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Manufacturing to the Power of Digital

A pragmatic approach to navigating technology-led business transformation in the manufacturing world

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Navigating roadblocks to drive digital-led manufacturing excellence

Manufacturers across the globe today operate in a volatile, uncertain, complex, and ambiguous (VUCA) business environment. While customers are beginning to expect "Amazon-like" immersive experiences, there are significant cost pressures and intense competition. Surfing the tide of change will require enterprises to build advanced manufacturing capabilities and leverage intelligent technologies throughout the entire manufacturing value chain.

Manufacturers are facing a plethora of challenges associated with the adoption of next-generation technologies, hampering the pace of digital transformation. The biggest impediments to fully embracing digital transformation can be traced back to issues with strategic intent, business-technology alignment, and change management.

This paper delves deeper into pertinent issues presenting themselves in manufacturers' journey towards digital led business transformation. We also discuss an intriguing approach to digital transformation – Manufacturing to the Power of Digital (MPOD) – that focuses on the entire manufacturing value chain by recommending strategic interventions across data, user experience, cloud, Industry 4.0 technologies, and core ERPs. The MPOD philosophy represents a paradigm shift from systems of record to ecosystems of experiences. That shift puts into perspective the evolving role of the ERP to harness the potential of a more connected, experience economy. Now more than ever, there is a greater emphasis on delivering superior experiences to consumers and the workforce through digitalization of the core.

Further, we discuss a framework by which manufacturers can measure their digital proficiency at a high level by using the MPOD index. Finally, we present a prudent roadmap to accelerate digital transformation and create exceptional long-term business value.

Digitalization for the Catbird Seat

Over two-thirds of manufacturing companies have piloted or are piloting digital industrial technology solutions with use cases ranging from connectivity and intelligence to automation.[1] Manufacturers seeing the potential in those pilots are looking to scale digital transformation initiatives across the enterprise, allowing them to capture and harness real-time data across machines for enabling faster, more efficient, and flexible production processes. Such strategic technological interventions are allowing companies to drive cost optimization, organizational efficiencies, top-line growth, and, most importantly, customer satisfaction.

The proliferation of digital industrial technologies such as Industrial Internet of Things (IIoT), additive manufacturing, augmented reality (AR), artificial intelligence (AI), big data analytics, digital twins, blockchain, 5G, autonomous robots, and the cloud is disrupting the manufacturing value chain. Next-generation technologies have unique applications across the manufacturing value chain – predictive maintenance, AI-led demand forecasting, shop floor communications driven by AR, connected supply chains, smart warehouses, and so many other applications.[2] According to estimates by Bain, companies that get execute their digital roadmap aptly will experience production gains of 15 to 20 percent.[3] That metric is significantly higher than the 2 to 4 percent returns delivered by traditional continuous improvement initiatives.

The need for adopting Industry 4.0 at scale is a top priority for manufacturing leaders across the globe owing to intense competition, rising production costs, digital disruption, growing customer demands, and labor shortage. That willingness to reimagine manufacturing processes is reflected in a recent survey conducted by PwC, which found that 71 percent of industrial manufacturers are already building or testing IoT-related solutions in both active and in-development projects.[4]

However, all leading studies around Industry 4.0 emphasize that transformation in the manufacturing industry cannot be limited to the adoption of digital technologies. It must involve the complete overhaul of manufacturing operations to drive significant business outcomes and achieve a more excellent circular economy.

Future-ready manufacturing operations involve the collection and analysis of data from a variety of sources, including factory assets and systems, CRM systems, and enterprise applications to support real-time decision making. Various equipment across the manufacturing operation are fit with multiple sensors and monitors that continuously track the health of the

equipment and the effectiveness of the manufacturing process, resulting in superior business continuity. In some cases, the equipment data flows directly into enterprise systems such as the manufacturing execution system (MES), which uses it to deliver actionable insights that help with reducing manufacturing cycle time, work-in-progress, and lead time. The data insights can further lead to improvements in the planning process and ensure a more reliable and accurate sequence planning. Manufacturers are also exploring intelligent tools such as augmented reality to streamline shop floor management with proven applications across product assembly, machine repair, and equipment service.[5]

While operational data from manufacturing facilities has always resided on-premise, the advancement in cloud technologies is driving the promise of Industry 4.0 with machine data and functionality hosted in cloud infrastructure. However, all that increased connectivity will necessitate that manufacturers bolster their data security practices and implement robust identity and access management solutions.

