IBM Global Business Services

Modern Industrial Manufacturing with Oracle and IBM

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1. What is Industry 4.0?

Increasing the productivity of production systems has been the impetus for every industrial revolution. In the fourth industrial revolution, Industry 4.0, transformation focuses on leveraging the digital infrastructure to drive modernization initiatives throughout the business in order to deliver enhanced products & services to their customer base. From IBM's point of view, the cognitive manufacturing era introduced via Industry 4.0 is fully differentiated from the preceding systematic transformations.

In this digital age, the ultimate goal is to create a "smart factory" where processes are fully automated using process automation, programmable robots, cognitive/artificial intelligence (AI) and 3D printing. Where all systems and machines are integrated and intelligent. Real-time data analytics drive continuous improvement and innovation. Digital transformation in manufacturing, or industry 4.0, will create more value to businesses and consumers.

As assembly lines did many years before, the digital transformation will revolutionize manufacturing further than most people can yet fully comprehend. For example, an automotive manufacturer consolidated 42 buildings into a single, computer-controlled "smart factory", reducing the production cycle from 21 days to six hours while lowering cost, inventory and injury rates.

www.ibm.com/industries/manufacturing

1.1. Key benefits of the transformed manufacturing facility

Driven by data analytics and the Internet of Things (IoT), digital transformation in manufacturing redefines manufacturing limits to produce industrial products faster, safer, with better quality, and at lower cost. *Unplanned downtime dropped 15% when equipment data is captured and analyzed.

Focused values, capabilities and benefits include:

- **Safer operations:** Newly integrated sensors in machines and around environments, can be monitored to give advanced alerts/ notifications for potential problems. Automated equipment will manage harmful environments.

- **Reduced production cost**: Cognitive analytics better predict consumer demand, allowing for optimal inventory. Smart machines will minimize production efforts.

- **Increased manufacturing and employee productivity**: Augmented/virtual reality, faster design capabilities and 3D printing will accelerate design processes and troubleshooting. Predictive monitoring collects alerts from smart machines to detect potential outages before a failure occurs.

- **Next generation quality control standards**: Integrated sensors and intelligent workflows included in the product creation and completion process will identify issues and "self-adjust" which will improve quality while reducing labor intensive, after-production quality control checks.

- **Mass product customization**: Consumers' ever evolving expectations now believe that customized products should be the same price as mass produced products, something that used to negatively affect margins dramatically, now can be delivered by smart manufacturing. Automation and intelligence-controlled workflow in the production process allows for changes in customization at key steps in the creation/fabrication process.

To apply productivity benefits at a more concrete level, Oracle Internet of Things and Analytics feed Oracle Production Monitoring Cloud which allows real-time visibility using configurable Key Performance Indicators (KPIs). You can easily map production facilities, products and machines for real-time monitoring.

Additionally, you can easily detect production anomalies by comparing KPIs over time to diagnose root causes of performance issues.

The predictive analytics engine of Oracle Production Monitoring Cloud allows real-time monitoring of sensor data. This allows for predictive maintenance on equipment before outages occur, which increase overall effectiveness and efficiency.

** A Forbes survey of 700 executives found that 27% are utilizing IoT to enhance their manufacturing operations while 22% are implementing IoT to provide greater transparency.

One of the ways Oracle is helping manufacturers address the integration challenge is through a partnership it formed with Mitsubishi Electric. The companies are providing manufacturers with an open platform for developing IoT applications that integrate seamlessly with Oracle cloud apps.

IoT apps developed on the Mitsubishi Electric FA-IT Open Platform collect data from factory equipment for visualization and analysis. Oracle IoT Cloud, which is designed to integrate with other Oracle cloud-based business systems, receives this information from these IoT apps in real time.

*Source: IoT & Analytics report, by Aberdeen Group, August 2017.

**Source: Forbes Insight Survey, September 2018.

1.2. Industry 4.0 data explosion

Industry 4.0 includes connected equipment, automated workflows and cognitive/artificial intelligence. What happens when all these changes are incorporated? The creation, transmission and storing of data throughout every business process from operations through reports and analytics. Strategies must be put in place to manage, cleanse, store, analyze and archive all the data.

Data drives machine learning and predictive analytics, when used correctly businesses can begin to anticipate machine issues and more accurately forecast product demand.

As previously mentioned, cloud applications, reporting and analytics are critical components of digital transformation. For the first time, cloud solutions are available for storing, managing and analyzing data on or off-premises.

1.3. What about security?

With all the advantages of digital transformation it also creates a growing concern. Cyber security in Manufacturing is an ongoing challenge that deserves fair attention. As an organization incorporates cloud applications and IoT-connected devices, the greater potential there is for security breaches.

Manufacturing ranks second on the list of industries targeted by cyber-criminals. Concerned business leaders and managers should make cyber-security an ongoing priority from the start. Incorporating IoT and the cloud also builds the challenge for a multi-layer cyber defense strategy in order to protect workers, production and profits. Proactively, Oracle has developed the world's first identity-based Security Operations Center (SOC) framework which uses advanced analytics and machine learning to put security risks in an identity context—delivering actionable intelligence that can help automate threat response.

