50 Years of Growth, Innovation and Leadership

Manufacturing 4.0: Navigating to Digital Success

Varying customer digital maturity model makes every journey unique and opportunistic

A white paper by NTT DATA Services and Frost & Sullivan

FROST & SULLIVAN

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EXECUTIVE SUMMARY

The New Imperatives of Manufacturing 4.0

2019 is a pivot point for manufacturing industry transformation. The industry, to this point, has implemented proof of concepts (POCs) that embrace various digital technologies like wireless sensing, cloud capabilities, machine learning (ML), Industrial Internet of Things (IIoT), edge compute platforms, augmented reality (AR), and real-time key performance indicator (KPI) visualization, to name a few. While the benefits realized from siloed implementation are promising, the industry is yet to realize full value-chain transformation. This is where initiatives like Manufacturing 4.0 (M4.0) resonate with customers. M4.0 drives a digital tapestry across the value chain, melding the physical and virtual worlds to drive smarter, faster, and simpler operations. This facilitates customers to deliver smarter products based on intelligent operations. Customers realize the need to make digital investments, but challenges reside in determining the "where" to start investing and "how" to achieve business benefits.

Frost & Sullivan found that customers invest, on average, 1% to 2% of their annual revenues toward plant-specific digital initiatives. It also found that, in its discussions with various manufacturing entities across process, discrete, and hybrids, the primary struggles are about digital roadmap design, culture transformation, sustained value creation from digital, cross-platform integration and cybersecurity. The aforementioned discussions also enabled Frost & Sullivan to draw a firm conclusion that digital transformation brings about people- and process-related challenges in addition to the expected technology-related challenges.

> Frost & Sullivan finds that customers invest, on average, 1%-2% of their annual revenues toward plant-specific digital initiatives.

Additionally, customers vary by digital maturity, often starting digital transformation from different focal points. Some are investing in setting up the basic levels of connectivity infrastructure, while advanced adopters are driving outcomes from Big Data insights. Every customer's digital journey is unique, and the key industry requirement is to drive co-relation between the investment amounts and the expected business outcomes such as profitability, productivity, sustainability, and efficiency. The market is awash with many solutions that promise turnkey digital transformation, but most only offer point solutions with limited cross process consideration. Customers need to judiciously evaluate the capabilities both on individual merit and on a holistic process enablement approach. This will prevent sunk cost predicaments and enable customer progress in the digital roadmap.

In an aim to help the industry understand the evolving challenges of M4.0 and how to implement a digital roadmap, this paper is designed to provide clarity around five key dimensions:

- Manufacturing pain points
- Digital journey impediments to plant-wide digital transformation
- Guiding framework for digital transformation
- NTT DATA's manufacturing value proposition
- Real-world customer success cases

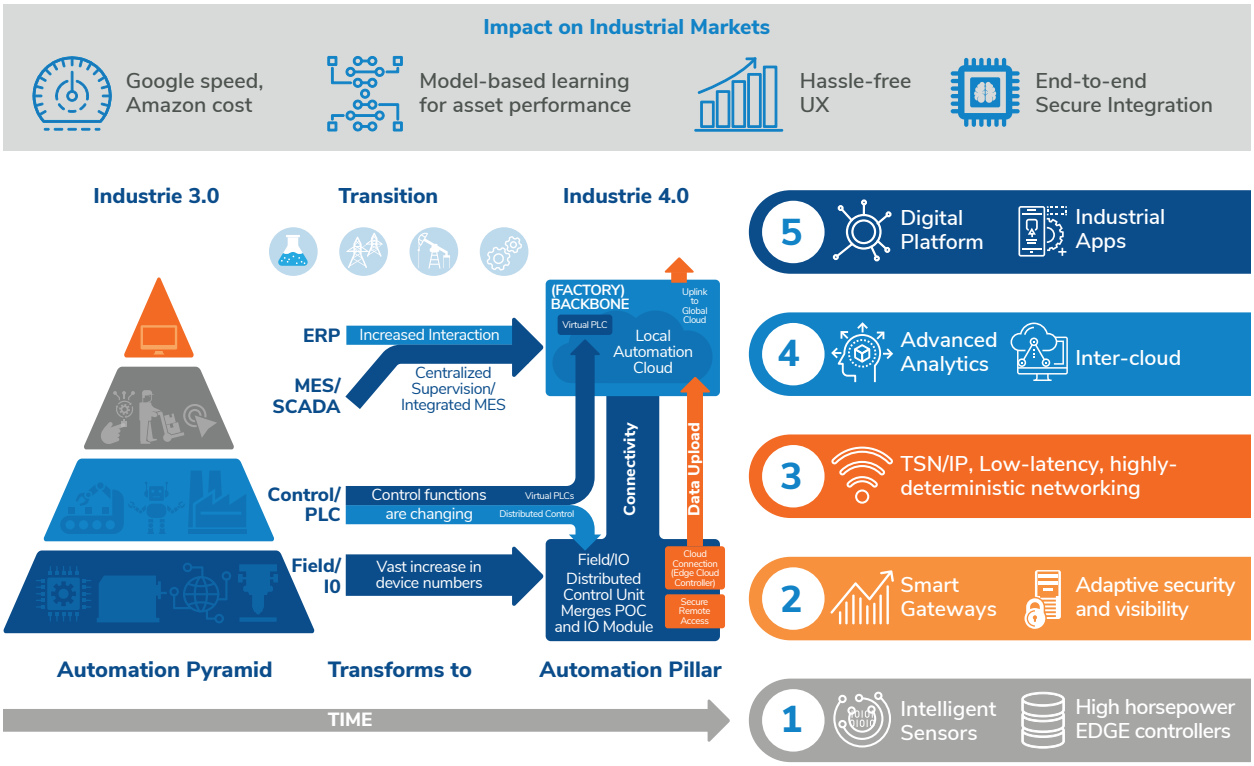
1. INTRODUCTION: CRITICAL ISSUES IN MANUFACTURING

Plant Architecture Transformations

The worlds of operational technology (OT) and information technology (IT) are now blurring due to ubiquitous connectivity and elastic computing models like cloud. Traditional plant architectures have always followed rigid hierarchies, which often led to time-consuming efforts when extracting value from data gathered from OT devices. Intense competition and the need for precise local control are driving a tectonic shift in the customers' mindset that is encouraging them to adopt a simple, flexible, and interoperable plant infrastructure backbone. The shift is from pyramid architecture to pillar, as shown in Exhibit A.

EXHIBIT A: PLANT ARCHITECTURE TRANSFORMATIONS

Purdue model (ISA-95) gives way to "Pillared" model. Five key transformations enabling a smarter future.