In subsequent sections, we will discuss why companies making digital-led manufacturing investments are facing difficulties in realizing Industry 4.0 returns. Also, we will discuss a pragmatic approach to understanding and executing digital transformation in manufacturing.

Navigating roadblocks to drive digital-led manufacturing excellence

In a recent study, two-thirds of manufacturing CxOs concurred they either have no formal strategies or are taking ad hoc approaches when it comes to implementing Industry 4.0 technologies.[6] The same survey revealed that only 10 percent of CxOs have longer-range strategies to drive Industry 4.0 programs. The lack of a formalized, pragmatic digital approach can prove to be detrimental for the success of an enterprise-wide digital transformation program.

For building a robust digital strategy, manufacturers must conduct a thorough analysis of their existing IT landscape and business workflows to uncover technological and operational gaps. Next, they must curate a vision with specific, measurable, and achievable objectives around stakeholder experience, process automation, and digital business models. Finally, CXOs deconstruct that vision to design strategic paths of action that help with streamlining and governing the process of digitalization effectively.

Manufacturing enterprises also face challenges in scaling up digitalization efforts due to the lack of unified leadership that makes cross-unit collaboration difficult. Executives at large organizations and those that are tasked to innovate, experience a significant disconnect where overall business objectives are not closely aligned with digitalization targets.

CXOs across business units need to collaborate to unlock the potential of Industry 4.0. That means all business functions across product development, procurement, production, supply chain, human capital, finance, sales and marketing, field servicing must come together to design a clear roadmap for digital transformation. An excellent example of that is how enterprise systems owned and used by each of those functions need to be combined to enable a single source of truth. PwC finds that those who excel at combining CRM, ERP, and PLM systems for facilitating real-time insights, achieve a 31% increase in product development efficiency.[7]

Change management is essential for realizing Industry 4.0. The pace of change in the past decade has been overwhelming with evolving customer expectations, technological advancements, and changing market conditions. For companies looking to become digitally mature enterprises, they must build an innovation-driven work culture that allows employees to fail fast and iterate and build proofs of concept using new-age technologies to showcase value. That type of organizational change is usually accompanied by inertia and needs to be driven top-down by establishing a steering committee. From insights gained through responsive feedback loops and regular updates, the steering committee can make strategic decisions confidently and ensure digital transformation projects are delivered on time, budget, and quality. Such an entity also promotes standardization and helps avoid redundancies across functions or geographies, resulting in an optimal digital roadmap.

Driving innovation at scale with MPOD

While start-ups across the world have demonstrated how innovative offerings can be taken to market and scaled quickly with limited resources, large organizations are still figuring it out for all the reasons discussed in the previous section. At Birlasoft, we strongly feel the need for every manufacturer to move up the ladder, from a laggard to a leader, by following a philosophy we call Manufacturing to the Power of Digital (MPOD).

The MPOD philosophy focuses on driving innovation at scale and encompasses four key elements – systems of record or ERPs, process optimization, data management and infrastructure, and the digital ecosystem.