Oracle Identity Security Operations Center offers an intelligent, identity-driven, and context-aware approach to better protect users, applications, APIs, content, and workloads. It makes it far simpler and quicker to predict, prevent, detect, and respond to advanced attacks across your entire hybrid-cloud estate.

1.4. Aging workforce concerns

The growth of newer millennial employees and retirement of baby boomers can create unforeseen workforce challenges, particularly for organizations that use legacy applications for core business processes. For the most part, the "baby boomer" generation includes the programmers who created and now modernize existing, "legacy" company applications and mainframe environments. When these workers leave, they usually take with them years of knowledge about how applications work and the legacy languages they're written in.

Newer millennial employees typically have little or no knowledge of legacy coding languages. Additionally, there is usually no desire to learn legacy languages, which could be viewed as less relevant and outdated. This would be a barrier to millennials' expectations of accelerated advancement in their career path. Dedication to personal success among millennials has a deeper loyalty than what baby boomers had to their employment company previously.

The growth of retirement rates of legacy programmers can pose serious risks to large organizations that rely on legacy applications. Loss of employees with knowledge and expertise in the languages that run core applications could result in operational failures, inefficiencies and longer downtimes, not to mention potential damage to overall revenue, company reputation, and negative brand impacts should systems fail.

Strategies should be put in place to retain and retrain aging workers and simultaneously plan to keep "cutting-edge" millennials on track with their career goals by leveraging new technologies that are relevant and valuable in modern manufacturing (Industry 4.0).

1.5. An innovative ecosystem for manufacturing

With the ability to leverage new technologies internally and with partners, the modern ecosystem is also taking new forms. Partnering with colleges has increased for manufacturers, not only for help with new innovations, but also for a channel for new hires to help supplement the retiring workforce. Supplier/Partners now share technologies to ensure flexible and durable supply chains to mitigate product outages which negatively impact operations. Additionally, supplier/partners are investing with manufacturing to innovate operations wherever possible. This innovation helps both partners and manufacturers drive efficiency in daily operations while sharing similar goals in increased revenue.

1.6. Where to begin?

To be competitive in today's modern manufacturing landscape, business leaders must embrace digital transformation. Careful attention and planning need to be focused on moving from legacy systems and equipment to a smart factory platform. Strategies must be crafted with the end goal in mind. Once execution begins, start with the less complex and immediate projects that delivers significant value quickly. The momentum and value will continue to build throughout the transformation process.

Evaluate cloud solutions early in the transformation planning. Whether you are adopting new software or moving existing workloads from on-premise, cloud solutions usually offer a quick return on investment (ROI). As another added benefit, automating manual processes enables sharing data easily and streamlines the management of master data (MDM) throughout the enterprise.

As the business case of Industry 4.0 becomes more concrete with the synergistic value of all combined technologies, the investments in technology flagged as Digital Transformation now start to become a higher priority. Technology to support Industry 4.0 should be a priority for every manufacturer.

The digital transformation (DX) foundation needed to implement Industry 4.0 is typically divided into three road map horizons (see Figure 1).

Horizon 1: Immediate – For most manufacturers, focusing their initial digital transformation efforts on supply chain systems and operations including Internet of Things (IoT) will yield the most dramatic initial results. The key objectives of this phase should be to optimize connectivity and transparency throughout their supply chain and implementing the tools/platforms necessary to analyze the integrated data. These activities typically represent about 70% of the digital transformation budget.

Horizon 2: Midterm — Intermediate activities build on capabilities established in Horizon 1 and are more advanced. This is where tools such as mobility, advanced analytics, and machine learning are implemented to extend Digital Transformation (DX) benefits. The combination of real-time data access and powerful analytical tools allows for optimized decision making across supply chain outcomes (cost, productivity, quality, etc.). These use cases represent approximately 20–30% of the DX budget.

Horizon 3: Long term - Horizon 3 imagines the “blue sky” possibilities. Starting from this point an organization may place some bets on the underlying capabilities supporting these use cases. Accordingly, this helps prioritize which use cases to focus on in Horizon 2. Horizon 3 use cases tend to revolve around cognitive computing or artificial intelligence to implement autonomous decision making which allows a manufacturer to optimize the entire supply chain.

