Digital Transformation in Manufacturing:

Creating an intelligent, connected and secure information advantage

December 2021

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Manufacturing at the Heart of Digital Transformation's Perfect Storm

IDC research shows that manufacturers worldwide are rapidly embracing new technologies to transform their business models and operations to improve agility, customer engagement, profit and sustainable competitive advantage.

They are at the heart of the perfect storm, both living with and seeking to exploit, disruptive information technologies such as cloud, big data, AI-assisted analytics and the Internet of Things (IoT), while facing increasing IT security challenges, regulatory pressures and a changing workforce. In the face of new and disruptive competitors, they are changing their businesses radically to offer value-added services and leverage tightly linked ecosystems.

It should be no surprise then that a clear majority of manufacturers are actively planning bold transformation of information architecture, operating models and more. In fact, 86% of European manufacturers have already begun their digital journey. Improving customer satisfaction and achieving higher operational performance are seen to be the key goals.

Q. Which of the following 5 stages of digital transformation maturity best describe your organization?

14%
DIGITAL RESISTER
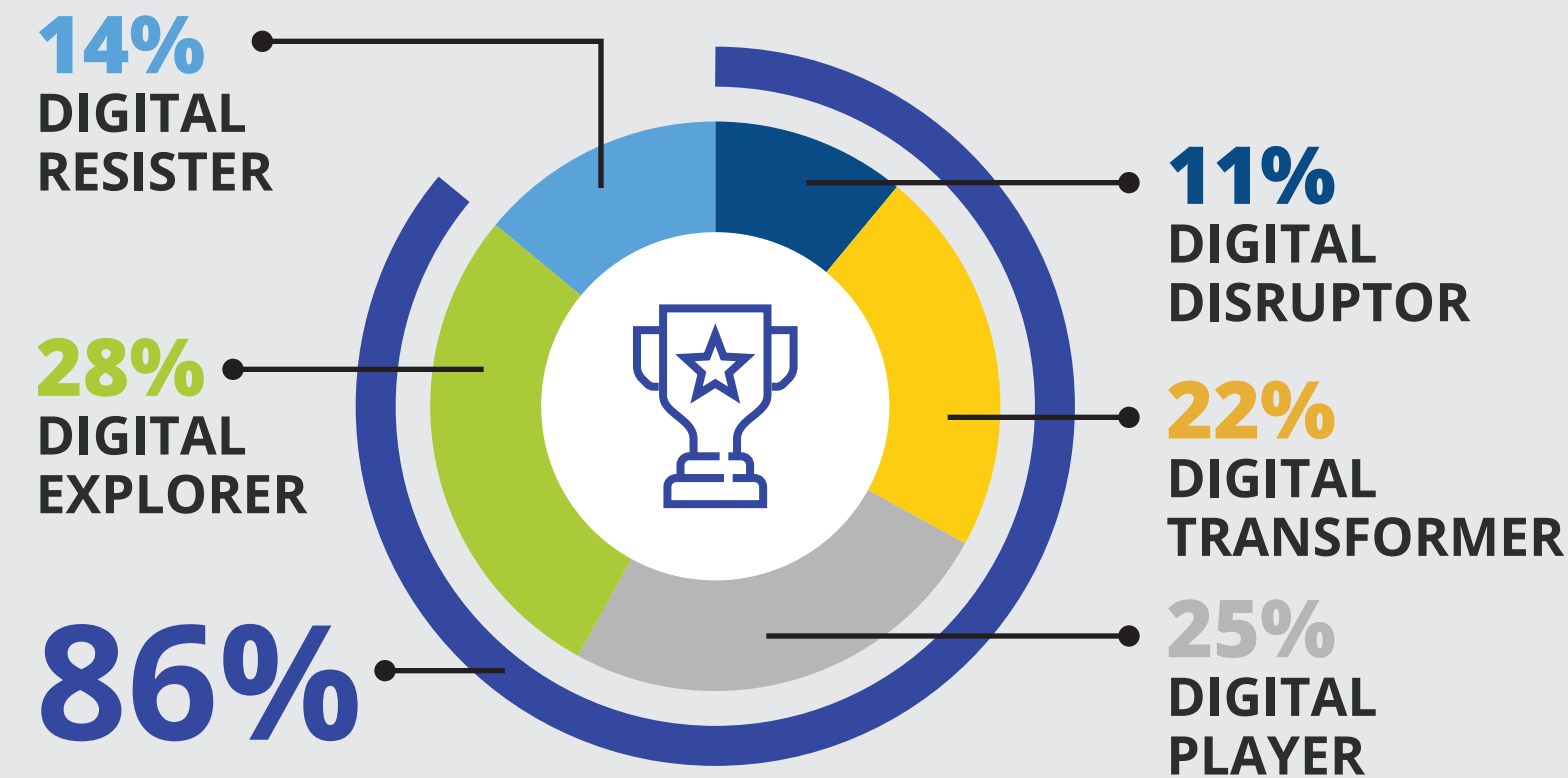
11%
DIGITAL DISRUPTOR

28%
DIGITAL EXPLORER

22%
DIGITAL TRANSFORMER

86%

25%
DIGITAL PLAYER

- Enterprise is aggressively disruptive in the use of new digital technologies and business models to affect markets.
- Integrated, synergistic business – IT management disciplines deliver digitally enabled product/service experiences
- Business-IT goals are aligned at enterprise level around the creation of digital products and experiences
- Business has identified a need to develop a digitally enhanced, word execution is on ad-hoc basis
- Business and IT digital initiatives are disconnected and poorly aligned with enterprise strategy