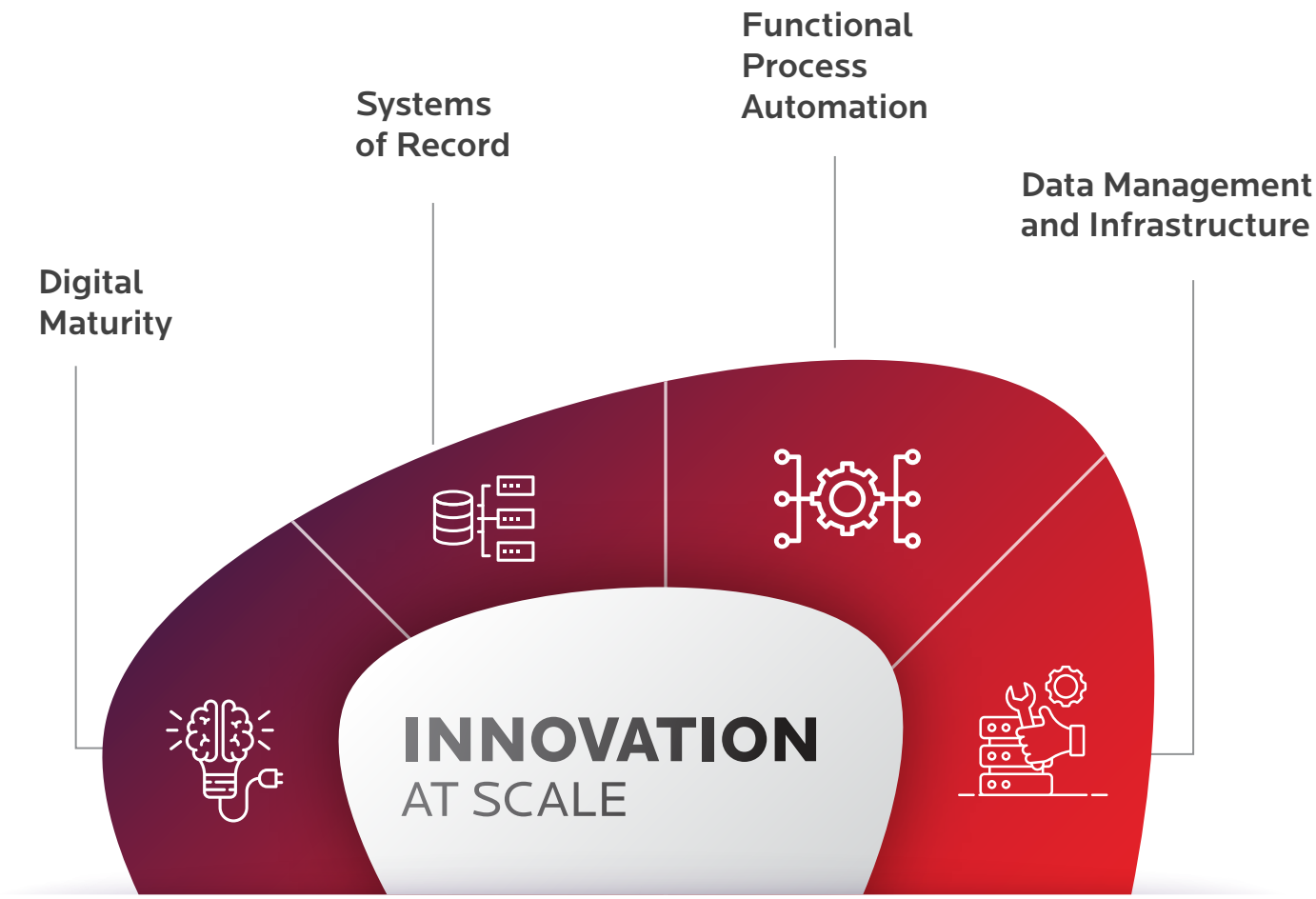


Figure 1 - MPOD elements for driving innovation at scale

Systems of record or ERPs, being traditionally 'transactional,' must be overhauled to take on the 'transformational' role. And that can be done with the help of the other three elements. Digital technologies applied to streamlined functional processes, along with the strengthening of core data processes, infrastructure, and governance, drive the shift from transactional to transformational.

01 Modernize the core to make it digitally amenable

Replace monolithic ERPs with next-generation, modern ERP systems that interact seamlessly with legacy systems, functional and industry-specific applications in the cloud (SaaS), and other third-party solutions. Build an ERP landscape that doesn't merely deliver efficiency but enhances predictability and enables actionable insights from data. Rationalize and consolidate multiple ERPs, accumulated as a result of aggressive M&A activity, to experience lower maintenance costs, robust data quality, and centralized reporting.

02 Automate to augment

Across front-office, middle-office, and back-office streamline, digitize, and automate business processes to achieve business agility, robustness, and superior organizational efficiency. Streamline the functional processes to facilitate the seamless flow of data and promote interoperability across the systems.

03 Simplify to scale up

Carry out infrastructure rationalization by leveraging cloud platforms – SaaS, PaaS, and IaaS. Maximize scalability and flexibility while minimizing capital expenditure and infrastructure management costs and simplifying provisioning and de-provisioning of computing and storage.

04 Personalize to engage

Empower the workforce with digital tools that enhance productivity, enable real-time insights, and boost process visibility. Engage suppliers effectively with digital performance management, automated workflows, and greater visibility into sourcing processes. Curate an exceptional customer experience by incorporating real-time feedback loops within the product development lifecycle and digitizing after-sales offerings.