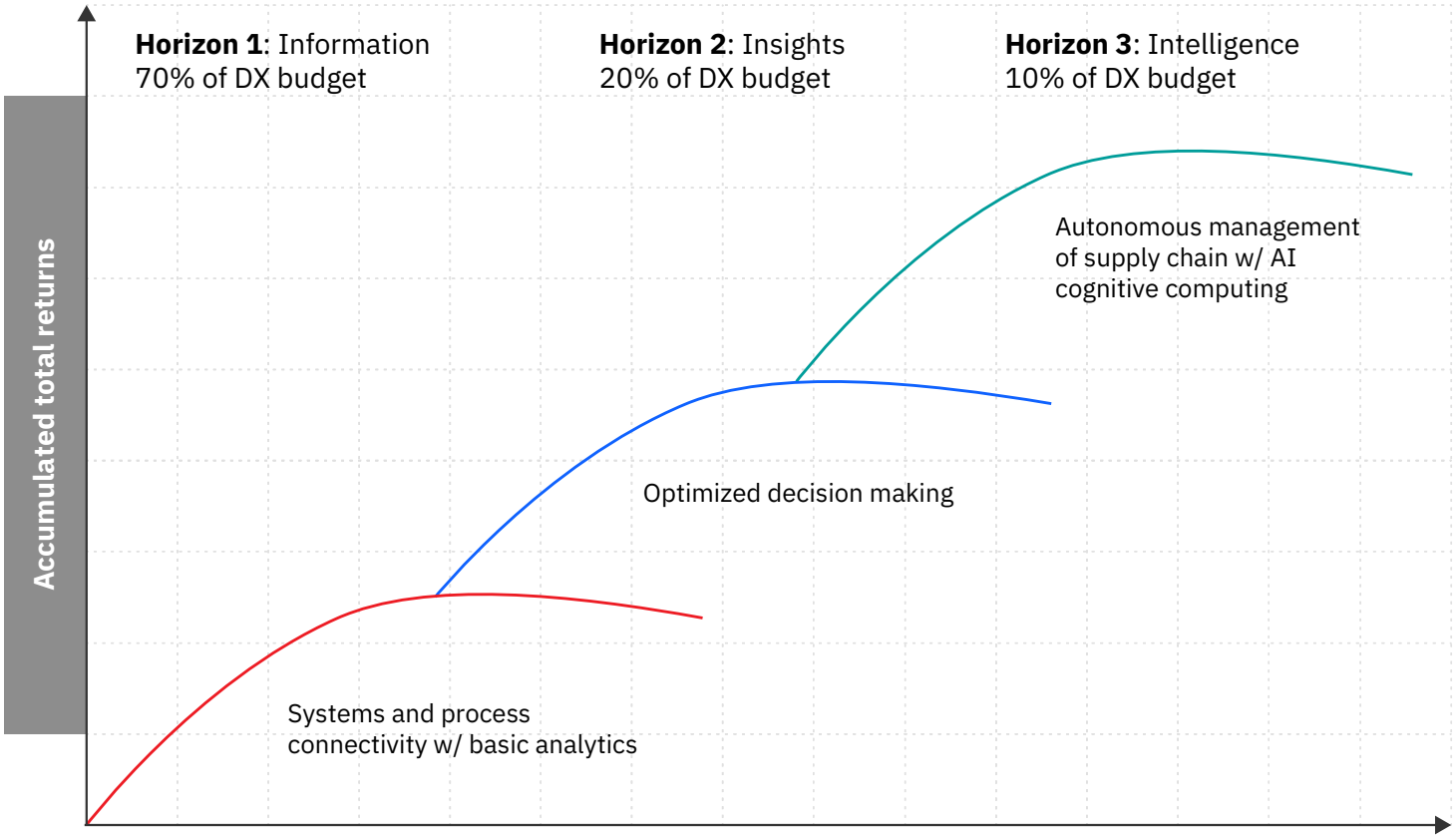

Figure 1: Industry 4.0 Transformation Roadmap

2. Modernizing IT infrastructure for digital transformation

2.1. IT infrastructure modernization

More production-related undertakings will require increased data sharing across sites and company boundaries. At the same time, the performance of cloud technologies will improve, achieving reaction times of just several milliseconds. As a result, machine data and functionality will increasingly be deployed to the cloud, enabling more data-driven services for production systems.

2.1.1. The big challenge

The digital transformation required to enable Industry 4.0 — automation, integration, and optimization of processes and manufacturing lines - especially in an existing facility, often requires several solutions, and onboarding and connectivity of numerous pieces of equipment (including brownfield), often from numerous asset vendors. This often results in:

- **Lack of collaboration** — between Information Technology (IT) and Operational Technology (OT) vendors and interoperability of solutions.
- **Master data management challenges** — for asset semantic modelling.
- **Security concerns** — regarding connections, authentication and authorization.

The digital transformation becomes even more complex when companies consider the overwhelming volume of information that will be generated by intelligent, IoT enabled systems and the analysis resources needed to gain meaningful business and operational insights. Turning data from multiple systems and equipment from multiple vendors (all with different formats and standards), into actionable information for different roles and responsibilities (ranging from plant operators to enterprise users), is no easy task.

Industry 4.0 promises to create the 4th industrial revolution and digitally transform manufacturing in both discrete and process industries.

Depending on who you talk to, Industry 4.0 has been touted as being able to solve some very compelling challenges that manufacturing companies face in today's market — from extreme supply, demand and design variability, to emerging markets of one and the growing need for rapid innovation.

2.1.2. Hybrid Cloud Architecture

Embracing Industry 4.0 does not mean manufacturers need to fully invest in public cloud services to take advantage of optimum savings. Software-as-a-Service (SaaS) and Platform-as-a-Service (PaaS) are public cloud offerings that have a place in the Digital Transformation Strategy, however, it does not have to be an all-in approach to public cloud services to see immediate value and savings.

