out or goes faulty.



RMX Plant Utilization Dashboard

Lastly, understanding the state of your inventory in the cement manufacturing process and generating timely alerts that are fine-tuned to the utilization rates of each batch is an important aspect of keeping the production running smoothly. This is achievable through real-time, online dashboards integrated with load planning and scheduling systems, batch information systems, and enterprise ERP and CRM systems.



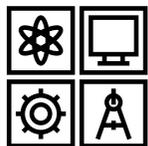
Logistics, Transportation, and Operations

A digitally transformed cement business must go beyond manufacturing excellence - and ensure that the same standards are at play within the overall operations governing the shape of revenues on an everyday basis. Here are a few ways to do this.



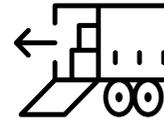
Self-Driving Connected Delivery Trucks

Cement producers are leveraging guided automation and seamless integration with ERP systems to build a network of self-driving trucks that can transport, onload and offload materials within the production site. Beyond the cement plant and automated concrete mixing, Level 1-2 driving automation and an interconnected fleet are being leveraged to lower costs, enhance the responsiveness and optimize delivery costs and timelines of the larger logistics that interface the producers with the rest of the ecosystem.



Integration with Plant Analytics

Analytics solutions are shouldered by sensing and measurement technologies that pipeline data from various machines and environments into a centralized data warehouse. By integrating the logistics and operations systems with plant analytics, cement producers can seamlessly move from a technology and operations view to a business view of their production units - and gain better visibility into bottlenecks and root causes that affect output quality, profitability, and input costs across different units.



Assured Unloading in Cement Silos

Producers can now customize bulker cement unloading systems to match their product density and environment-specific requirements of unloading capacities. These systems can help unload the bulker into the silos within an hour and reduce dependence on the compression mounted bulker's availability.



Vehicle Tracking System

As customer expectations are on the rise, and logistics operations under increasing constraints (due to dynamic lockdowns), leveraging a fully connected fleet that deploys real-time vehicle tracking has become critical to optimizing delivery routes, building visibility into materials in transit, and dynamically re-routing trucks. Moreover, tracking systems inject greater predictability into the logistics planning process - making them agile, accurate, and cost-efficient.



Command Center

Command centers were previously pictured as rooms with a few screens updating operators of critical variables that synchronized with the actual status of machines every few hours or minutes. However, the command center of today must do much more - like providing centralized control based on the real-time status of every system, from milling and kilns to cooling and power systems, cement recipe selectors, clinker characteristics, and so on.



Traffic Condition Analytics and Order Lead Time Updates

In sum, as more and more physical machinery, vehicles and systems are mirrored on the screen, the greater the value that can be leveraged from them. For example, by integrating plant analytics with connected trucks that are being tracked on a real-time mapping environment, producers can not only deliver insights directly into their drivers' navigation systems but also keep the customers up-to-date with on the status of their orders until the last minutes, with 100% precision - thereby boosting satisfaction and improving order lead times.



Customer Enablement, Sales and Marketing

One of the biggest digital transformation imperatives in the cement industry will be hinged on customer enablement. As the supply chains are far from fail-proof, customer-centricity remains at sub-baseline levels, and sales are fuelled largely by demand rather than customer service, needs, and loyalty. Here are the next steps for manufacturers to rewrite their sales and marketing strategies.



XR and 3D Modeling Services

Beyond concrete and cement products, manufacturers need to extend the utility value of the services they deliver to their customers - for example, extended reality (AR and VR) and 3D modeling services that can fuel cutting-edge, modern-day infrastructure projects. Such strategies will build trust and brand value within the ecosystem and create the center stage of collaboration between multiple stakeholders - and ultimately pave the way to becoming a partner of the customer rather than a mere, replaceable supplier.



RMX Cement, Level Monitoring, and VMI

Instead of operating on the assumption that a customer can accept an order in-situ, or worse still, calling up a customer to gauge their inventories manually, manufacturers can now leverage modular delivery platforms that can facilitate vendor-managed inventories based on real-time level monitoring,

accurate weather forecasts on the construction sites, and improve supply visibility for both sides. In return, cement producers can expect greater customer loyalty, reduce freight costs and demurrage charges, and secure a greater and predictable share in the market.



RMX Customer Segmentation

Most industries have moved to specialized delivery and treatment across their customer segments - in the RMX market. For instance, manufacturers must segment their customer/target customer base on the grounds of application - like residential use, commercial/industrial use, and infrastructure use, or on the type of products sold, like transit-mixed concrete, shrink mixed concrete, or central mixed concrete. Accordingly, a targeted approach must be taken regarding marketing, sales enablement, and loyalty-building for specific segments to convert clients into stable revenue streams.



Mobility Solutions For Better Collaboration Between Retailers, Sales, and Distributors

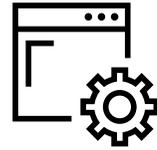
Lastly, the sales process needs digital life too - for example, manufacturers need to implement connected logistics fleet and integrate their shipment planning with some of the moving variables that can cost heavily for the customer - like planning shipments by accounting for the customers' inventory levels, conditions in the field, and changing mobility directives across geographies. In other words, collaboration must be injected within the solutions that interface the transactions (physical or digital) between the manufacturers, distributors, and retailers. Moreover, customers must also be proactively kept up-to-date on the status of their shipments - like the whereabouts, estimated time to delivery, etc.



The Future of Building & Construction Material Manufacturing

As bleak as the figures underpinning the building and construction materials industry might look at the present, the future of the industry looks bright as ever - according to a McKinsey study, the cement plant of the future will operate on a significantly lower carbon footprint (approximately 75% of where most plants stand today) while producing output at an increased margin of \$4-9 per ton. How is such a future possible?