05 Leverage insights to compete

Unearth actionable insights through AI and intelligent automation to empower strategic decision making and identify opportunities for growth, differentiation, and process optimization.

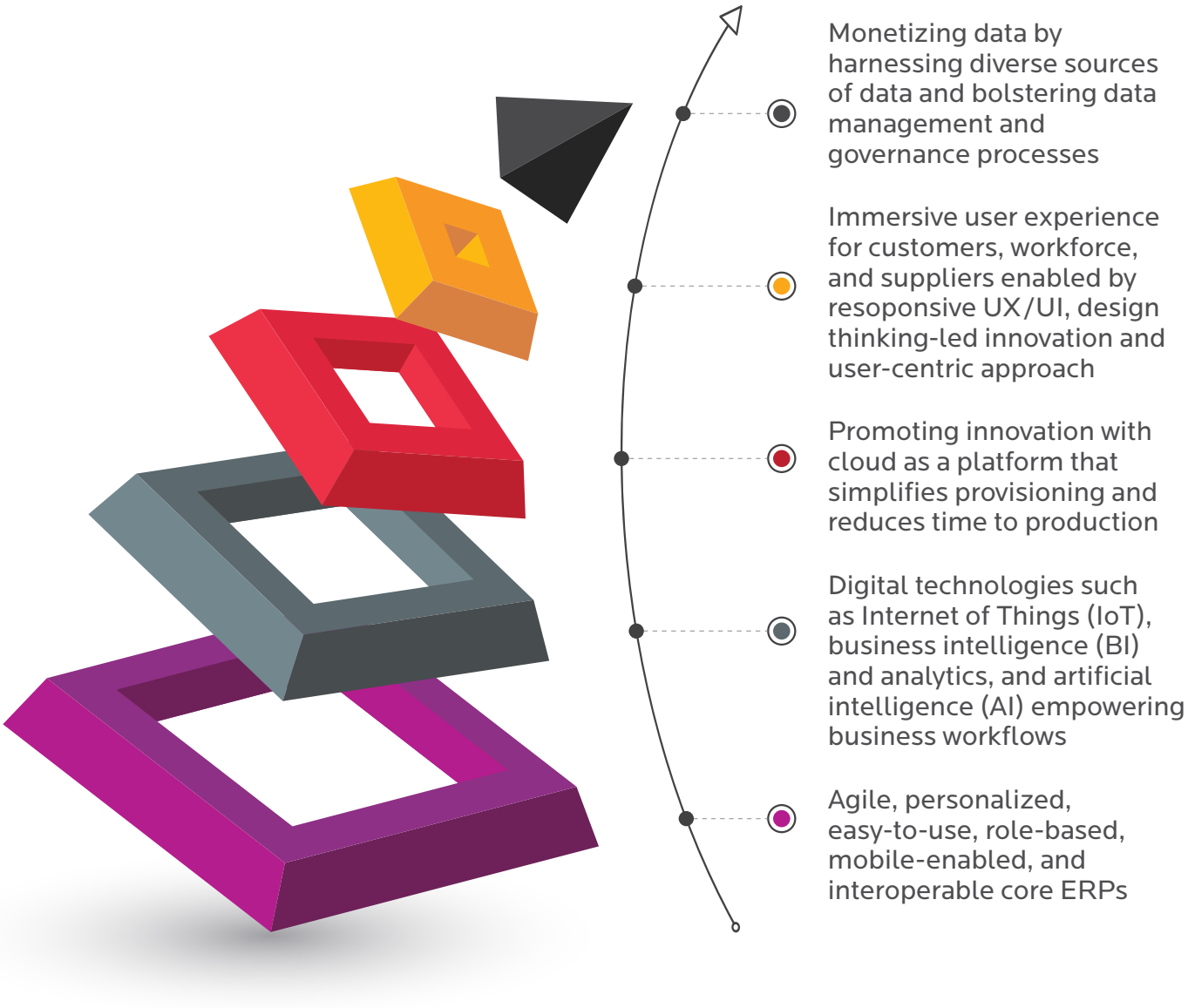


Figure 2 – Anatomy of the MPOD approach

MPOD in action: The move from transactional to transformational

The MPOD philosophy, when applied to real-life manufacturing scenarios, yields significant business outcomes. From systems of records, we move towards an "ecosystem of experiences" – a concept that places a clear focus on delivering superior experiences to customers and employees alike through digitalization of the core.