What is hybrid cloud?

Hybrid cloud is a computing environment that connects a company's on-premise private cloud services and third-party public cloud subscriptions into a single, flexible infrastructure for running the organization's applications and workloads.

The principle behind hybrid cloud is that its mix of public and private cloud resources — with a level of orchestration between them — gives an organization the flexibility to choose the optimal cloud for each application or workload (and to move workloads freely between the two clouds as circumstances change). This enables the organization to meet its technical and business objectives more effectively and cost-efficiently than it could with public or private cloud alone.

The benefits of hybrid cloud are easier to understand once you know more about the capabilities, limitations, and uses of private and public clouds.

www.ibm.com/cloud/learn/hybrid-cloud

Private cloud vs. public cloud vs. hybrid cloud

Private cloud

In the private cloud model, cloud infrastructure and resources are deployed on-premises and owned and managed by the organization.

Private cloud requires a large upfront capital expense for equipment and software, a lengthy deployment, and in-house IT expertise to manage and maintain the infrastructure. It's also expensive and time-consuming to scale capacity (because you have to purchase, provision, and deploy new hardware) and add capabilities (because you have to purchase and install new software). But private cloud provides maximum control over the computing environment and data, which is especially important — or even mandatory — if your company deals with highly sensitive data or is subject to strict industry or governmental regulations.

Public cloud

In the public cloud model, a company consumes compute, network, storage, and application resources as services that are delivered by a cloud provider over the Internet.

The cloud provider owns, manages, provisions, and maintains the infrastructure and essentially rents it out to customers, either for a periodic subscription charge or fees based on usage.

Public cloud offers significant cost savings because the provider bears all the capital, operations, and maintenance expenses. It makes scalability as easy as requesting more capacity, and it lets your company's IT staff focus more on revenue-driving activities and innovation and less on "keeping the lights on."

In public cloud's multi-tenant environments, your workloads are subject to the performance, compliance, and security of the cloud provider's infrastructure. With Virtual Private Cloud (VPC) capabilities, you gain full control over your public cloud environment, including security and controls. VPCs give you the scalability of a public cloud and the security of a private cloud.

Hybrid cloud

The hybrid cloud model represents the best of both worlds. You can run sensitive, highly regulated, and mission-critical applications and workloads or workloads with reasonably constant performance and capacity requirements on private cloud infrastructure. You can run less-sensitive, more-dynamic, or even temporary workloads (such as development and test environments for a new application) on the public cloud.

With the proper integration and orchestration between the two, you can leverage BOTH (when needed) for the same workload. For example, you can leverage additional public cloud capacity to accommodate a spike in demand for a private cloud application (this is known as "cloud bursting").

New public cloud tools can inter-operate between on-premise and public cloud offerings which can accelerate cloud adoption for manufacturing. Pre-built toolsets deployed on the cloud can ease digital transformation efforts from the onset. Oracle Cloud Platform services (or PaaS), built on a proven set of enterprise technologies and software capabilities, enable you to enrich your existing applications with new features right from the start.

Regardless of whether your application is part of an on-premise or private cloud deployment today, you can take advantage of the rich functionality, tools and capabilities enabled by Oracle Cloud Platform services.

2.1.3. Communications network

For the industrial Internet of Things (IoT), we will need to connect hundreds of billions of devices. What kind of a network can accommodate so many devices at a reasonable cost?

It's not just cost, however, other challenges with current network technology, such as latency, security and fragmentation must be addressed. In this new era, business and mission critical data will rely on real-time communications. Data will be carried on both public and private networks and stored in the cloud. Data networks with lower-latency connections and more robust security features are required.

2.1.4. IT and OT convergence

A related challenge is the convergence of the traditionally separate domains of information technology (IT) and operational technology (OT), mainly driven by the adoption of the industrial Internet of Things (IoT). (Industrial companies use OT, such as computerized control systems, to monitor production processes and equipment and make adjustments to improve performance.) Going forward, the IT function will need to be strongly involved in operational excellence programs, because IT will be integral to initiatives aimed at improving operations.

Obtaining new capabilities and combining IT and OT will have major organizational implications for industrial companies. Some companies have started to experiment with "digital organizations" that combine IT, technological, and manufacturing capabilities. For example, a tier-one automotive supplier created a multidisciplinary digital organization led by a chief digital officer who reports directly to the board. At a steady state, the organization will employ 100 employees at its headquarters and across regional locations. Its mission is to design, develop, and roll out digital initiatives across the company. The company also created specific roles for leading the digitalization of regional plants that are at a distance from its headquarters.

Regardless of the organizational setup, a company should expect the convergence of IT and OT to increase complexity in its operations. For example, an absence of automation standards across a manufacturer's production lines and plants creates a tangible risk of higher complexity.

2.1.5. Integration is KEY

Integrating information from Operational Technology (OT) with Information Technology (IT) and across cloud environments is required to have a comprehensive view of manufacturing in a near-real time or real-time status. Legacy integration or integration created at a manufacturer is a heavy administrative burden to maintain and keep accurate/consistent long-term.