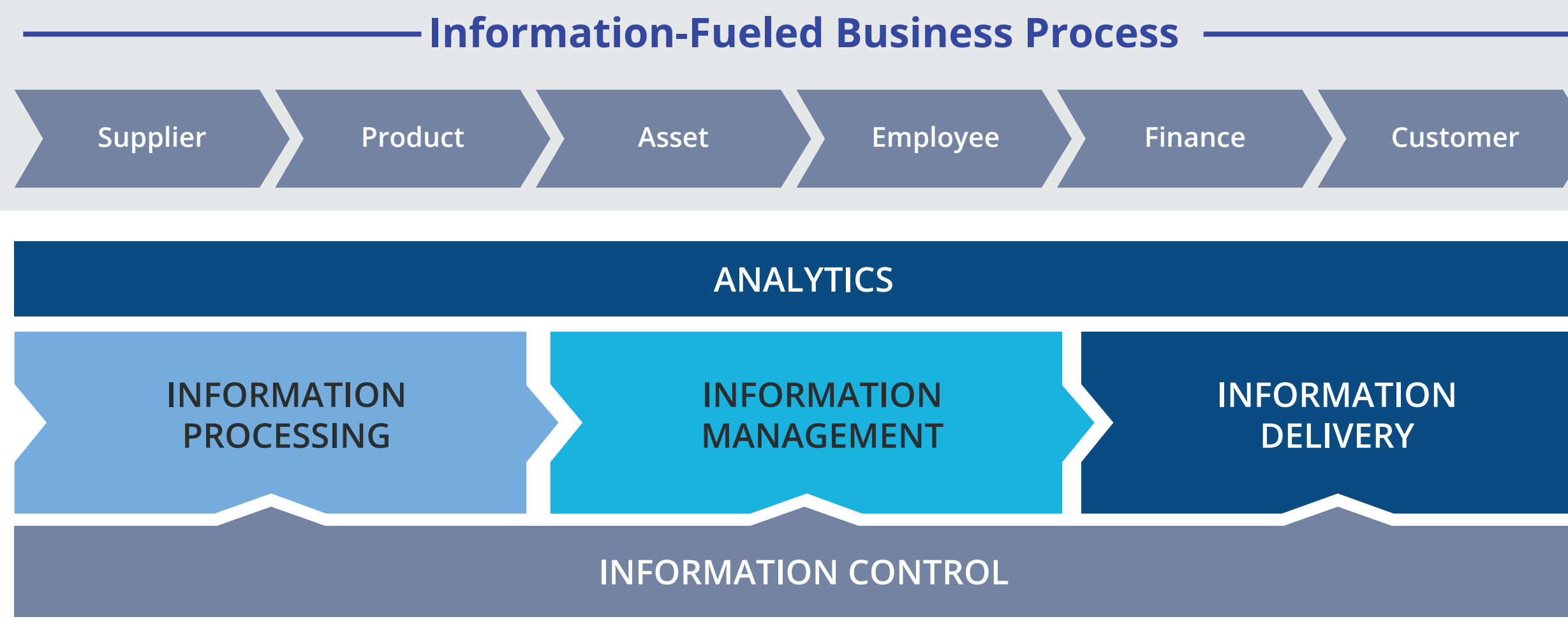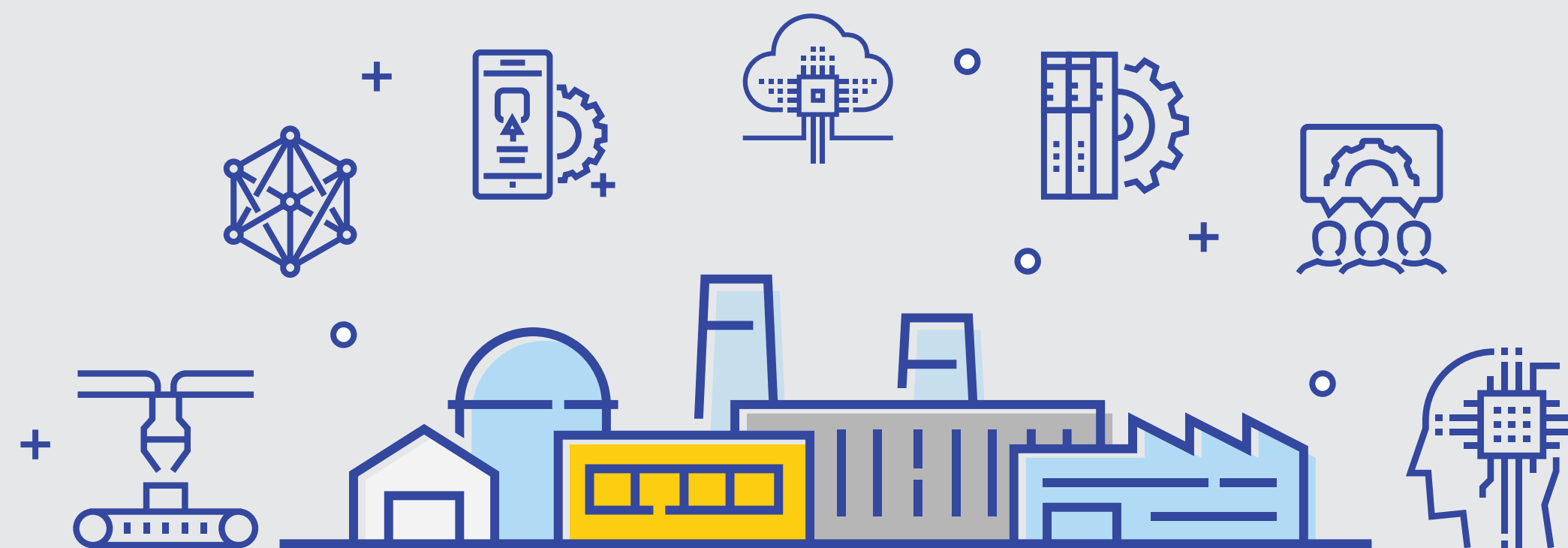**Q. Where do you expect digital transformation having the biggest impact on your business?**