For instance, by applying stakeholder-centric user experience design principles to critical processes across the manufacturing value chain, companies can boost stakeholder engagement, productivity, and overall satisfaction. On a tactical level, that can be achieved through the enablement of B2B2C models, implementation of next-generation customer relationship management systems, and by facilitating robust e-commerce integration.[8/9] In particular, the success of B2B2C e-commerce models requires that close attention be paid to curating seamless digital customer journeys. A salesforce study found that nearly 70 percent of business buyers expect an "Amazon-like" buying experience from their business vendors. And hyper-personalization can no longer be treated as a priority only for customer-facing brands.[10]

Process maturity is another facet of MPOD, which serves as the foundation of all digital-led manufacturing initiatives. If the process is inefficient, no amount of digitalization or automation can deliver optimal efficiency and quality. For instance, consider the case of 100 percent unassisted onboarding of suppliers using robotic process automation (RPA), where process reengineering at the outset ensures rapid returns on investments in subsequent RPA deployments.

Uncovering insights from data is critical to executive decision making, and manufacturers are looking for ways to accelerate the data-to-insights-to-action cycle. Let's take the example of a typical up-sell or cross-sell sales and marketing engagements. With the availability of high-quality, accurate, and ready to use data, companies can drive personalized marketing campaigns, and leverage AI-based cross-sell models. Moreover, manufacturers can employ structured and unstructured data modeling for uncovering insights, for instance, using social listening to boost the accuracy of demand forecasting.

On the infrastructure front, the optimal use of cloud technology will deliver the much-needed scalability, flexibility, and cost-effectiveness required to drive innovation. The proliferation of various cloud

service models across IaaS, PaaS, and SaaS has made it increasingly simple to adopt cloud technology, reducing the effort to build and deploy applications and optimizing overall infrastructure cost with 'pay as you go' commercial models.[11] Leading independent software vendors (ISVs) have been aggressively marketing their industry-specific cloud offerings to drive cloud adoption and deliver the benefits of cost, scale, and ease of management to the manufacturing industry.

Finally, digital technologies such as blockchain, IIoT, artificial intelligence, augmented/virtual reality, mobility, digital twins, and big data are enhancing production processes, enabling real-time shop floor visibility, bolstering supply chains, and improving customer satisfaction.[12] According to some estimates, machine learning can help reduce supply chain forecasting errors by 50% and improve product availability for cutting lost sales by 65%.[13] Another example is that of digital twins that are helping manufacturers consolidate existing data silos into a virtual entity, capturing the complexity of an end-to-end process with a scalable data model.[14] The FMCG giant Unilever leveraged a customized digital twin solution at one of its sites in Brazil, leading to USD 2.8 million in savings at the site due to lowered energy usage and increased productivity.[15] There are several other success stories and proven use cases of applying digital technologies to manufacturing business challenges, which we will discuss in the following sections.

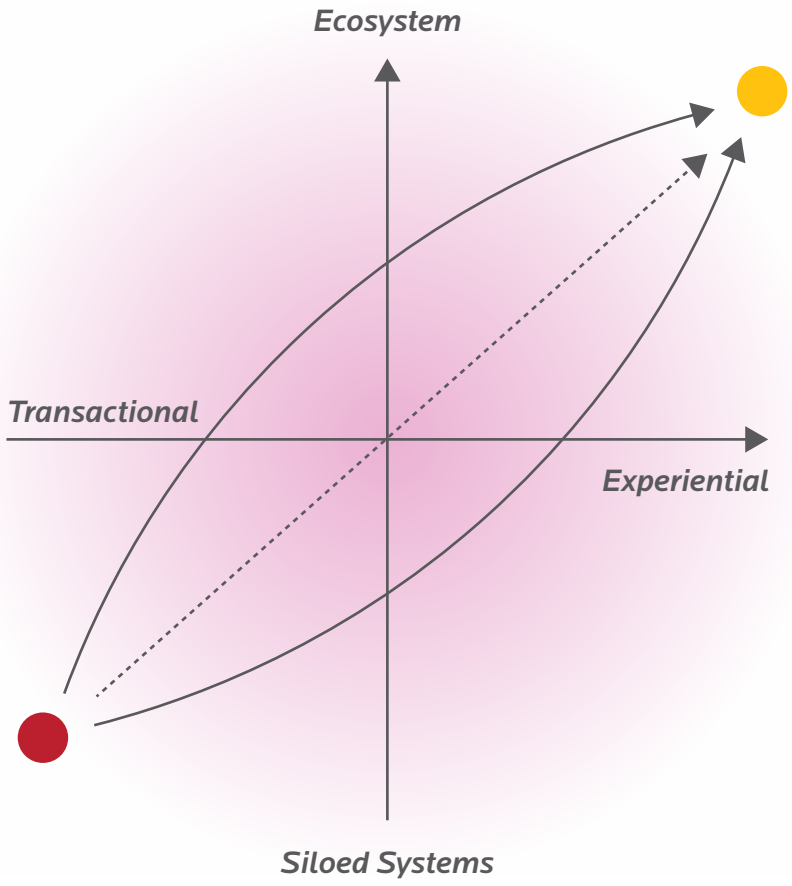
Experience economy and the evolved role of the ERP