In a hybrid cloud environment with applications hosted in different places (clouds and/or on premise), the integration between them can become a challenge. Especially considering security, accessibility and latency.

A cloud integration solution can be a good way to resolve that. Even better, if it is simple to use and contains multiple adapters for different targets, allowing business teams to easily implement applications themselves (for the most part with almost zero-coding). A great example of a modern Integration platform is the: Oracle Integration Cloud.

Oracle Integration Cloud consists of three parts. Combined, they provide a set of solutions that help you design business processes, integrations, orchestrations and web/mobile applications. You can use each one independently if you prefer.

- Process Builder: made to design your business processes using a friendly interface and zero coding. You can also use the platform to execute activities related to your process, like task approvals, monitoring, and reports.

- Integration: the purpose of this tool is to design your integrations, while using a friendly interface. You will need some technical knowledge and coding, depending on how complex your mapping and data manipulation are. With this tool, you can also monitor and manage all the instances executed by your integrations.

- Visual Builder: if you require a tool for an application, web or mobile, you can use Visual Builder. With this tool, it is also possible to create forms and pages for your processes and integrations. Some coding will be required. You can use Oracle JET and Groovy scripting.

With the available pre-built adaptors and next-generation process modeling, integration between cloud and on-premises systems has become optimized. This toolset also streamlines integration between Operational Technology (OT) systems with Information Technology (IT) systems to ease integration pain and develop an accurate data foundation that drives decision systems for manufacturers.

2.1.6. Manage IT architecture as a critical enabler

To capture the benefits of digital technologies, companies must manage their information architecture effectively. The following are three examples of information architecture's critical role in enabling the successful adoption of Industry 4.0:

Migrating to the cloud—Many companies are using the cloud to collect, store, analyze, and distribute data to improve the flexibility of production, increase the speed of making calculations, and reduce costs. However, the migration of data and systems to the cloud must be rigorously managed. A company should establish migration criteria—for example, data's age and level of importance—to guide decisions on whether data is stored on the premises or in the cloud. The criteria should also consider issues related to protecting the intellectual property of the company and the confidentiality of customers and suppliers. Moreover, the migration of applications to the cloud creates the need to update the mix of IT skills to include expertise in cloud-native API integration, microservices, and application container deployment.

Integrating legacy systems—Companies are uncovering valuable information by integrating machines, equipment, and plants that have traditionally operated separately. System integration enables companies to establish virtual operations, monitor the shop floor, and optimize operations within the factory and along the supply chain. For maximum flexibility to exchange data across hybrid and multi-cloud platforms be sure to include a cloud-based API integration solution in your deployment architecture. To manage connectivity with the physical plant environment, best practice is to implement a Plant Service Bus (PSB) at each plant location.

Embedded analytics and cognitive software—In addition to the plant service bus we recommend deploying embedded analytics and AI software at the edge level between the OT and IT networks. These physical edge servers bring compute and data storage capabilities closer to the plant devices that generate the data. Not only does this distributed computing architecture minimize latency and data integrity issues it also reduces cost by processing the transactions locally versus in a centralized cloud-based location.

Cloud native application architecture—Where practical, migrate legacy applications to cloud-native SaaS solutions. For highly customized, business critical applications consider modernizing the application architecture to use microservices and containers so you can deploy them via cloud-native PaaS architectures.

Building "cyberresilience"—A high level of integration among systems, both internal and external, means that a company must intensify its focus on securing its data and systems. Companies that have implemented Industry 4.0 technologies have expressed a high level of concern about cyberattacks and other issues that could arise from extensive integration. Leading companies are building their organization's "cyberresilience" by understanding the actions to take before, during, and after an attack.

2.2. The built-in value of Oracle Cloud Platform Services

Beyond basic infrastructure, Oracle Cloud Platform services save development time and effort. An Oracle Cloud-based enrichment strategy can help you build application features that previously may not have been attainable, affordable or feasible, such as:

- Advanced application data management capabilities with the Oracle Database, Big Data, Hadoop solutions and MySQL pre-integrated, optimized, and available in the Oracle Cloud.

- Extreme performance, security and reliability built on proven technologies such as Real Application Clusters (RAC), Active Data Guard, and Exadata in the Oracle Cloud.

- Pre-built business intelligence analytics and dashboards in Oracle Business Intelligence Cloud Service that you and your end-users can leverage and extend.

- User mobility and social media capabilities you can seamlessly integrate into your existing software with Oracle Mobile Cloud Service.

- Integration with third-party applications and external data sources through Oracle's Integration Cloud Service so you can extend your applications while maximizing the value of your existing investment.

Unlike other cloud providers, the Oracle Cloud is built on open industry-standard Oracle technology. This greatly reduces or even eliminates the amount of support you'll need to provide for the applications and services you build on top, while you inherit the reliability and performance that Oracle can provide. These are the same reasons competitive cloud providers have chosen Oracle software and platform technologies for their own cloud solutions.