Improving customer satisfaction

More efficient operations/Cost optimization

Improving workforce satisfaction

Faster IT innovation rates

Expanded market share/Greater customer (patients/students) base

Increasing revenues/margins from core businesses

Reducing time to market

Fostering new business models

Faster business innovation rate

Brand uplift

Increasing revenues/margins from new digital businesses

Being celebrated in media and by peers

No expected impact

Source: IDC European Tech and Industry Pulse Survey 2019-2020 – Manufacturing N = 290

The Information Advantage: Information is at the Center of Business Processes – and the Key to Process Improvement

Technologies including cloud, mobile, big data and AI, as well as blockchain architectures, enable new services and models such as intelligent predictive maintenance and as-a-service, outcome-based business models. In this digital economy, information and analytics are fueling every business process. With this in mind, manufacturers are realizing the importance of employing advanced enterprise information management (IM)[1].

Information is delivered across business processes, from supplier engagement, manufacturing, logistics and asset management to HR, finance and sales and marketing, always as a part of a larger system of ecosystem applications.

[1] Information Management (IM) allows organizations to capture, govern, exchange and enhance information while keeping it secure. IM brings together key technologies to enrich information and processes from end-to-end. Both unstructured and structured information flow across the extended enterprise. Through IM, businesses can consolidate and integrate information so it can be managed transparently throughout the entire information lifecycle.

Information-Fueled Business Process

Supplier	Product	Asset	Employee	Finance	Customer

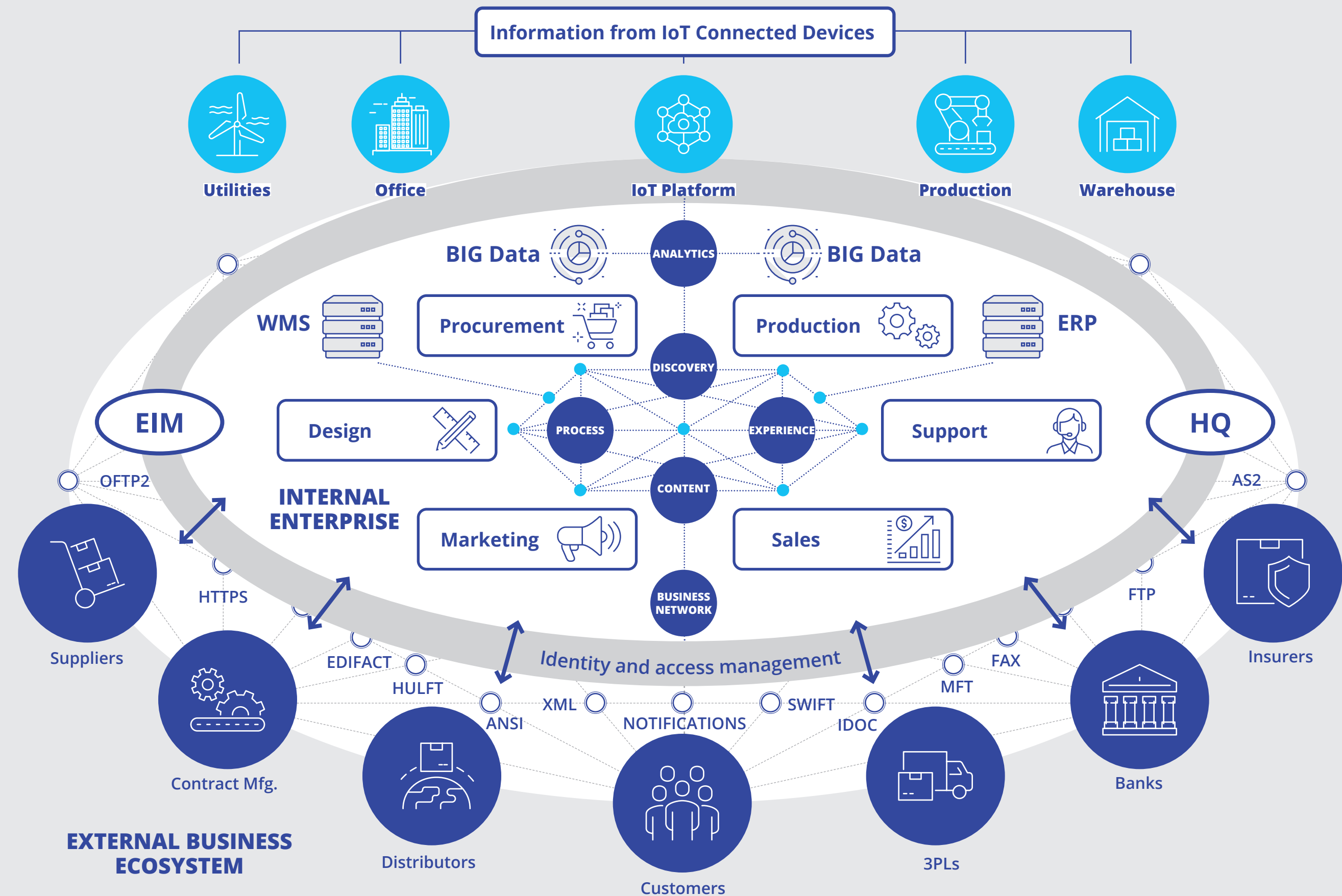|	ANALYTICS		
AI	INFORMATION PROCESSING	INFORMATION MANAGEMENT	INFORMATION DELIVERY	BLOCKCHAIN
	INFORMATION CONTROL		