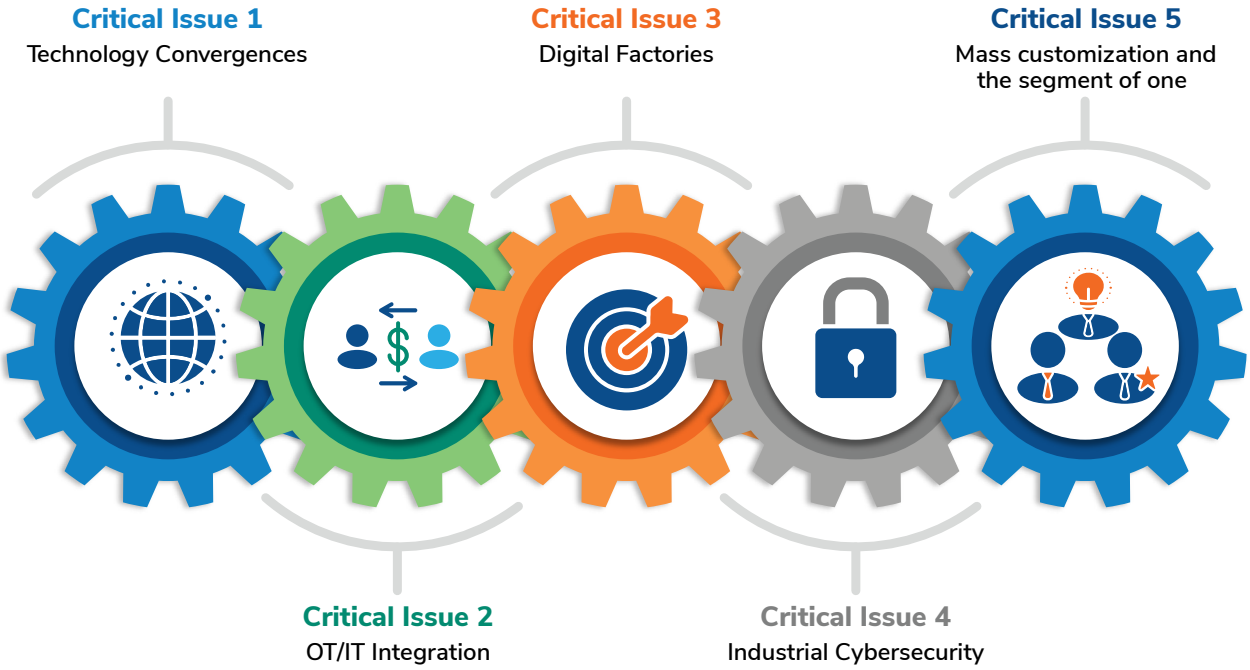
Source: Frost & Sullivan, Industry Analysis

As OT/IT integration becomes inevitable to achieve speed, responsiveness, and faster time to resolutions, legacy assets are often the biggest impediment of this convergence. Integrating legacy assets (that are at least at M1.0 level) and transforming them to M4.0 level will require careful consideration of the current state of assets and plant architectures. Another prominent challenge in this journey is that costs can quickly outweigh business benefits, destabilizing the original investments. Basing architecture transformation on IT can help the industry alleviate some of this pain by structuring a secure and reliable data conduit. The use of IT architectures will also help customers shift from manual, paper-based operations to informed decision making that leverages data. The future is adaptive plants based on flexible information architectures that stitch a plant's Big data to clear business outcomes. The journey to this stage is complex and requires the industry to overcome several critical issues.

Critical Issues in Manufacturing

The top five critical issues impacting manufacturing are shown in Exhibit B:

EXHIBIT B: CRITICAL ISSUES IN MANUFACTURING



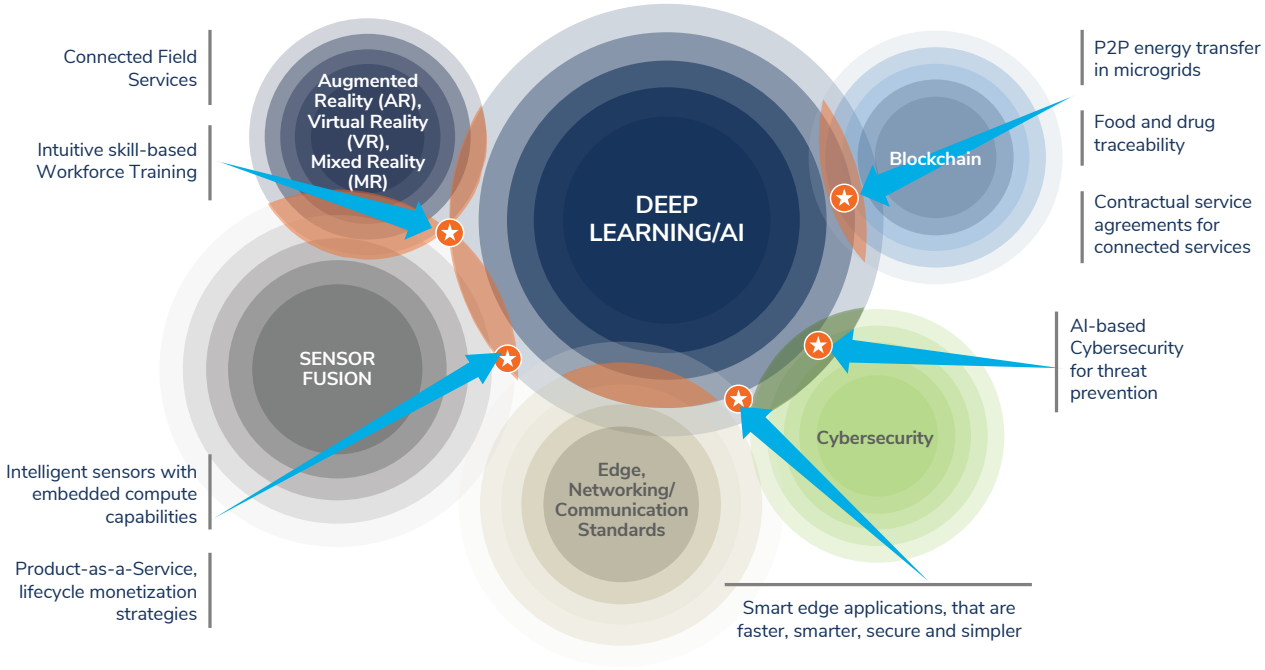
Source: Frost & Sullivan

1. Technology convergences. Technology within industrial markets has been implemented in siloes. As a case in point, customers often use instrumented assets to monitor parameters but do not fully utilize the data generated by these various assets to enable benefits such as predictive maintenance or reliability programs. Digital has continued to drive creative destruction and expansion of traditional business models. It has also enabled a converged view of technologies. Customers can realize the benefits of convergence between sensing, analytics, cloud, and edge. With 70% of a plant's data being generated from edge devices (like sensors, process equipment, other balance of plant assets), less than 5% of that data volume is acted upon.