The paradigm shift from an industrial economy to an experience-centric economy emphasizing superior customer engagement and fast-paced innovation is significantly disrupting the traditional manufacturing value chain. Manufacturing companies have, over the years, had limited interactions with the end customer, restricted to selling the product or delivering after-sales services. Today, the focus is shifting towards outcomes that extend way beyond the physical product.

An excellent example of that is the automotive industry that has been selling vehicles to individuals for decades. However, with the advent of smart cars and telematics, there is an abundance of contextual data that can significantly influence the driving experience. What was once a 'sell and repair' type of engagement may turn into an everyday relationship.

In such a situation, what is the role of ERPs? Does their function as systems of records empower manufacturers to thrive in a highly competitive experience economy? To understand that better, let us look at how manufacturing ERPs have evolved over the years. Enterprises deployed various systems to manage the most critical aspects of their operation, including manufacturing, supply chain, HR, accounting, CRM, and more. Those systems ran in siloes, which meant that the data couldn't flow seamlessly across systems, and there was no single source of truth. That resulted in poor visibility into business processes and caused issues with centralized reporting, user access, and security. Those challenges compounded when manufacturers acquired companies that came with their unique landscape of enterprise systems.

Slowly, with advancements in enterprise integration technologies and the advent of APIs, integrating siloed systems became a reality. However, those legacy systems required a lot more time, cost, and effort to maintain and stalled innovation. It became increasingly difficult to take new products and services to market faster and integrate digital technologies with the incumbent enterprise systems. Those limitations have now led to the introduction of microservices focused on delivering scalability, flexibility, and agility. Companies can breakdown complex monolithic applications into smaller individual components or services, each performing a critical business function. Every time a functionality needs an upgrade or customization, only that microservice experiences downtime or outage, and an earlier version of it continues to run. Such developments are a result of stakeholder experience becoming a top priority for most companies. Consequently, there has been a slow transition from 'systems of records' towards 'ecosystems of experiences.'



Let's consider an example of how an 'ecosystem of experiences' plays out in real-life scenarios. A manufacturer having a diverse vendor base for the procurement of raw material, equipment, and parts needs to monitor purchase price variance (PPV) as that affects the cost of procurement significantly. To make procurement decisions effectively, manufacturers need a dashboard of top-performing vendors, insights into factors affecting PPV, and baseline estimates of prices of raw material and spare parts. However, with multiple suppliers providing parts with differing specifications, it becomes difficult to evaluate vendors and determine baseline prices. In such a scenario, a system of records or traditional ERP would require you to classify parts based on their descriptions, leading to significant wastage of time and manual effort. However, with the use of machine learning and AI, dataset management and process improvements, the same can be done in a matter of hours, resulting in improved business user experience and supplier collaboration. To make effective use of those intelligent technologies, manufacturers are increasingly investing in data stewardship by partnering with proven organizations that can manage data assets and deliver actionable data insights.[16]

Measuring digital maturity with the MPOD index

The way forward for all manufacturers is to embrace digital transformation and not lose focus on improving stakeholder experiences. Once the strategy for building and executing the digital transformation roadmap is in place, the focus turns towards the actual execution. However, manufacturers must first assess the existing systems, processes, and digital footprint. At a broad level, that can be calibrated using what we call the "MPOD index."