Source: © Open Text 2020

Companies Need to Pursue an Integrated Information Management Approach

To be effective, information has to flow in many directions: top-down, bottom-up, from inside out and outside in, between employees, business departments and across the business network. Companies must integrate data analytics, transactional content and content-related services, and provide strong reporting on activities such as content created and received via easily-accessible dashboards.

However, most business applications — as originally conceived — excel at managing silos of information, but lack the capability to seamlessly hand data and information to other business processes and applications. In order to effectively cover intra-enterprise processes, companies often need to rely on expensive and cumbersome custom applications or on error-prone manual processes.

Enabling a unified data platform is central to empowering business to work smarter with information to improve productivity, completeness and customer experience, driven by better business insight.

- To digitize, harmonize and improve business operations

- To integrate business strategies and operate across ecosystems of innovation

Information from IoT Connected Devices

Utilities · Office · IoT Platform · Production · Warehouse

BIG Data · ANALYTICS · BIG Data

WMS · Procurement · Production · ERP

DISCOVERY

EIM · Design · PROCESS · EXPERIENCE · Support · HQ

OFTP2 · INTERNAL ENTERPRISE · AS2

CONTENT

Suppliers · HTTPS · Marketing · Sales · FTP · Insurers

BUSINESS NETWORK

Identity and access management

Contract Mfg. · EDIFACT · HULFT · ANSI · XML · NOTIFICATIONS · SWIFT · IDOC · MFT · FAX · Banks

EXTERNAL BUSINESS ECOSYSTEM · Distributors · Customers · 3PLs

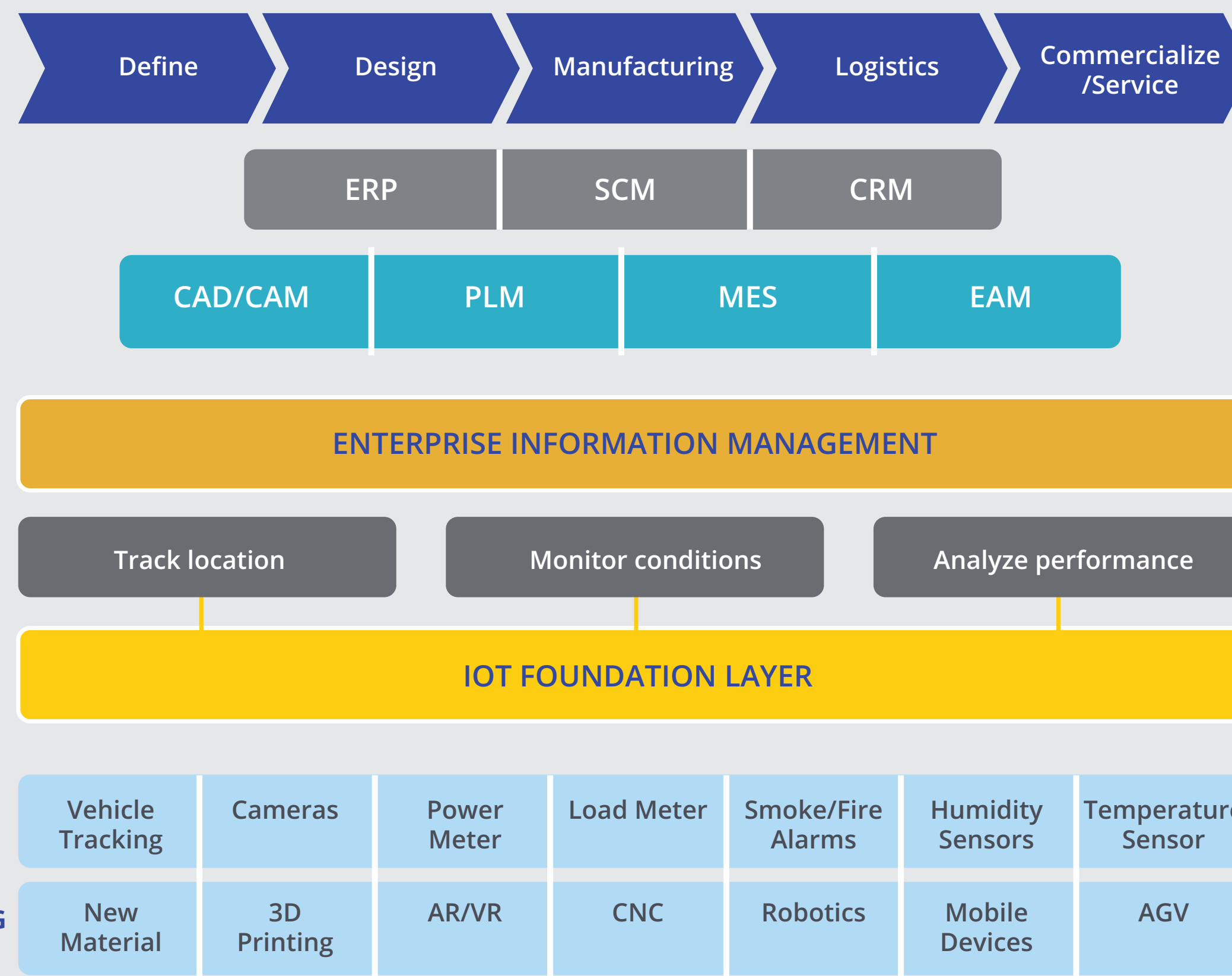# The Factory of the Future Has a Layered Approach to Information