Similarly, knowledge management has been a big focus due to the widening technology consumption gaps that are caused by increasing system complexity and a decline in skilled workforce. Hence, the use of technologies such as ML, sensors, and AR/VR will allow customers to retain knowledge from the experienced workforce and train the new workforce in an immersive environment. IT technologies such as Robotic Process Automation (RPA) could also help customers efficiently automate manual back-office tasks and manufacturing data analysis tasks.

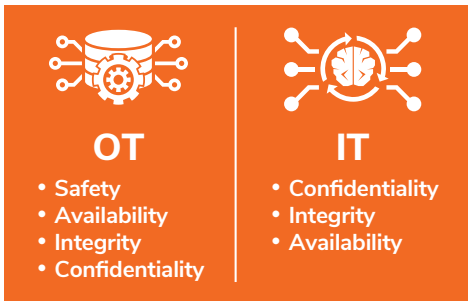
Converging technologies will allow customers to unlock new levels of performance efficiencies and outcomes that were impossible to achieve before. A few technology convergences are shown in Exhibit C.

EXHIBIT C: TECHNOLOGY CONVERGENCES



Source: Frost & Sullivan

2. OT/IT integration. The myriad plant-level systems (e.g., sensors, process equipment, manufacturing execution systems, quality control, energy management) and enterprise systems (e.g., production planning, supply chain, business analytics, enterprise content management, systems interoperability) will need to collaborate to help customers achieve a true digital plant of the future. A significant portion of the industry is better streamlined on the IT front when compared to the OT landscape. Ad hoc investments and poor standardization have led to heterogeneous OT environments, which are making the integration and transformation even more cumbersome. However, the challenge comes from integrating these two. This is primarily because the priorities of these domains are different. While the OT cares about safety, availability, integrity, and confidentiality, IT's top priorities are confidentiality, integrity, and availability—in that order. The value of digital transformation diminishes as OT and IT continue to remain separate. This critical issue cannot be solved by implementing technology; it is a people- and process-related problem.



Customers will need cross-functional teams that have OT and IT backgrounds to showcase the synergies of working symbiotically. Frost & Sullivan expects digital transformation projects to have a significant portion of effort focused on OT/IT integration. There also needs to be an exchange of skills so that the departments understand the true challenges that need to be overcome. A consultative-based approach often helps mitigate the issues and build strong OT/IT competencies.

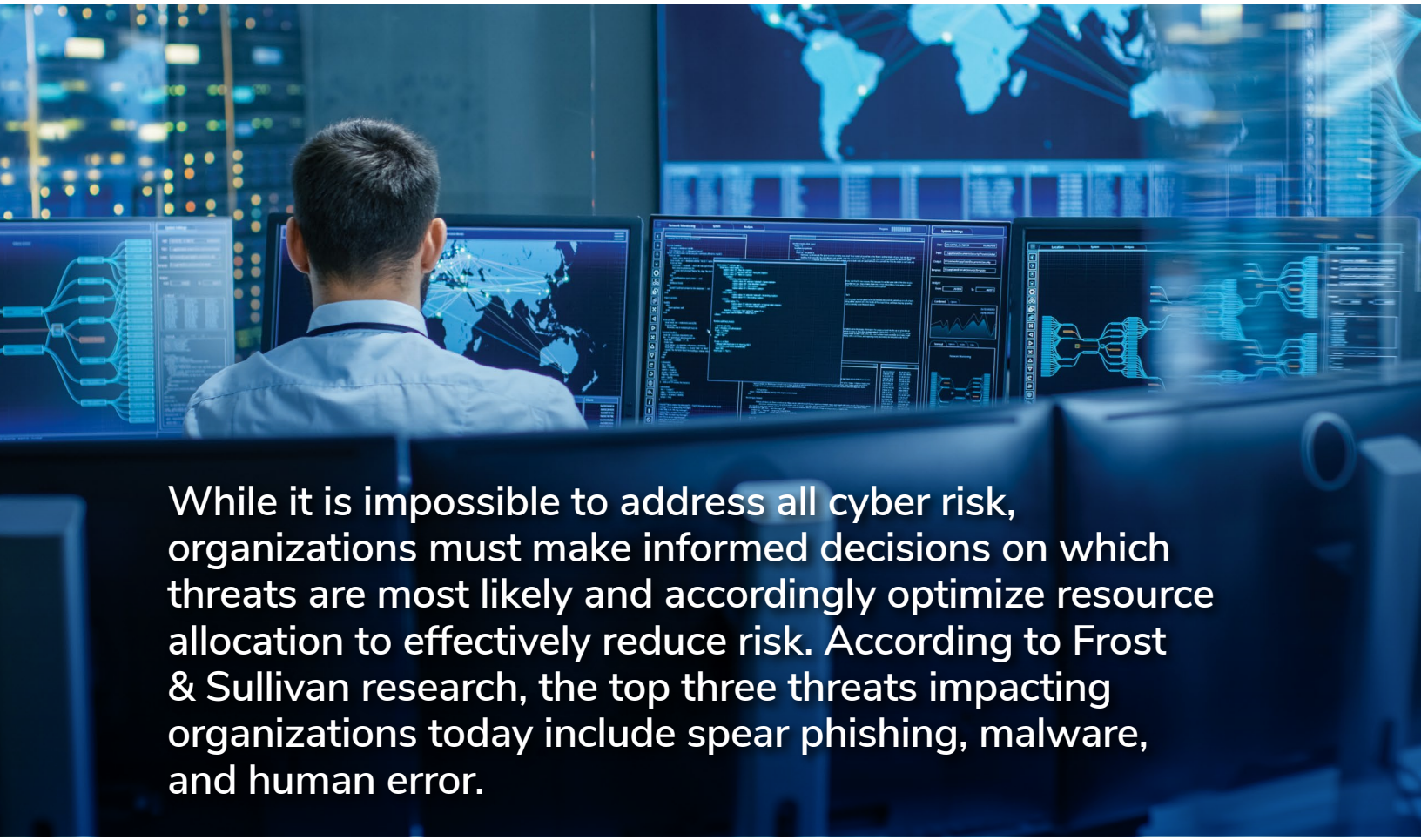
3. Digital factories. In the future, digital factories (i.e., smart factories) will streamline manufacturing value chains where there is a common data thread that connects all data, including sourcing, manufacturing, production, supply chain, and life cycle services. The digital factory will be built on a spectrum of cutting-edge technologies like wireless infrastructure, analytics, modern data connectivity, elastic compute platforms, business continuity solutions, and AR/MR, to name a few. This vision is promising, but the challenge for customers is in navigating the current chaos, establishing a clear roadmap, and executing through to the end of the plan. This is a long-term journey and will require a dedicated customer focus that incorporates both small-scale POCs and full-scale deployments. Innovations at the POC level can be rewarding, but the true benefits of digital are when it is scaled. Challenges across infrastructure, software, and process/people alignment will only be evident as the digital vision is tested.

