

Maximizing Innovation in Digitally Maturing Process Manufacturing

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Overview

For digitally maturing process manufacturers, this report identifies the roadmap that market leaders follow to identify and build the digital core competencies needed to leverage transformation as a competitive advantage. It also outlines three critical objectives they achieve along the way. Also, it discusses their modern approach to a key technological tool that all consistently, successfully leverage—analytics.

Supported by constantly evolving digital technology, business innovation,

commonly referred to as digital transformation, has become central to the market strategies of many process manufacturers. Progress has been made, both in terms of internal improvements in operational excellence as well as new ways of gaining competitive advantage in markets.

Use cases now abound, solutions are widely available, and process manufacturers are improving their ability to harness data and

deploy digital technologies at scale. And transformation has been accelerated by the harsh lessons presented during the pandemic, where the necessity and pragmatism of innovation became immediately evident as overdue. That acceleration has continued, still driven by fragility in markets and supply chains, but now also pushed by the global need to act on climate change. Environmental, social, and governance (ESG) issues and sustainability performance are being woven into the core fabric of business strategies. Process manufacturers view digital transformation, and the myriad technologies associated with it, as inseparable from the transition away from fossil fuels and improvement in environmental stewardship.

Despite the numerous advances made, the majority of expected benefits of digital transformation are still in front of most process manufacturers, even

as they mature in terms of building digital competencies. How can process manufacturers continue to mature, arriving at a place where digital transformation delivers competitive advantage and dynamic business agility while also addressing energy transition needs and sustainability performance? Learning from the best practices of digital leaders is key.

For digitally maturing process manufacturers, this report examines the roadmap that market leaders follow to identify and build the digital core competencies needed to leverage transformation as a competitive advantage. It also outlines three critical objectives they strive to achieve along the way. Also, it discusses their modern approach to a key technological tool that all consistently, successfully leverage – analytics.

Digital Leaders Execute a Distinct Roadmap

For most companies, and this goes for digital leaders when they started, it is typically overwhelming to determine an effective starting point for digital transformation. Without solid ideas on how to develop strong digital com-

For leaders, effective digital transformation doesn't occur unless the organization connects the change to some external market or customer signals. They use those signals as a basis for identifying what must change within the organization, how it will change, and what incentives exist for doing so.

petencies, what ARC refers to as “the accrual of digital wisdom,” companies often experiment and fail. They get stuck in cycles of technology deployment and ensuing collapse of pilots and projects, leading to the internal perception of wasted investment. So, what do leaders do differently?

The common thread is *clarity* around starting points. For leaders, effective digital transformation doesn't occur unless the organization connects the change to some external market or customer signals. They use those signals as a basis for identifying what must change within the organization, how it will change, and what incentives exist for doing so. Beginning with those signals, these leaders create a roadmap that includes:

- **Emphasis on business outcomes that differentiate:** The company defines ideal outcomes that emphasize speed and accuracy of how a company recognizes and reacts to these external market signals. This provides vision for what needs to change.

- **Transparency of objectives:** Armed with an externally based vision for change, leadership is transparent by communicating what transformation will look like and how it will impact people.
- **Aligned incentives:** By realigning incentives with the vision, transformation leaders reward transformative behavior. This becomes the lynchpin step for realigning the work culture, which is fundamental to transformation but also the single-most difficult change to affect for industrial companies.

Using this step-by-step process, it becomes evident what people, processes, and data are involved as well as a clear picture on before and after states of transformation.

Two Key Objectives Accomplished

In executing their digital transformation roadmaps, leaders inevitably identify two key objectives that need to be achieved as innovation is implemented. Both are critical to fully maturing as a digitally transformed business.

A process manufacturer must be able to effectively harness the immense data it has available to it and then use it to deliver new means of competitive differentiation. Analytics is the means for doing so.

The first objective relates to identifying and securing critical intellectual property (IP) and then amplifying its use across the organization so that it delivers new value. This IP resides within people (i.e., tribal knowledge), as well as in the massive volumes of structured and unstructured historic and real-time

data inherent to industrial businesses.

Leaders in digital transformation aggressively secure, codify, and magnify this expertise. In doing so, the organization can then extend this differentiating knowledge across the organization where it can be applied to gain the most effective outcomes.

The second objective digital leaders accomplish is improving business agility by letting as many aspects of the business as possible run at the speed of machines. With advanced analytics, machines can be trained to consume data to produce insights that pinpoint where problems occur and the most effective course of action to eliminate them. Digital transformation leaders

understand that machines do so far better and faster than humans, and they then enable machines to do so whenever possible. However, most companies don't take advantage of this opportunity, as they are too constrained by technical and organizational debt to take the time to put both humans and machines in ideal roles, thus improving the speed and agility of the business.

Third Objective Identified and in Progress

In addition to these two main objectives, a third one has emerged, informed by the pandemic and global focus on climate change. Digital leaders learned during the last few years that many components of their value chains were simply too fragile. At the same time, financial stakeholders began to demand that these value chains improve their ESG performance. Investment shifted toward those companies and industries that could quantify that improvement.

In response, digital leaders, armed with the correct work culture, expertise, data, and technology, can implement business strategies that can support this third objective: parallel improvements in both operational resiliency and sustainability. It is true that the achievement of this multi-goal objective is still very much a work in progress and will continue for the foreseeable future. However, digital leaders have recognized that parallel, quantifiable improvement in both resiliency and sustainability will become brand differentiators in the eyes of the market.