In the Factory of the Future, the foundation layer will be automation intensive: all production processes will be highly or completely automated with few or no people involved in production operations. Digital technologies will make continuous improvement a transactional exercise, allowing people to focus on business reinvention.

This transformation will provide a further growth opportunity for companies deploying advanced automation that will cover all the processes where humans cannot bring any added value.

An IT intensive operational layer will create real-time decision-making environments. The connection between factory technology and enterprise systems is based around an IoT layer supporting the seamless transition from operation technology (OT) to IT systems. This entails dismantling the traditional organizational boundaries that have OT and IT as separated domains.

Above all it will be information-intensive to support people's decision making. People will be at the center of the Factory of the Future as they provide the degree of flexibility and decision-making capabilities that are required to deal with increasing complexity.

EIM will be the facilitator that eases the exchange of information transparently across organizational boundaries. EIM acts as the information highway assisting the transmission of data between OT and IT for better business outcomes.
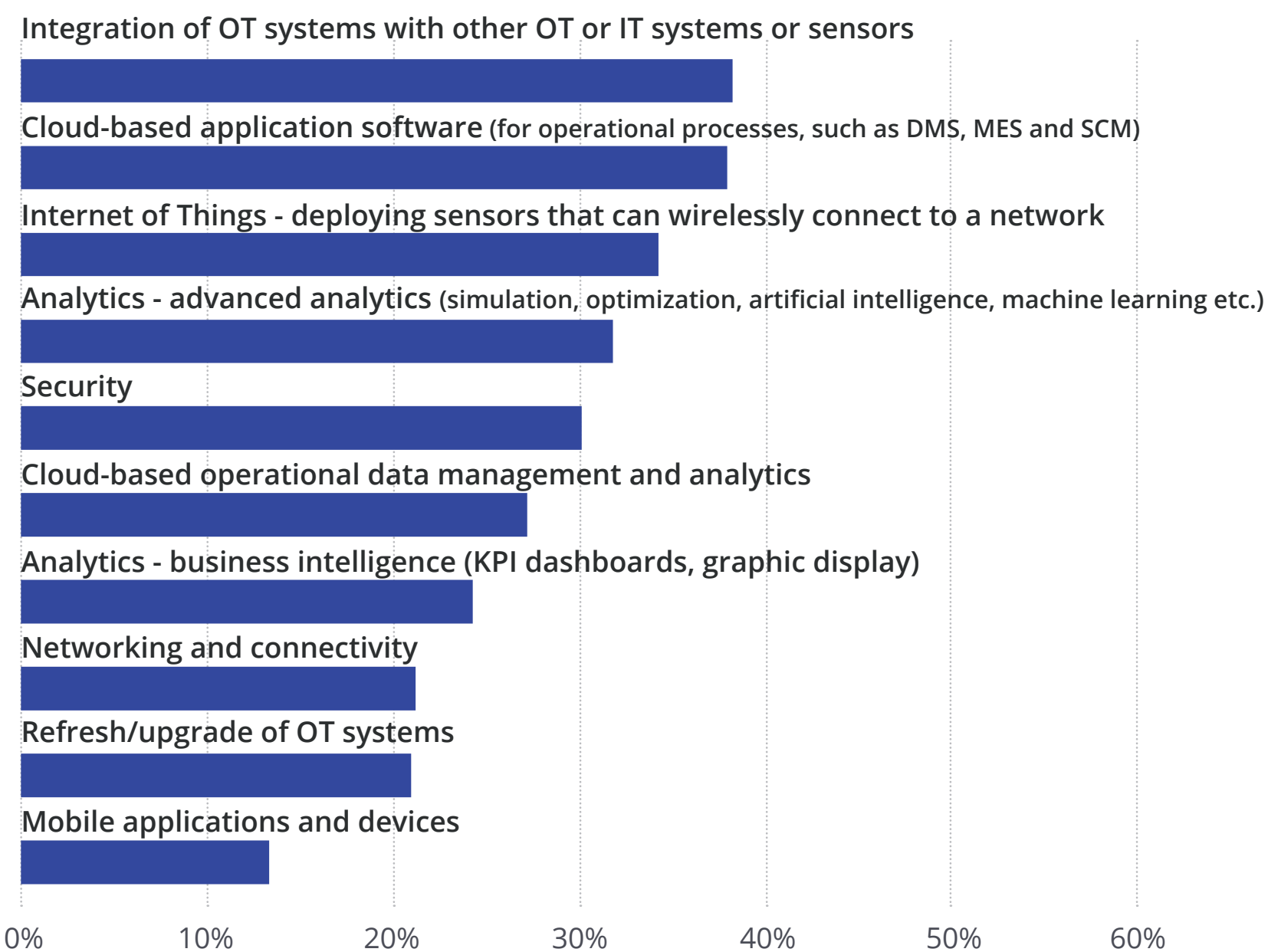
Define	Design	Manufacturing	Logistics	Commercialize /Service