Further, every customer's digital journey is unique, and manufacturing facilities within an organization will have different levels of digital maturity. For example, one of the largest earth-moving equipment manufacturers in the world has a fleet of plants in the US. Only 10% of its plants have modern infrastructure, while 90% is aging and over 35 years old. It has adopted a selective digital strategy because applying digital technologies to aging plants may not result in the best returns when compared to continued investment in modern plants. These scenarios showcase the strategic importance of business consulting. Process-centric approaches will help customers evaluate various solution inter-dependencies while balancing the trade-off between people, process, and technology.

> Only 10% of its plants have modern infrastructure, while 90% is aging and over 35 years old.

4. Industrial cybersecurity. Global syndicated reports indicate a lack of cyber preparedness and a significant increase in the frequency of attacks on critical infrastructures. For instance, a 2016 US DHS report named 290 incidents of cyber invasions or breaches with 63 in critical manufacturing and 59 in energy. Currently, the US power grid is struck by a cyber or physical attack every 1 in 4 days.

A single vulnerability (in an asset, network, or enterprise) creates an opening for cyber hackers to gain possible control over infrastructure and its sensitive data. Because hacktivists pinpoint digital security vulnerabilities with increasingly sophisticated precision, organizations must continually adapt their ability to respond to cyber threats. Unfortunately, most organizations merely react after a security breach has occurred, and this is suboptimal. Detecting and preventing cyber-attacks is far more cost effective for organizations than taking corrective actions because a host of adverse outcomes are possible in the event of cyber-attacks.



While it is impossible to address all cyber risk, organizations must make informed decisions on which threats are most likely and accordingly optimize resource allocation to effectively reduce risk. According to Frost & Sullivan research, the top three threats impacting organizations today include spear phishing, malware, and human error.

5. Mass customization and segment of one. Manufacturing has predominantly been built to stock, which left little or no choice to customers who may need some level of product specialization. The integration of value chain and data exchange between customers and manufacturers has increased the adoption of made-to-order models. This is prevalent in high-end automobiles and consumer goods such as footwear and clothing. Manufacturers invest in elaborate infrastructures like cloud, eCommerce, and digital site capabilities to support the digital customer. Today, end customers could go to a manufacturer's Web site and build a car based on specific requirements (e.g., color, trims, console design), and these requirements are sent to the production environment and planned for delivery. The challenge is two-fold: one is the lead time, as it would take time to customize and deliver; the other is the cost of production. These issues must be solved with technology use, as the future is shifting toward personalization.

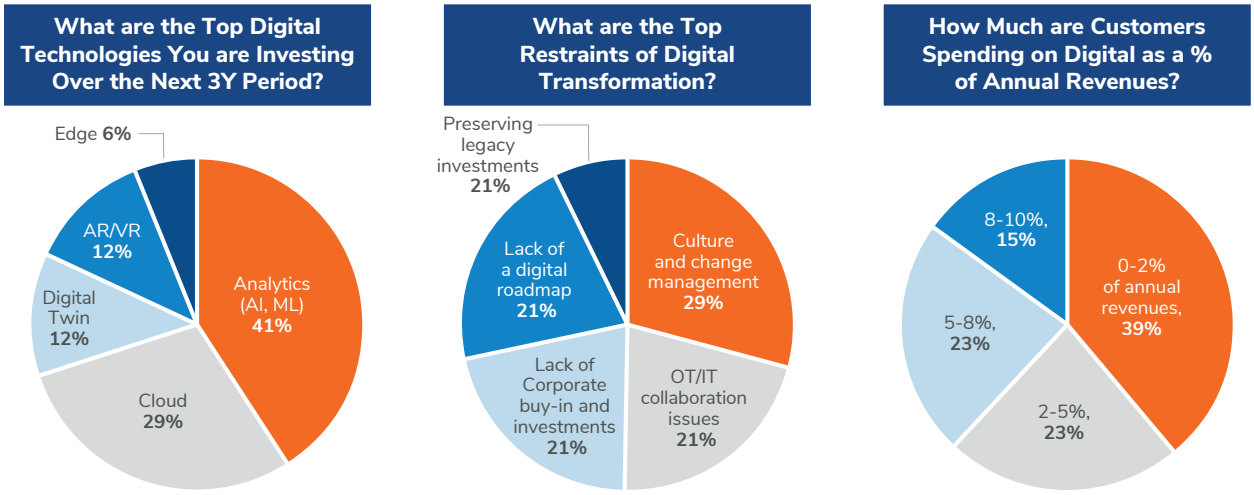
The critical issues have provided a clear view of the complex state of today's manufacturing. In the next section, we will evaluate the digital journey of a customer and the unmet needs

2. DIGITAL JOURNEY OF A CUSTOMER AND IMPEDIMENTS TO A PLANT-WIDE DIGITAL TRANSFORMATION

Digital Journey of a Customer

Frost & Sullivan surveyed 75 customers across process, discrete, and hybrids industries on three areas related to digital. The data shown in Exhibit D is an accurate reflection of the current state of the manufacturing industry.

EXHIBIT D: CUSTOMER ANALYTICS ON DIGITAL



N=75 customers across process and hybrids industry verticals.

Source: Frost & Sullivan

Top technology investment areas

The top two investment areas in digital were analytics (AI, ML, and cloud). The increasing volume of data from plant-related assets and the lack of human resources to track every byte of data are driving the adoption of analytics. Analytics can be deployed on-premise or in the cloud. Predominant deployments have been on-premise, but there is a progressive shift toward cloud to train machine-learning models while leveraging the ability to scale up or down based on the compute requirements.

Top restraints to digital transformation

The biggest unmet needs for the manufacturing industry are culture transformation, change management, and OT/IT collaboration (this was covered in the early section of this paper). Hard-coded plant practices and processes that used to be done a certain way will need to undergo changes with digital. Transforming from reactive to collaborative and insightful business process is a journey.. For example, digital tools can help plant operators shift from manual/paper-based data capture to automated and collaborative data capture and analysis. On a similar scale, digital tools can help efficiently utilize resources through predictive modeling and/or ML algorithms.