Leading players are already closing in on fractional achievements along with these figures. Here are three major changes that the industry must (and will) undergo to get there:



Automation Reduces Sunk Costs

While end-to-end automation of tasks requiring no human inputs will save money by eliminating the person-hours input in the production and distribution process, predictive maintenance will eliminate over 20% of maintenance costs compared to the current levels. At the same time, this will also boost the lifetime of assets while boosting the employee attrition rates due to the reduction of repetitive, uninteresting tasks that currently deploy largely unskilled labor.



The Information Revolution

Automation currently remains at the top of the list of technologies that generate the highest RoI out-of-the-box in the manufacturing industry as a whole. However, automation calls for networked sensors that collect and pipeline information on assets, materials, and processes into a centralized repository. This will pave the way for advanced technologies like digital twins, end-to-end process optimization systems, hyperconnected order capture-to-delivery, and a complete birds-eye view of systems, people, and processes - based on granular, real-time data. Such systems will be backed by upskilled managers that can get any information they need to decide and control - at their fingertips.



Towards Greener Cement

The cement plant of the future will reduce carbon emissions by utilizing greener alternative fuels and hyper-optimize power consumption by gaining complete visibility into the production units - from extraction sites to warehouses. An AI and ML revolution will be a critical player in this shift, increasing the consumption of alternative fuels in a chemically unstable and complex process as cement manufacturing more than calls for one. Beyond data capture and warehousing from some systems, alternative fuel optimization requires highly precise and fine-tuned simulations powered by advanced ML techniques.

While most of the technologies that exist today can help cement manufacturers get to this future cement plant - and most regulatory, climate, and market factors already point to the success of such a plant in the coming decade, how can cement manufacturers get there?

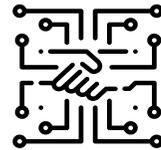
How to Build Your Digitalization Roadmap in the Building & Construction Material Industry

The arsenal of technologies available to the manufacturers today is sizeable. The degree of change that adoption of such technology would bring to the business might look overwhelming - especially, given the current state of the industry, a systematic, self-propelling approach is the need of the hour for those looking to emerge at the top of this highly competitive industry. Here are five tenets that will help producers sail through this digitalization roadmap in the coming years:



Adopt High RoI Technologies First

Automation and predictive maintenance are unarguably at the top of this list and can kickstart significant RoI for manufacturers from day 1. However, this change must be made in a swift yet permanent manner; some plants have demonstrated low RoI on technologies such as predictive maintenance precisely because of a failure to effect cultural change and retaining skilled workers that are willing to commit behind the screens.



Build the Digital Backbone

The RoI on IoT networks can be exponentiated through the adoption of public clouds - because IoT sensors pave the way for aggregating information, and the cloud provides a platform where this information can be aggregated, manipulated, and used along the most profitable vectors. ERP and CRM systems will be a major first step in this direction, synchronized with a solid adoption strategy that realigns the right roles along the right processes built with the right digital tooling.



Expand the IoT Fabric

As a few use cases lead to an expanding IoT network, the adoption of a public cloud makes a strong case for bringing the end-to-end processes within the purview of the IoT fabric. As manufacturers can reproduce the reality of the plant digitally, AI and ML-based technologies can make more advanced use-cases financially, technologically, and culturally feasible. This is where the move to a smaller carbon footprint must be advocated for too.



Build a Strong Stakeholder Focus

Stakeholders refer to both internal and external - re-energizing the HSE focus must now be coupled with the right sales enablement strategies. Manufacturers must look for new ways to add value for the end-user. To do this, an effective customer segmentation strategy must inform investments that aim to build the right services in line with the company's existing portfolio. Once the revenue streams of the largest segments have been consolidated, the senior management can work to identify new expansion strategies.

While these steps will vary across companies depending on their size, geographies of operations and non-negotiable priorities that dictate the possibility of operations altogether, identifying and committing to outcomes rather than the approach will be crucial to get to the target state.

Key Takeaways

Takeaway 1

Ultimately, digital transformation in the cement industry is driven by several internal factors to the enterprise and external to the industry. These factors make transformation non-negotiable - like climate change concerns, rapidly declining profit margins in the legacy world, and tightening regulations. Therefore, senior executives must no longer lose time making a digital transformation case to the board - this case was closed yesterday.

Takeaway 2

Digital transformation is not all about technology transformation projects that have led to suboptimal returns at many companies - the right approach to adopting technologies and adapting to change is as critical in effecting the change on a business level. Therefore, a calculated approach to digital transformation will not overlook the financial aspects, compatibility of the target state with the current skill profile, and investments needed to effect cultural change.

Takeaway 3

Lastly, a lack of the right skills in the industry - coupled with a lack of experience owing to a largely passive technological landscape, will see several manufacturers partnering with technology companies. However, in doing so, manufacturers must analyze their partners in change beyond the obvious dimensions like their current portfolio and implementation experiences. Equally important will be their ability to synergize change within the workforce beyond the technical elements and thoroughly entangled with the manufacturers' environment to strategize and commit to a roadmap that builds profitability along the way.

It is time for cement manufacturers to commit to this change, too - as early movers are mobilizing now to capture leadership in the decades to come.

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Building and Construction Materials to the Power of Digital

Partner with us to transform your manufacturing, business operations, supply chain, and workplace safety. Powered by AI, IoT, automation, digital twins, mobility, augmented reality, and cloud, we help construction and building material manufacturers achieve cost leadership, revenue growth, and high operational efficiency.

Learn more to know about how we can help you in your business transformation journey, visit: www.birlasoft.com/Construction-and-Building-Material-to-the-Power-of-Digital



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