	ERP	SCM	CRM	

CAD/CAM	PLM	MES	EAM

ENTERPRISE INFORMATION MANAGEMENT

Track location	Monitor conditions	Analyze performance

IOT FOUNDATION LAYER

SENSOR-DRIVEN — Vehicle Tracking	Cameras	Power Meter	Load Meter	Smoke/Fire Alarms	Humidity Sensors	Temperature Sensor
MANUFACTURING TECHNOLOGY — New Material	3D Printing	AR/VR	CNC	Robotics	Mobile Devices	AGV

Source: IDC 2020

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The Factory of the Future Ecosystem will Leverage Multiple Data Sources with AI-Assisted Analytics

Digital transformation of manufacturing means a highly interconnected supply chain and increased expectations around quality, logistics and security. Digital transformation requires not just integrated processes in a factory, but a tight coupling between suppliers, customers and the manufacturing organization to give greater closeness to the customers and better control over WIP and raw materials; however, the expectations will be towards greater flexibility and agility in the ecosystem.
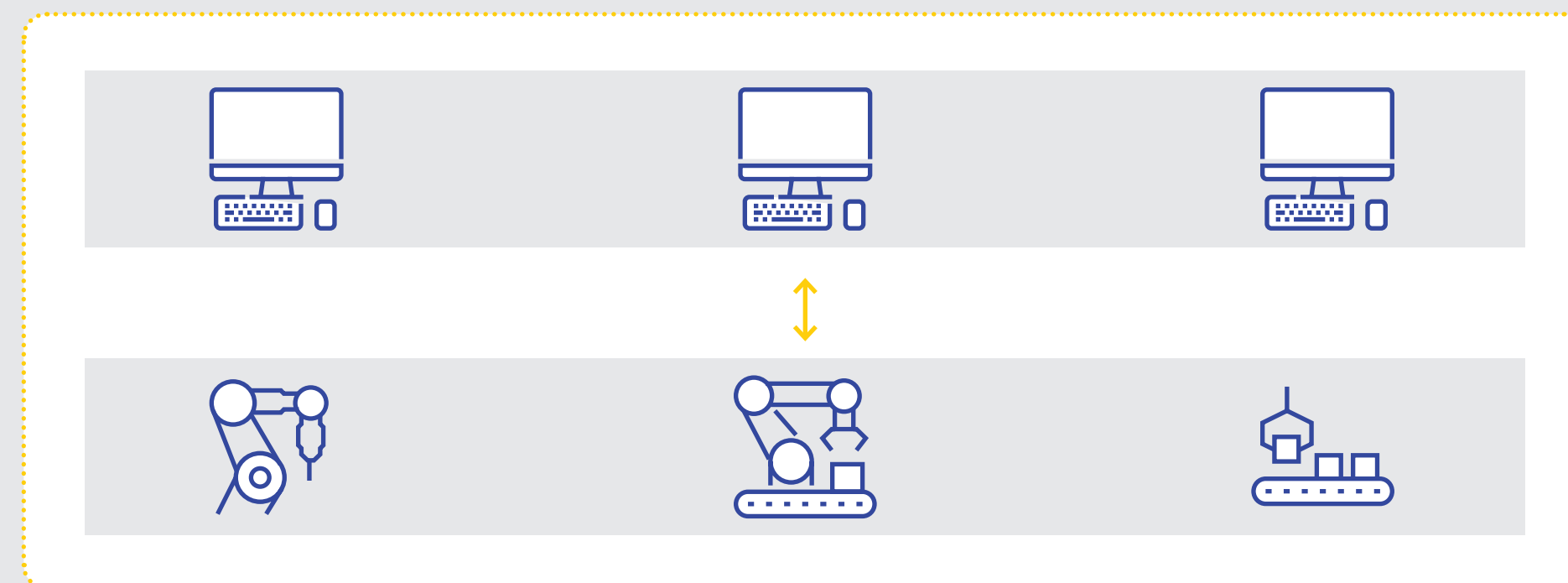
This implies a unified information strategy across the organization's assets and extending across the supply chain. Information sharing will be absolutely vital to support this. Manufacturers' top priorities for operational investments are around capturing and sharing the information their processes generate by leveraging cloud and analytics

Source: WW - IT and OT Convergence Survey 2020, Manufacturing, N= 346

What are your top three priorities for investment within your operational technology IT related initiatives?

Integration of OT systems with other OT or IT systems or sensors

Cloud-based application software (for operational processes, such as DMS, MES and SCM)

Internet of Things - deploying sensors that can wirelessly connect to a network

Analytics - advanced analytics (simulation, optimization, artificial intelligence, machine learning etc.)