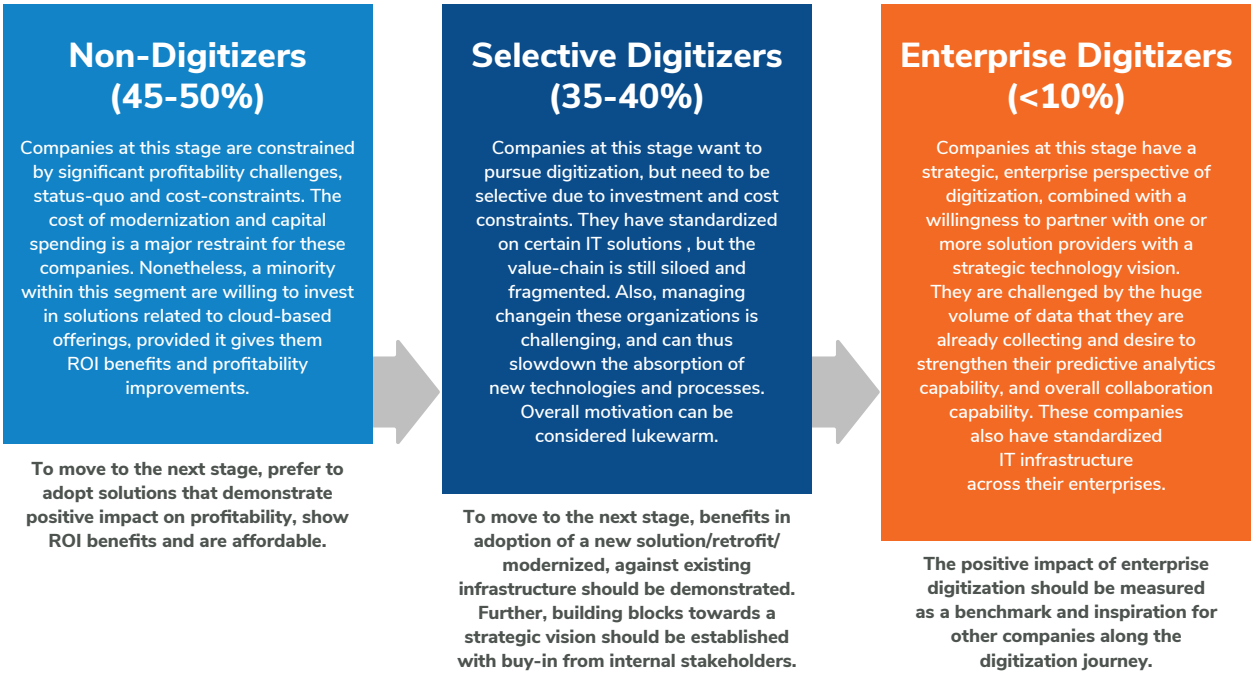
Spend on digital as a percent of annual revenues

Frost & Sullivan classifies customers, based on their digital maturity, into three segments: enterprise digitizers, selective digitizers, and non-digitizers. A brief explanation of these classifications is provided below:

- ***Enterprise digitizers:*** Companies at this stage have a strategic, enterprise perspective of digitization and a willingness to partner with one or more solution providers with a strategic technology vision. They are challenged by the huge volume of data that they are already collecting and desire to strengthen their predictive analytics capability and overall collaboration capability. These companies also have a standardized IT infrastructure across their enterprises.
- ***Selective digitizers:*** Companies at this stage want to pursue digitization but need to be selective due to investment and cost constraints. They have standardized certain IT solutions, but the value chain is still siloed and fragmented. Also, managing change in these organizations is challenging and can slow down the acceptance of new technologies and processes. Overall, motivation can be considered lukewarm.
- ***Non-digitizers:*** Companies at this stage are constrained by significant profitability challenges, status quo, and cost constraints. The cost of modernization and capital spending is a major restraint for these companies. Nonetheless, a minority or companies within this segment are willing to invest in solutions related to cloud-based offerings, provided they provide ROI benefits and profitability improvements.

Exhibit E shows the customer segmentation based on digital maturity.

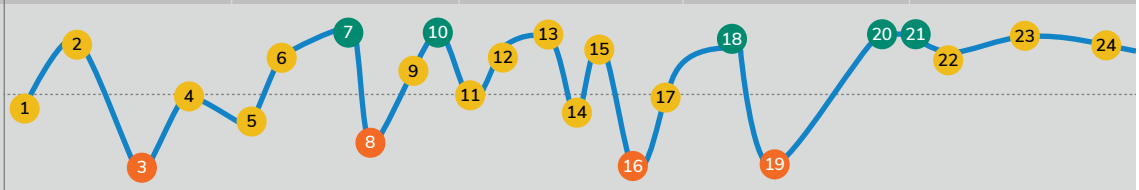
EXHIBIT E: DIGITAL MATURITY-BASED CUSTOMER CLASSIFICATION



Source: Frost & Sullivan

Large enterprise customers typically spend 1% to 2% of their annual revenues on digital spending. Mid-sized customers spend 4% to 6% of their revenues on digital. The spending is higher for mid-sized companies because they look to strengthen their manufacturing operations and compete with large companies. The focus is on initiatives like infrastructure modernization, predictive maintenance, supply-chain optimization, metadata management, and analytics. The digital spending planned by customers happens in phases, and to understand the journey, Frost & Sullivan structured a design thinking approach (a popular method) to track the emotional highs and lows of customers. It is important to understand the persona of the customer because digital solutions are aimed to improve their productivity and complement their skill sets. Exhibit F shows the digital journey roadmap of a customer.

EXHIBIT F. DIGITAL JOURNEY ROADMAP OF CUSTOMERS

Journey	Assess	Identify	Structure	Implement and Scale	Experience and Sustain
Activities	1. As-is state 2. Layout objectives of digital journey 3. Understand business, organization and culture constraints 4. Government incentives and regulations	5. Current and evolving operational pains 6. Best opportunities 7. Quick win POV's 8. Digital roadmap 9. Gap analysis and risks 10. Digital initiatives and technology enablers	11. The Digital Group's design 12. Best-practices and benchmarks 13. Digital infrastructure 14. Digital KPI's 15. Solution packs 16. Cybersecurity	17. Initiate digital iniatives 18. Tie it to KPI management and outcomes 19. Change management and training 20. Scale outcomes from single site → Enterprise (wherever applicable)	21. Establish OKR's to SLT 22. Identify other areas of improvement 23. Sustain focus on current initiatives 24. Continuously improve
Emotions (High / Low)					
Opportunity	- Onsite customer workshops - Every plant's digital journey is unique	- Establish POV's, using customer's data - Showcase technology portfolio strength for pull through - Focus on ROI	- Benchmark data to bring in ICE awareness - Operational consulting - De-risk the journey - Cybersecurity	- KPI management and visualization - Systems and Information integration - Scale to other areas/plants	- Training and knowledge management - Preferred vendor, based on track record - Continuously improve and sustain