Modern Approach to Analytics is Critical

There are many technologies that can, and will, support digital transformation in process manufacturing. No single one is a panacea, and successful use of these innovative technologies is reliant on changing work culture and the articulation of cogent, competitive strategies.

Yet, at least one innovation core competency is considered central to most all digital transformation initiatives, and that's analytics. A process manufacturer must be able to effectively harness the immense data it has available to it and then use it to deliver new means of competitive differentiation. Analytics is the means for doing so.

Analytics are crucial to identifying and securing critical intellectual property. They are also key for improving operational agility and running the business

at the speed of machines. They are, and will continue to be, necessary to achieve parallel improvements in both operational resiliency and sustainability. Given their importance, how should an organization integrate analytics as a core competency? Avoidance of technical debt and flexibility of application are paramount.

Any analytics solution needs to avoid adding technical debt and the limitations on value it creates. Technical debt is the addition of limiting technology that must eventually be discarded or reconfigured, based on the gap between what is needed and what is delivered. Without this guiding principle about technical debt in mind, companies will be burdened with investment that can't support dynamic adjustments in operations.

In addition to avoiding technical debt, an analytics solution must be flexible

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in how it can be applied. Why is this so important? Until demonstrated through deployment, scale, and ROI, digital solutions are like theoretical math in a world that demands practical applications. Solutions that can't make that leap from theory to scale will simply fail to be adopted beyond the proof-of-concept (POC). This was particularly true during the nascent period of the advanced analytics market and

continues to be evident today.

Even those that pass the POC muster must also provide enough flexibility to be applied beyond niche use. Adaptability is important as users inevitably become more expert at creating value from analytics tools than the companies that provide them. This does not mean that a solution must be all things to all people. Instead, a solution must be technologically flexible so that it can be adapted by users as they discover new ways to innovate and improve the business.

A solution capable of this flexibility includes three characteristics. Each one of these can stand alone as a value, but true solution flexibility comes from the presence of all three. They are:

- **Enterprise coverage**—As use cases expand for digital transformation, organizations will want to level up the strategic value these use cases can provide. That means expanding data sources,

deconstruction of process siloes, integration of new subject matter experts, amplification of insights into new business units, standardization of use, scale across plants and data sets, etc. If an analytics solution does not provide functionality to support this type of expanded use by multiple personas (especially business users), it will ultimately hit a ceiling on value creation.

- **Full analytics lifecycle support**—Targeted analytics are certainly useful, particularly those that can automate processes and safety. However, to help integrate analytics as a strategy-level business competency, a solution needs to support the full analytics lifecycle, including data management, insight discovery, and deployment. Data management includes the ability to support a breadth of data types, with the capacity to cleanse and organize them for use. Discovery enables a right-method-right-use approach by leveraging a deep toolkit of techniques. Once in use, a solution also must contain functionality to manage, measure, and adjust the effectiveness of the techniques being deployed. By providing these lifecycle capabilities, the solution allows the organization the most flexibility in how problems can be overcome.
- **Use in real time**—Not every decision needs to be made quickly, but an analytics solution must support the ability to make the best decision every time a decision is made. By necessity, in digital economies, some of these decisions must be made in near- and real-time. And so, an analytics solution should be capable of handling a real-time environment, including the incorporation of streaming data. This real-time capacity ensures that the solution deployed, such as quality optimization, not only identifies real-time risk but also delivers corrective action in timely manner. For example, improvement plans can be implemented to predict quality output of manufacturing processes and prescribe in real time what the parameters of the process should be to optimize yield and throughput. This could include measuring, reviewing, and responding in real-time to daily improvements; weekly improvements made by OEE review with downtime analysis by asset; and monthly improvements made by OEE review with downtime analysis by asset. Similar lines and loss lists can be reviewed, and yield and throughput optimization opportunities can be identified by targeting low complexity, high value issues. In one case, a major US-based food processor recognized a 15 percent

improvement in throughput 12 months across 5 locations, based on a combination of downtime reduction, yield improvements, a first run quality rate of 77 percent, and an increase in run rate.

Avoidance of technical debt and adaptability should help drive the selection of an analytics solution. Doing so allows an organization to both apply analytics to obvious uses cases and then scale them as the organization matures.

Recommendations

Analytics is on its way to becoming ubiquitous in organizations. Those that can leverage analytics tools to better problem solve will be capable of applying expertise in a way and at a speed the competition cannot. Analytics can initially unleash that expertise and then maintain it, helping a company sustain a market advantage over the competition

Based on ARC research and analysis, we recommend the following actions for owner-operators and other technology users intent on maturing their digital transformation efforts, particularly through the use of analytics:

- Consider the three key objectives of digital transformation leaders. Identify how analytics can help: capture and amplify organizational knowledge and critical IP; develop competitively differentiating business agility; and demonstrate parallel achievement of both business value and sustainability.
- Consider carefully where to integrate humans in analytics processes and select technologies that match accordingly, not vice versa. In doing so, machines will then provide the opportunity for the business to greatly reduce time between problem identification and ideal resolution.
- To integrate analytics as a strategic core competency, adopt a solution that allows expansive, flexible application, while avoiding the cost, risk, and time-consuming weight of technical debt.

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