The MPOD index, as shown in the figure 3, is a function of three variables: connectedness of systems of record, digital footprint, and process maturity.

The X-axis represents how connected the ERPs are, while the Y-axis captures the level of digitalization across core business processes. The diameter of the circles indicates process maturity levels – the bigger the circle, the greater the process maturity. Based on the MPOD index, we have showcased circles in red and green. The red circles indicate ecosystems that are low on the MPOD index. On the other hand, circles in green represent ecosystems of experiences that are more likely to achieve digital led business transformation and have an MPOD index that is above average or high. Building and executing digital transformation programs in the manufacturing space requires several teams, including strategy, finance, operations, IT, sales & marketing, human capital, and many other functions to collaborate. However, the MPOD index serves as an excellent theoretical measure of the success of a digital transformation program.

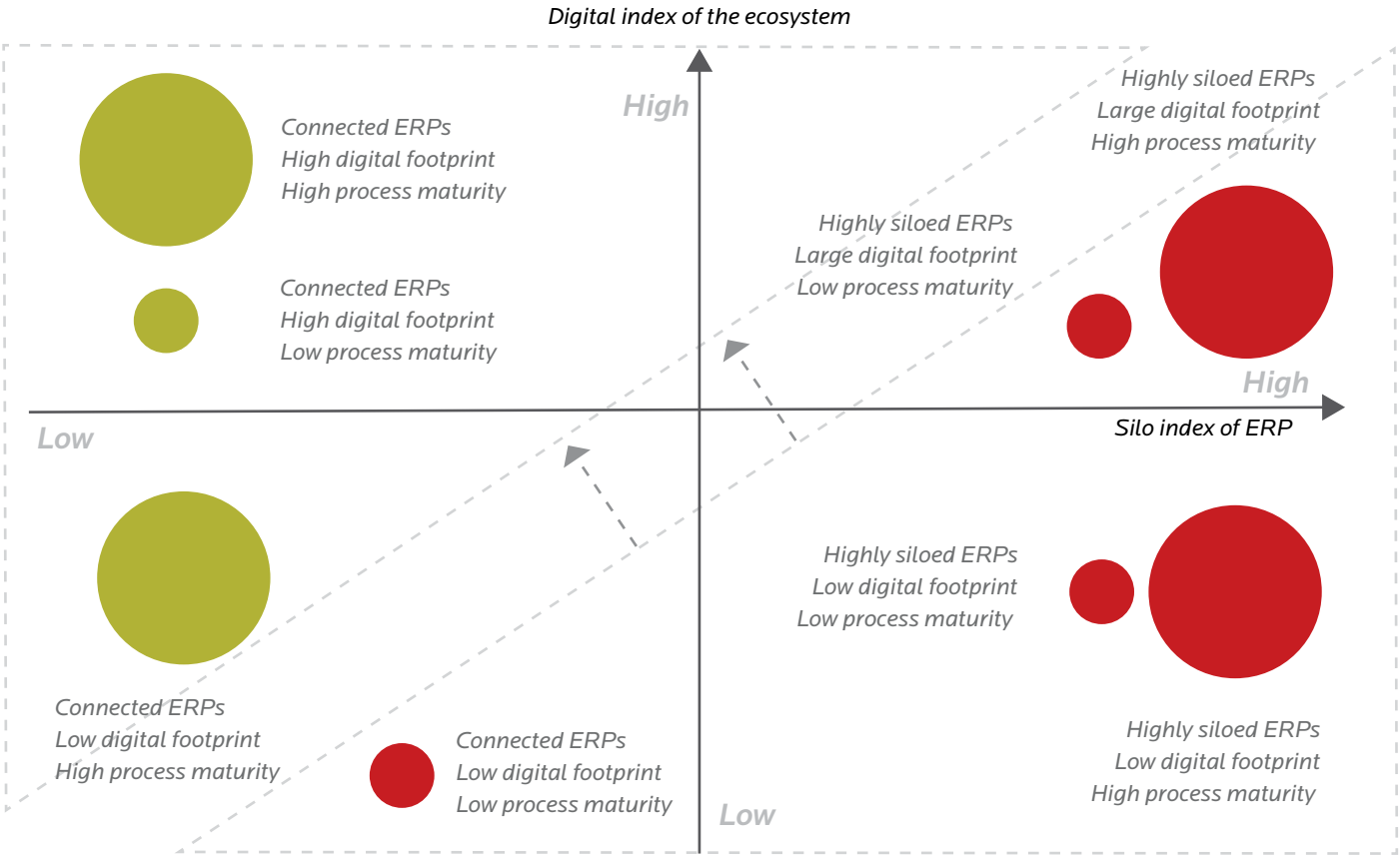


Figure 3 - MPOD = f (connectedness of systems of record, digital maturity, process maturity)