Source: Frost & Sullivan

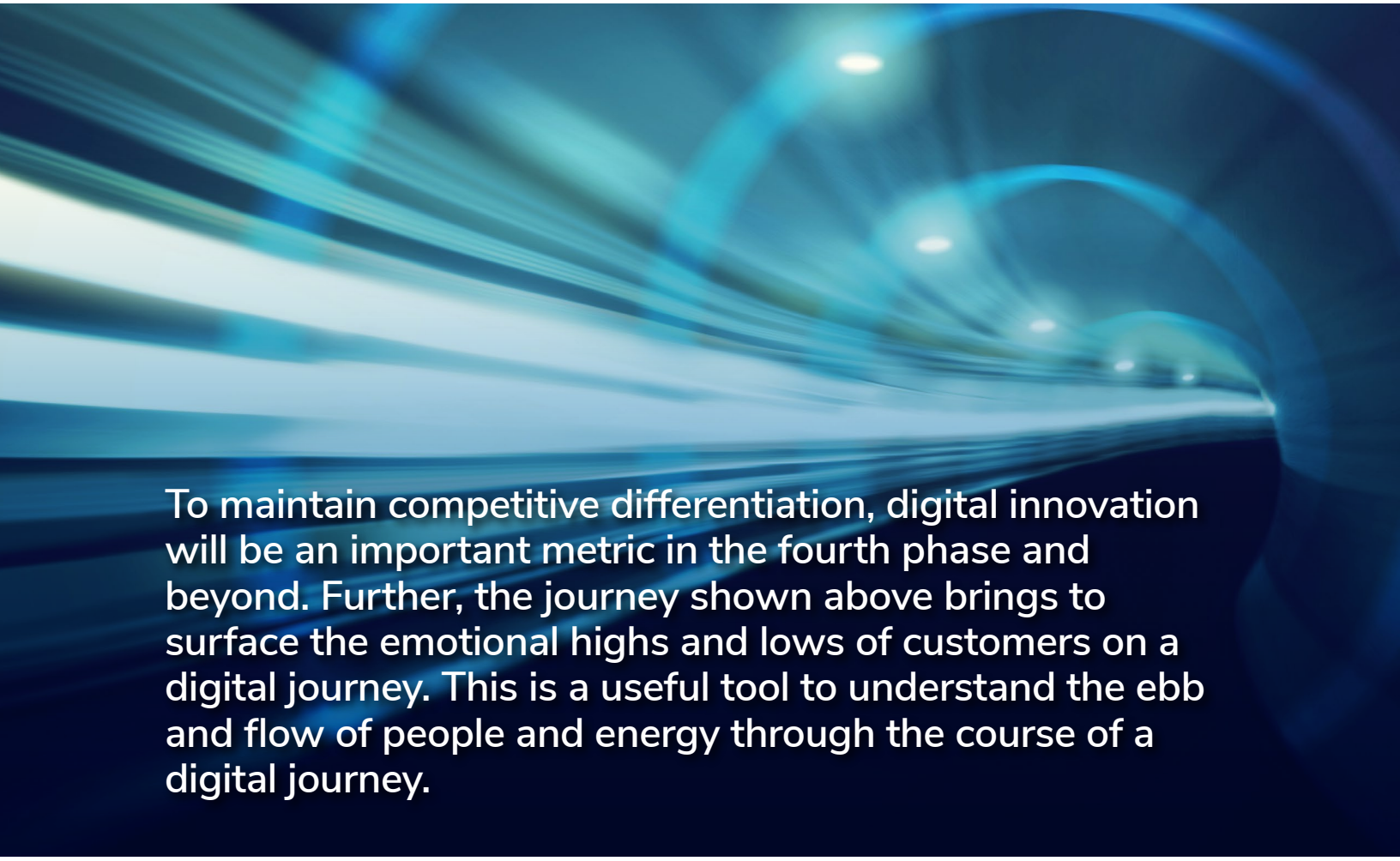
At a macro level, the digital journey predominantly starts with an **assessment** phase to better understand the current state of plant operations, map out the business value drivers of digital initiatives, and determine internal challenges. This is usually done in a workshop setting to bring internal alignment and collaboration.

The second phase of the journey is the ***identify*** phase, where the solution provider maps out key priorities, showcases proof of value from proofs of concept, and focuses on ROI. This is usually a "start small" part of the journey, as proving the value at smaller scale is important before significant effort is spent.

The third phase of the journey is ***structure***. Once the unmet needs and POCs have been established, digital infrastructure is set up; it is the necessity for a sound strategy. Benchmark data against peers is established to drive awareness among investors, customers, and employees.

The fourth phase is ***implement and scale***. The first two important initiatives in this phase are KPI management and culture transformation. While POCs may be site-specific, this stage will also move to enterprise-wide scaling of proven initiatives.

The fifth phase is ***experience and sustain***. This is the phase were solutions are taken over by the customer and performance is sustained for continuous innovation, which requires leading in technology adoptions because peers catch up rapidly.



To maintain competitive differentiation, digital innovation will be an important metric in the fourth phase and beyond. Further, the journey shown above brings to surface the emotional highs and lows of customers on a digital journey. This is a useful tool to understand the ebb and flow of people and energy through the course of a digital journey.

An interesting outcome of the journey is new business models. An example of this use case is that customers could work with capable solution and service providers who can deliver outcomes-based service agreements. For example, instead of the customer managing assets using internal resources, they might subscribe to asset performance. The subscription model of assets is similar to the jet engine model, wherein airline companies do not buy engines but rent them per hour of thrust.

Typically, the digital journey lasts more than 24 to 40 months, and value generation lasts a lifetime. Throughout the journey, customers need to identify the best partner who can bring in a collaborative ecosystem, while providing consulting services and high-quality integration. As you have seen from critical issues, digital will bring about integration of old with the new on physical assets, processes, and information. Hence, integration services will play a pivotal role in driving a trusted and risk-free digital transformation journey.

Even though customers have access to roadmaps like the one shown above, there are many impediments to plant-wide digital transformation. OT/IT integration alone does not mean digital transformation has been achieved, as it is just one facet. Many plants will face the following impediments on the digital journey:

- ***Weak communication infrastructure:*** The volume of data generated within a plant will need to be computed on premise and/or sent to the cloud for machine learning model training. At the same time, the conduit to transmit the data is important. High-quality data results in high-quality outcomes. Hence, secure gateways will help alleviate data transmission issues between the plant and the enterprise by setting up wireless infrastructure with edge computing platforms.

- ***Security as a bolt-on and not a baked-in concept:*** Every connected asset is a point of vulnerability for plant operations. Setting up defense-in-depth and de-militarized zones (DMZ) to protect data, device, network, and enterprise will help prevent attacks rather than just reacting to them.

- ***Poor data management strategy:*** The manufacturing industry has long embraced piecemeal solutions. Production execution uses a myriad of solutions, such as manufacturing execution systems (MES), quality management systems (QMS), and supply-chain planning (SCP). However, there has always been poor data exchange strategy between the silos. Having a data strategy could potentially cut time to action by nearly 30%, according to Frost & Sullivan.