Security

Cloud-based operational data management and analytics

Analytics - business intelligence (KPI dashboards, graphic display)

Networking and connectivity

Refresh/upgrade of OT systems

Mobile applications and devices

0%   10%   20%   30%   40%   50%   60%

OLD FACTORY Closed Environment

FACTORY OF THE FUTURE

Open Environment
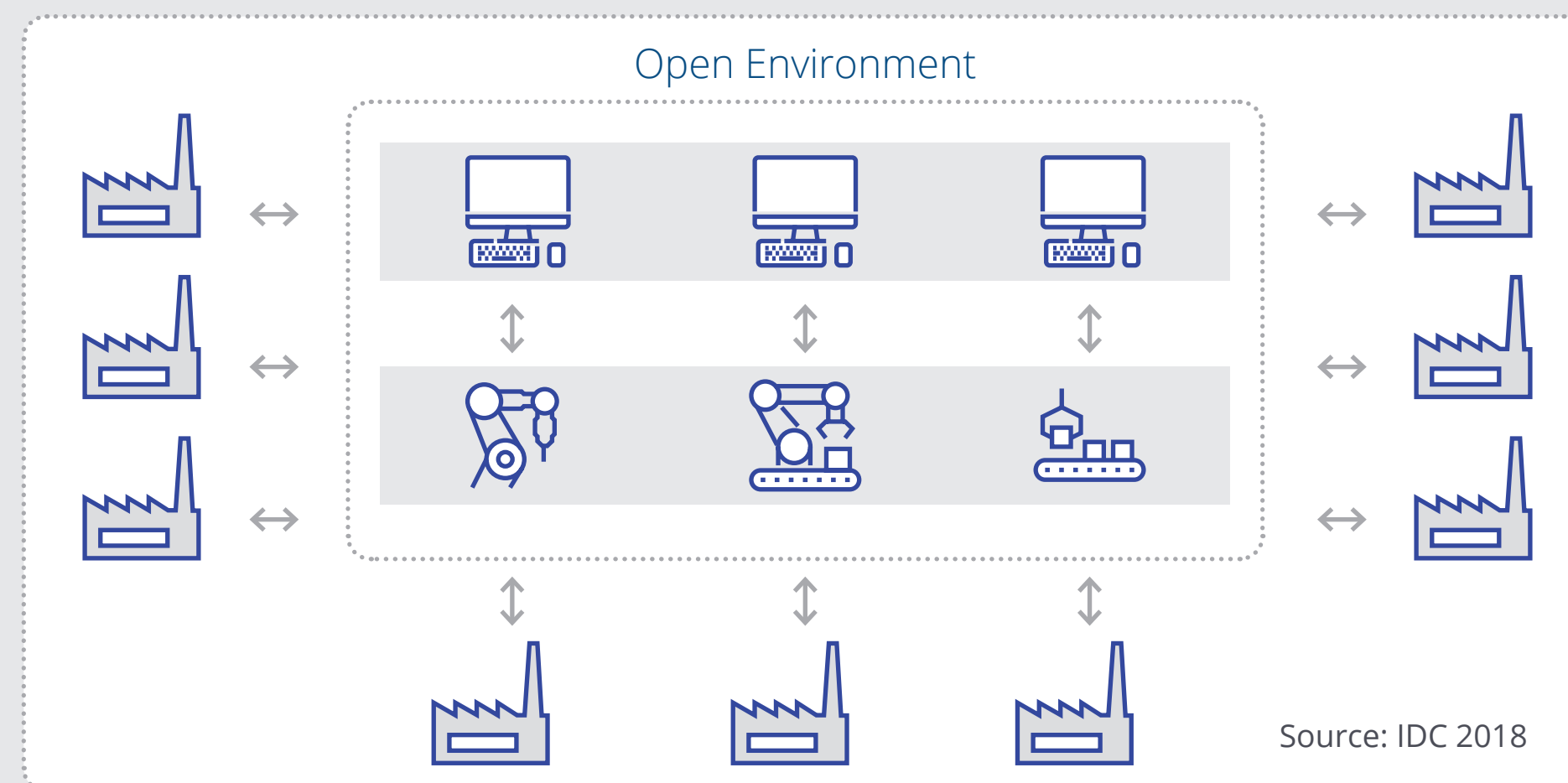
Source: IDC 2018

Once information is created, it can reach multiple audiences. Mixing advanced analytics of enterprise business data with operations technology data is central to delivering better, more powerful business applications.

A Drill-Down on IT/OT Integration

Too many companies have a segregated approach to IT/OT integration, where each plant makes independent investment decisions about technology in the plant through execution and plant scheduling. Integration with corporate systems is asynchronous (batch) and is usually limited to demand download and finished product upload. However, things are changing. We see more and more companies looking at coordinated integration models as they create a common platform to manage operations at an execution level. The trend will be for companies to achieve an integrated vision enabled by standing centers of operational excellence with permanent staff.