There is no looking back with digital transformation

A Harvard Business School (HBS) study found that a considerable chasm is developing between organizations with accelerated digital transformation programs and those that are still to formulate a holistic digital strategy.[17] The disparity between the leaders and laggards is very apparent, as can be seen from their business performance metrics. Leaders achieved an average gross margin of 55 percent across three years, compared to just 37 percent for the laggards. Those numbers are a telltale sign of how critical it is for enterprises to make strategic investments in moving along the digital maturity curve. The manufacturing industry is at a tipping point where the potential of intelligent technologies has been demonstrated, and companies that build prudent adoption strategies and manage change effectively will reap the benefits of digital transformational and experience pathbreaking results.

More specifically, when we look at how companies are adopting IoT to streamline business processes and unearth rich data insights, we notice only less than 30 percent have taken their IoT programs beyond the

pilot phase.[18] What is separating the leaders from the laggards in the IoT space is the aggressiveness with which those companies are pursuing IoT projects – implementing multiple use cases, climbing the learning curve faster, and building high ROI IoT applications that deliver tangible results. That approach is a culmination of having a pragmatic digital strategy in place, driving synergies across functions, and leveraging the expertise of experienced digital partners.

It is becoming increasingly clear that manufacturers who follow a more aggressive digital strategy will drive business outcomes across three areas – market performance, financial performance, and organizational performance. There are critical key performance indicators in each of those areas that will see significant improvement with the adoption of the MPOD philosophy.

Market Performance	Financial Performance	Organizational Performance
• Market leadership • Competitive differentiation • Customer satisfaction • Long term growth • Shareholder value	• Gross margin • Cost optimization • Year on year growth • Unit costs • Maintenance costs • Return on assets	• Workforce experience • Overall equipment effectiveness (OEE) • Production volume • Production downtime • Right first time

MPOD proven plan of action

Actualizing the MPOD philosophy requires manufacturing executives to create conducive conditions, set priorities, foster innovation, and scale digitalization efforts. First, enterprises must carefully evaluate their digital maturity and define a clear target state.

Next, identify measures that will help bridge the gap between the current and future state, and prioritize them based on how they align with the overall business strategy. There must be leadership buy-in before the plan is set in action, and the commitment must trickle down to every employee within the organization. That would help drive digitalization efforts and overcome organizational inertia, which can become a stumbling block when it comes to realizing the MPOD philosophy.

Once the strategic intent is compelling enough, the next step is to build proofs of concept and demonstrate the value in deploying next-generation technologies. Each of those pilots will contribute to experiential learning for your team, allowing them to create quality pilots in a much shorter period going forward. What is important to note is that the scope of such pilots should not be too broad, and the entire concept of business transformation is covered – from procuring materials to delivering products to the end customer. Manufacturers should also look for collaborative opportunities with experts from the start-up, research, academics, and corporate worlds to build an ecosystem that further accelerates innovation.

Finally, the scaling up digital transformation project requires manufacturers to tackle in-house IT skills shortage, which has emerged as a critical impediment to digital success. The National Association of Manufacturers early this year found that 522,000 jobs remained open in the sector.[19] Manufacturing companies must identify gaps in IT talent and bridge those through cutting-edge talent acquisition practices and proven learning and development tools. Those talent shortages can also be addressed by onboarding an experienced, domain-specialist technology services provider that brings in-depth technical expertise, industry best practices, turnkey solutions, and bolstered IT governance workflows to the table.

Manufacturers can tackle the tide of digital change by choosing projects at the "edges" of the organization, which can be implemented and refined with minimal impact on business continuity. Learnings from those projects can be applied to more significant digitalization initiatives, resulting in better outcomes and minimizing business and financial risk.

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manufacturing@birlasoft.com

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