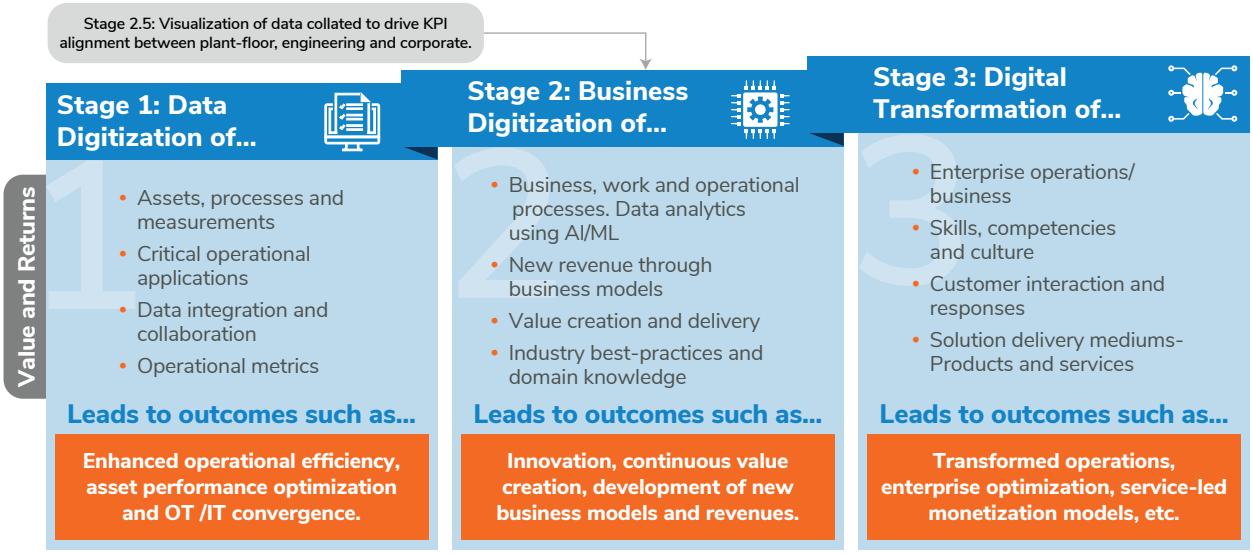
- ***Lack of awareness on best technological combination:*** As outlined earlier, every plant's digital journey is unique. Hence, every plant will need a unique combination of technologies that will help them achieve the pre-determined outcomes. Implementing unfit technology could be costly further down the line.

To help guide a trusted digital journey, Frost & Sullivan has assembled a framework that also helps benchmark where you stand in the digital journey. This is covered in the next section.

3. DIGITAL TRANSFORMATION MATURITY MODEL

This digital transformation model will help you simplify and transform. Exhibit G shows the digital transformation maturity model.

EXHIBIT G. DIGITAL TRANSFORMATION MATURITY MODEL



Source: Frost & Sullivan

To better benchmark your position in the digital transformation roadmap, we define each of the stages below:

- ***Stage 1: Data Digitization*** – is the adoption of digital technologies (e.g., wireless, smart devices, edge, analytics/algorithms, controls, software, and cybersecurity) to drive automation, repeatability, and predictability in actions compared to traditional work processes.

- ***Stage 2: Business Digitalization*** – leverages digitized data collected to drive new revenue streams and value creation while transforming business, work, and operational processes. This includes helping customers benchmark their performance against industry best practices that are constantly reviewed. This is a change in processes, as customers are used to comparing performance against historical data. New business models and alternate monetization (such as outcomes-based services) will be generated as a result of this stage.

- ***Stage 3: Digital Transformation*** – builds on digitization and digitalization to transform enterprise operations. Stage 1 and 2 may be restricted to individual sites/plants, while moving into Stage 3 helps customers drive performance excellence across the enterprise. This transformation should be performed within a structured change management process so that you become a world-class performer with sustained achievements.

While this is an internal benefit, digital transformation will also help companies interact with customers in new ways and create truly digital offerings. The future looks promising with digital transformation, but the fundamental driver required to partake in this journey is nimbleness and resiliency in infrastructure.

4. NTT DATA MANUFACTURING SERVICES VALUE PROPOSITIONS

Digital led business transformation is not about technology implementation, but it is intrinsically about people, process, and data management. As the creative expansion of traditional business models ensues, customers look for new experiences and value creation from existing operational structures. The blurring of boundaries in manufacturing is also driving the traditional silos of IT and OT to work in an orchestrated manner to bring new levels of responsiveness and efficiencies.

With the manufacturing industry shifting from a technology-centric viewpoint to an experience-centric one, it sets up a strong platform for NTT DATA services. In an era, prime with modernization opportunities, NTT DATA pulls together a comprehensive portfolio of infrastructure, applications and business processes combined with deep manufacturing industry expertise. NTT provides both vendor and in-house service offerings, deployed with manufacturing subject experts. The following NTT DATA offering snapshot illustrates NTT DATA's commitment to both internal and external software portfolios, uniquely deployed to address manufacturing issues.

The organization's rich track record with SAP applications puts it in a very compelling position due to rising OT/IT integration needs. SAP essentially helps at least 50% of the manufacturing industry run efficiently. Customers often struggle in integrating plant level systems with business systems to align with corporate objectives. A case in point is that of Greene Tweed—a specialty elastomers and thermoplastics manufacturer that caters to critical industries like aerospace, chemicals plants, and pipelines. Greene Tweed's challenge was twofold:

- Balance the trade-off between improving production yield and product quality
- Shift from manual to digital work processes

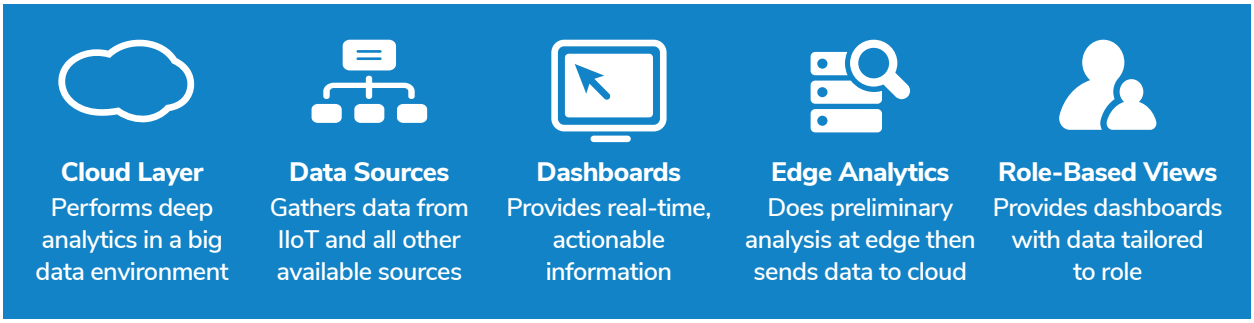
NTT DATA's breadth of skills and domain expertise helped Greene Tweed to integrate five plants and 144 work centers through automated workflows and custom dashboards. This helped plant floor personnel gain real-time insight across 22 processes.