Using the Oracle Cloud to extend your existing application's feature set in a hybrid deployment is a cost-effective modernization and enrichment strategy. With this hybrid approach, you can continue to innovate, compete and realize new revenue opportunities without the costs of building and managing additional infrastructure. The Oracle Cloud helps to drive business efficiencies, improve customer communication channels, uncover new opportunities, and streamline your operations end-to-end. Real-time cloud dashboards give you the insight needed to prepare for usage fluctuations and growing demand. The result is enhanced user support, improved customer relationships, a more efficient software operations model, and business growth needed to drive future innovation.

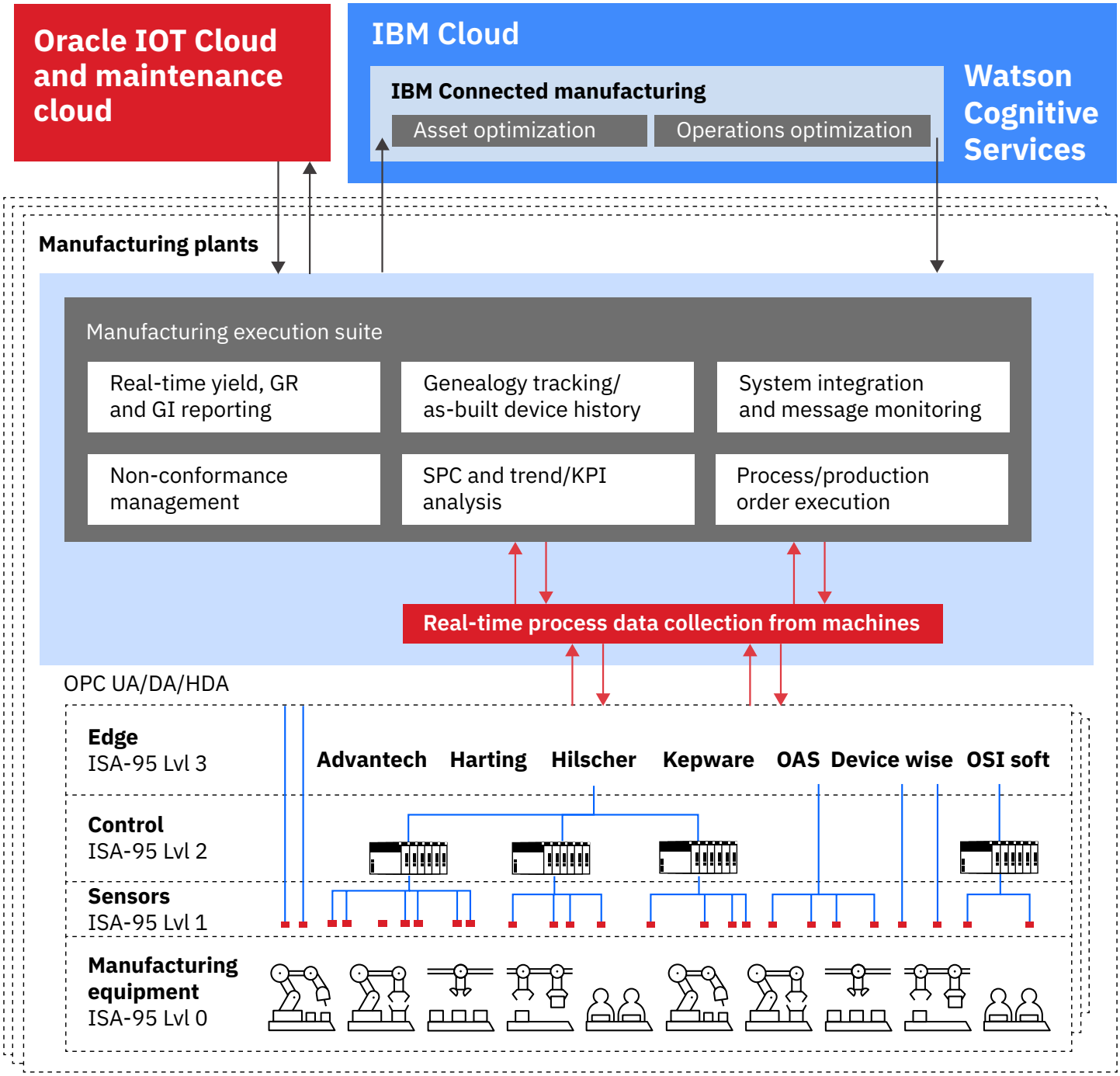

Figure 2: Proposed Solution Architecture for IBM/Oracle Connected Manufacturing

3. Unlocking the value of digital transformation

Global spending on digital transformation technology and services is predicted to reach $2.3 trillion in 2023 with an average annual increase of 17.1% according to a recent IDC study. By 2023 DX technology investment will represent 53% of the total worldwide technology investment. (IDC, 2019)

3.1. Optimizing business value of Industry 4.0 investment

Realizing the bottom-line benefits of Industry 4.0 technology investment requires a thorough cost analysis that is closely coupled with the technology deployment roadmap. To offset the heavily front-loaded investment needed to implement the foundational digital infrastructure; initial efforts should focus on innovative solutions for conventional manufacturing challenges such as asset utilization, control of production yield, scrap, and rework, disconnected OT and IT systems with complex, siloed data repositories, unreliable demand and supply chain forecasts, etc. that can deliver measurable ROI.