Greene Tweed drives revenue and efficiency by giving staff real-time insight into global production processes and automating manual workflows with an SAP solution built with NTT DATA Services.

As see with the above example, where complexity was reduced, most of the manufacturing industry customers are also observing the data deluge and the sheer inability to effectively manage it. Compounding this issue is the changing workforce and increased connected system complexity.

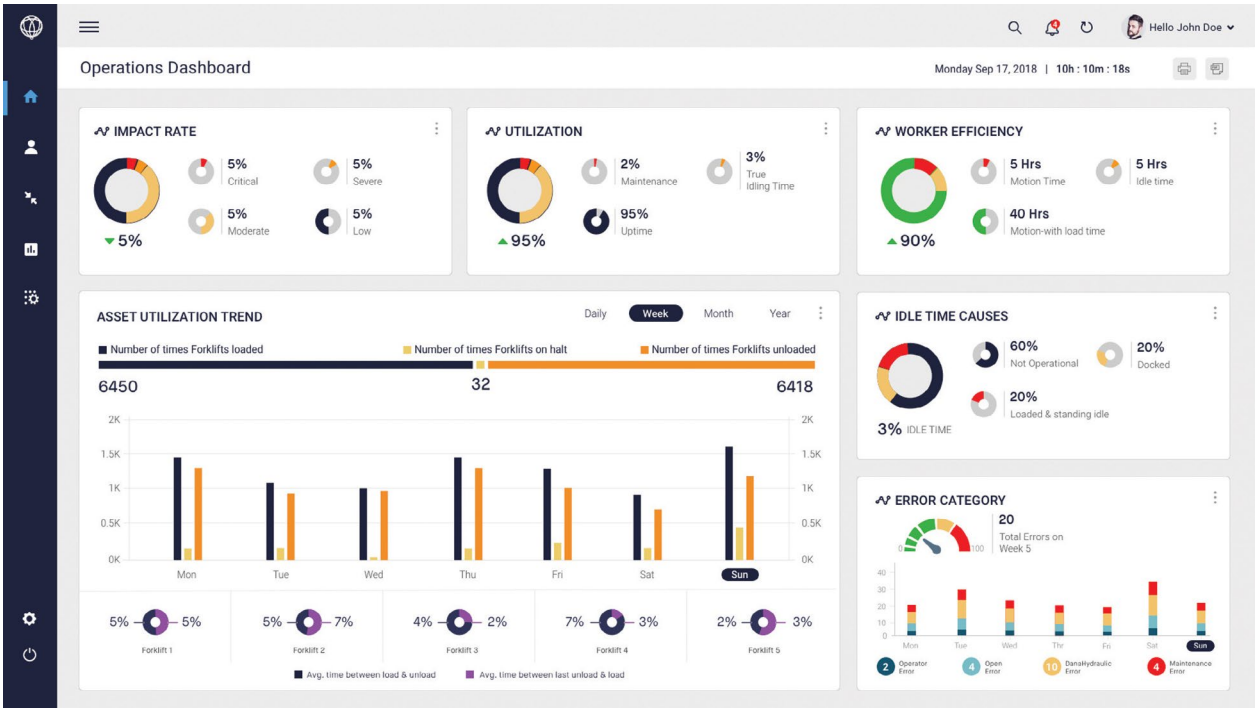
The heterogeneity and point solutions used at the shop floor level augment this issue but do not provide a comprehensive solution. Basically, organizations have access to an excess of data but limited insights, connecting various business processes. NTT DATA capitalized on this trend of connected systems, a willingness to move IT workloads to cloud, and increased use of mobility applications, and it introduced a new offering called NTT DATA Smart Operations. The solution is a platform offering that provides comprehensive visibility of all industrial assets with strong analytical and predictive features. The NTT DATA Smart Operations includes the following components, as outlined in Exhibit H:

EXHIBIT H: NTT DATA'S SMART OPERATIONS FRAMEWORK COMPONENTS



The NTT DATA Smart Operations solution provides actionable data at-a-glance is shown in Exhibit I.

EXHIBIT I: SMART OPERATIONS DASHBOARD



The ability to package its solutions in virtual containers and lightweight applications takes away the complexity of expensive custom coding requirements that are typically needed to integrate various islands of automation. For example, a major forklift manufacturing company leveraged NTT DATA's holistic capability to drive visibility in forklift utilization, visualize shop floor movement patterns, and predict maintenance issues, to name a few. The customer also leveraged NTT DATA's orchestration capability to stitch a seamless experience between OT and IT systems by driving excellent visibility into their operations. Frost & Sullivan perceives this use case as one of the very few, yet successful implementations leveraging a portfolio of technologies like cloud, mobility, digital twin, analytics, and containerization.

NTT DATA strikes a much-needed delicate balance between new-age digital offering and operations modernization, which helps customers reap the best returns from sunk and new capital investments. Its customer-centricity is shown in its penchant to overhaul the experience that its customers undergo internally and externally. True digital transformation happens when it is applied on an internal operation (like a customer's manufacturing site), which in turn pivots to transform external customer interactions (transforming the customer's customer interaction with its products). NTT DATA's service, application, cloud, security portfolio expertise, OT/IT integration capabilities, and business consulting services capability ensures a 360-degree perspective of every manufacturing customer's digital transformation journey.

5. STRATEGIC CONCLUSIONS

The manufacturing industry is at a transformational crossroads, and while the majority of customers know they need to change they are struggling to embrace the process. While the benefits of digital transformation outweigh the risks, customers need a co-creation approach to help them navigate the chaos. Further, it is cumbersome for manufacturing customers to work with multiple vendors in engineering a digitally transformed enterprise, due to resource constraints. The preference, in most cases, is to work with one vendor who can bring in the collective synergies of multiple solution providers by way of partnerships.

As a pioneering leader focused on delivering positive business outcomes, NTT DATA has digitally transformed businesses across manufacturing industries (including automotive, chemicals, discrete, energy, high tech, process, and aerospace). To assist clients, stay ahead of the game, and manage technology refresh cycles efficiently, NTT DATA spends close to $2 billion annually on R&D activities. These are in areas like edge, cybersecurity, IoT, robotics, AI, robotic process automation, and other cutting-edge technologies—all of which are supported with a process-centric, business consulting layer.

In a market that is awash with general solution providers, NTT DATA's full stream capabilities from consultative approaches to design, development, implementation, and life cycle sustainment differentiates itself in the market. It's approach is simple: Leverage the best technology, to support your digital business transformation objectives.

While the path to digital success is volatile, uncertain, complex and ambiguous, navigating Manufacturing 4.0 starts with finding a trusted advisor!

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