Conventional Manufacturing Challenges	Industry 4.0 Solution	Measurable Results
Production interruptions due to unplanned downtime reducing overall plant equipment return on assets.	Deploy predictive and prescriptive maintenance plans using IoT and advanced analytics.	Predictive real-time IoT driven maintenance approach reduces downtime losses. A large German automotive manufacturer uses IoT to continuously monitor production line performance and pinpoint performance degradation and schedule maintenance before an unplanned production outage.
Disconnected corporate IT and manufacturing OT systems	Integrated IT and OT systems merged with IoT and other Industry 4.0 technologies facilitate end-to-end production optimization and management performance reporting.	By deploying AI-powered inspection solution based on IBM's Watson IoT platform Shenzhen China Star Optoelectronics Technology Co., Ltd. was able to significantly improve production quality and improve manufacturing throughput using smart visual inspection capabilities.
Workforce aging and skills gap	Collaborative methodologies like IBM's Innovation Garage helps companies digitally reinvent their core processes and establish an open, collaborative culture that nurtures continuous learning.	CEMEX, a global cement and heavy construction material company, partnered with IBM to educate top management on digital transformation. As part of the initiative, CEMEX established the Monterrey Digital Hub, a co-working space aimed at attracting and developing new digital skills for the next generation of talent and entrepreneurs.

4. What's next?

Industries and countries will embrace Industry 4.0 at different rates and in different ways. Industries with a high level of product variants, such as the automotive and food-and beverage industries, will benefit from a greater degree of flexibility that can generate productivity gains, for example, and industries that demand high quality, such as semiconductors and pharmaceuticals, will benefit from data-analytics-driven improvements that reduce error rates.

Countries with high-cost skilled labor will be able to capitalize on the higher degree of automation. This will optimize the cost of labor and automation which stabilizes operational cost. However, many emerging markets with a young, technology-savvy workforce might also jump at the opportunity and might even create entirely new manufacturing concepts.

To actively shape the transformation, manufacturers and system suppliers must take decisive action to embrace technological advancement. They must also address the need to adapt the appropriate infrastructure and education.

4.1. IBM's Oracle Cloud Impact Assessment

A great starting point for manufacturers is to embrace applications and technology assessments to clearly identify a roadmap of future value for every investment in IT. The roadmap that is unique to each manufacturer should be prioritized by value return to the company for every investment, starting with largest first of course. This digital transformation roadmap will clearly layout the most valuable path forward. The roadmap and value of return will serve as business justification for moving forward.

IBM offers the leading **Cloud Impact Assessment** for Oracle across the industry. The assessment is an automated analysis for legacy Oracle ERP / SCM / EPM and HCM on-premise customers looking to transition to the cloud, no matter the Oracle legacy suite foundation (JDE, Peoplesoft, E-Business Suite, Siebel, Hyperion etc.). It is designed to answer many questions organizations are asking about why, when, and how to move to cloud.

The 4-week assessment provides:

- Current state functional and technical assessment
- Target state business process and technical opportunities in transitioning to Oracle Cloud
- Transition risk assessment
- Recommended roadmap
- Costed business case and ROI statement
- Demo instance of Oracle Cloud environment with client configuration and master data (optional)

The assessment may take longer for those clients not leveraging a legacy Oracle system as some pre-built automation scripts and IBM developed tools may not be used as configured. However, this is still a great starting point for all manufacturers to identify value from an Oracle Cloud applications or Oracle Cloud Infrastructure adoption strategy for your business.

This industry leading assessment has been proven globally by IBM with several references and case studies for potential manufacturers to review to quickly understand the value and business case to expect from the exercise.

4.2. IBM Cognitive Enterprise for Oracle Cloud

We implement Oracle Cloud differently.

The Cognitive Enterprise for Oracle Cloud is a business platform that enhances the core functionality of Oracle through the addition of intelligent workflows powered by the exponential technologies of automation, AI and IOT. Our vision centers around touchless processing, agile decision making & insight led innovation.

We do not execute design against an 'empty shell' of Oracle Cloud, spending weeks gathering requirements, configuring a platform, and running design workshops. This takes time and often results in an "as-is" design. Our platform brings together the key design components to expedite design and deliver the future state target operating model.

Our platform delivers:

- An optimized organizational model, providing a structure to support operational and managerial needs
- Role definitions for each of the roles within the organization structure
- Role specific dashboards delivering Key Performance Indicators (KPI) benchmarks against industry standards
- Business processes aligned to Oracle and the APQC standards-based process framework.
- Intelligent workflows to deliver incremental automation and business value within key business processes
- Localizations for country requirements
- Security and controls aligned by process area

Our platform is underpinned by Leading Practices, defining the key process and technology practices to be adopted to optimize your business and deliver Industry 4.0.

4.3. IBM RapidMove for Oracle Cloud

Migration to Oracle Cloud can be slow, expensive and sometimes does not deliver the business value you need. Technical upgrade approaches can't deliver business transformation nor leverage the full feature-set of Oracle Cloud Applications. Conversely, greenfield implementation with no accelerators, are slow to deliver and incurs a premium cost.

IBM RapidMove for Oracle Cloud delivers the solution fast while unlocking the full value of business transformation.

- **Save 80%** in configuration time through our Oracle Cloud Configuration Injector, able to pump data into any environment, maintain a Gold Copy offline, produce documentation and enable transformation between instances.
- **Save 40%** on integration design and build using the 50+ Cloud integration adaptors to systems including ADP, Maximo, Taleo, Concur, Blockchain and all legacy Oracle platforms. Deliver integrations through the IBM Utility Integrator, a framework to rapidly integrate 3rd parties into the Cloud, underpinned by our Error logging and Monitoring framework to reduce time spent resolving defects by 20%.
- **Save 40%** on data migration, designed and built via our 40 Oracle Cloud ready adaptors handling extract, transform and load.
- **Save 40%** on test execution. IBM Test Automation for Oracle Cloud delivers over 400 scripts in open source technology including the ability to auto-capture screenshots for audit purposes.

www.ibm.biz/oraclerapidmove

4.4. IBM's Oracle Cloud Managed Services

Once new digital transformation platforms have been created, how do you keep them running optimally? How do you keep them current, with continuous innovation being retrofitted into those environments?

IBM Managed Services for Oracle Cloud is a new way of delivering applications support. Our model delivers an optimized managed service embedding innovation through cognitive and automation to realize increased business value. In addition, different processes and skills are required for maintenance in a SaaS environment like planning and implementation of quarterly patches and updates and a different type of environment and release management.

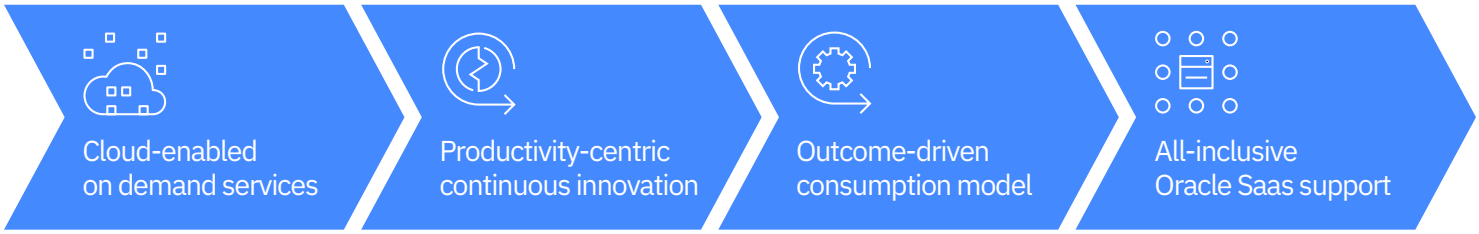

Figure 3: IBM Managed Services for Oracle Cloud — Stages

IBM offers a comprehensive end-to-end solution for Oracle Cloud:

- Implementation to Go-Live Support
- Customization of business processes through Oracle Platform-as-a-Service (PaaS) toolsets
- Ongoing managed services with continuous innovation

5. Why Oracle and IBM?

It is the true desire of business leaders today to modernize their company, making it more nimble and adaptable while reducing the complexity for their employees. This desire also directly relates to digital transformation. Business leaders need to take action modernizing the business while addressing current demands from customers, partners and employees while at the same time grow the bottom line.

Oracle Corporation through its vast application and database experience (since 1977) has driven the inclusion of embedded business processes into their applications which helps business leaders address immediate operational demands while modernizing and reducing cost simultaneously. Oracle's acquisition history includes industry leading software companies like: JD Edwards, PeopleSoft, Siebel, Hyperion, Primavera and many others. Leveraging the experts from these companies, as well as their assets, Oracle has created the most mature cloud applications and cloud tool-sets in the market. Oracle is uniquely positioned to deliver "end-to-end" cloud applications to its clients which include the most mature embedded business processes to simplify complex operations while reducing cost and providing a platform of flexibility for future growth for your company.

As you will later read in the analyst reports, Oracle has invested heavily in cloud assets to provide businesses, including manufacturers the cloud platform for transformation and continuous innovation.

5.1. Oracle Cloud Momentum

Industry analysts continue to rank Oracle as either the top cloud application provider or challenger in every application category. Oracle's Enterprise Application maturity and truly cloud optimized application offerings, makes Oracle the overall leader in cloud applications. Please take a moment to visit Oracle's analyst report page. There are over 40 different analyst reports evaluating Oracle's current offerings by topical area. Oracle's cloud offerings deliver long-term value and continuous innovation to its clients.

www.oracle.com/corporate/analyst-reports.html

5.2. IBM 's Oracle Services

Since 1986, Oracle and IBM have been providing customers with joint solutions, combining Oracle's technology and application software with IBM's complementary hardware, software and services solutions.

IBM, a Platinum and Cloud Elite member of OPN, has over 15,000 Oracle skilled resources, 10 global delivery centers, 6,000 Oracle certifications, and has won numerous awards and accolades for Oracle.

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