Status of OT/IT Integration

- 🔵 **Integrated**
- ⚫ **Coordinated**
- 🟡 **Segregated**
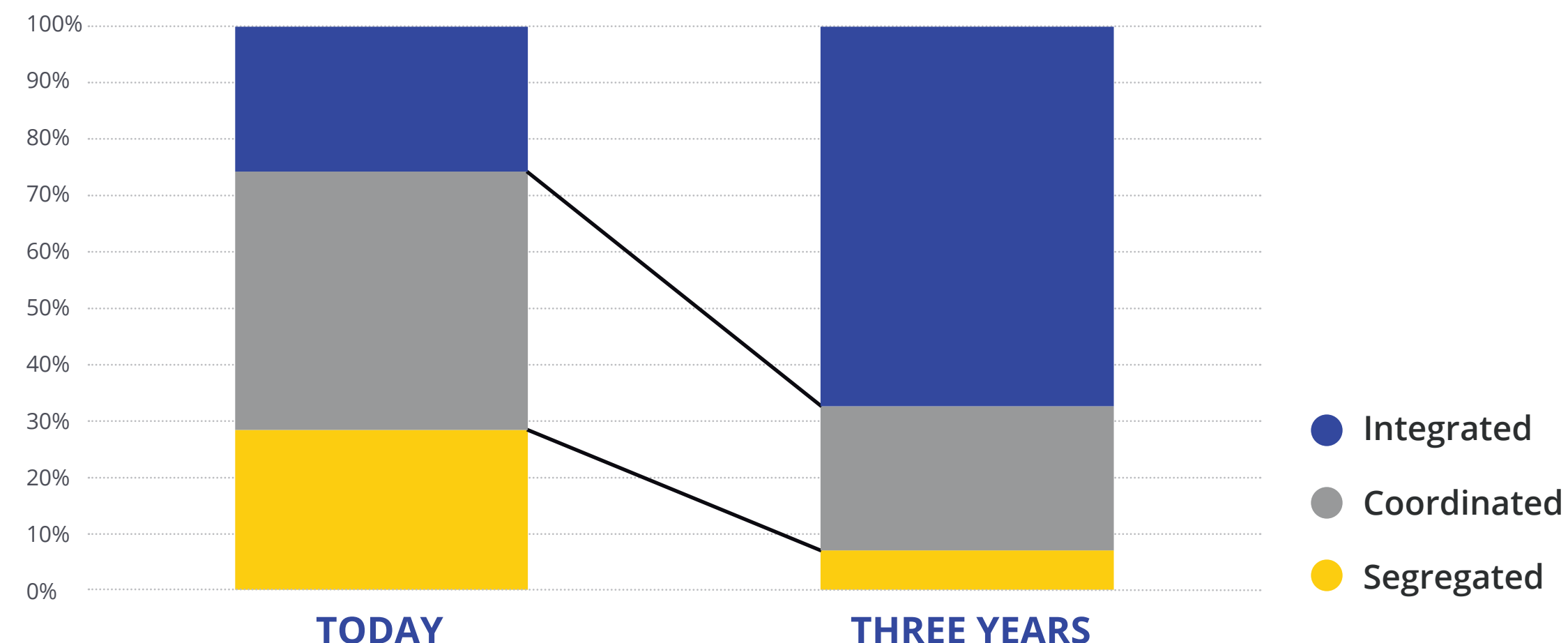
🟡 **Segregated.** Each facility makes independent investment decisions about technology in the plant. Integration to corporate systems is asynchronous (batch) and is usually limited to demand download and finished product upload.

⚫ **Coordinated.** Based on a common platform to manage operations at an execution level, with governance through PMO. Support is handled by IT with a local "power user" at each plant. The plant continues to make control-level decisions.

🔵 **Integrated.** The company sets up a standing center of excellence with permanent staff, from the business as well as IT. The control systems are shared between IT and OT.

Source: WW - IT and OT Convergence Survey 2020, Manufacturing, N= 346

Value chains as ecosystem networks

Manufacturing organizations are increasingly understanding the importance of engaging much closer with their broader ecosystem such as with suppliers, partners, and customers.

By 2025, driven by volatile global conditions, 75% of business leaders will leverage digital platforms and ecosystem capabilities to adapt their value chains to new markets, industries, and ecosystems.

IDC FutureScape: WW Digital Transformation 2021 Predictions

Cloud: Key technology enabler for ecosystem digitization

- Scalable and secure cloud-infrastructures
- Aligned architectures of edge and cloud depending on requirements
- Multi-cloud management solutions

Data exchange: Key to fuel ecosystems operations

- Need for appropriate data management and data sharing IT infrastructure and architectures.
- IT architectures need to address specific needs related to security and IP concerns, latency of data exchange, and the volume of data exchange.

31% of manufacturing organizations....

... already have a well aligned and agile ecosystem supporting a co-creation model to develop new and innovative solutions
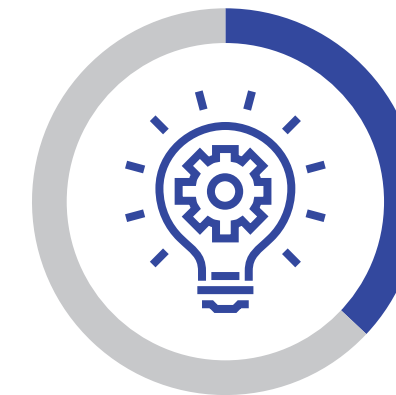
61% of manufacturing organizations....

... are expanding their ecosystem to scale existing products, acquire new customers and create new offerings.

Collaboration in ecosystems is very much about sharing data!

By sharing data within their ecosystem, manufacturers can achieve **greater product quality** and **customer experiences**, more **efficient supply chain execution** and **manufacturing operations**, as well as **faster and better product and software innovation**.

Source: Worldwide Future Enterprise Resiliency & Spending Survey, IDC, February, 2021, Manufacturing companies n= 127

Tracebility is the foundation to strong ecosystems
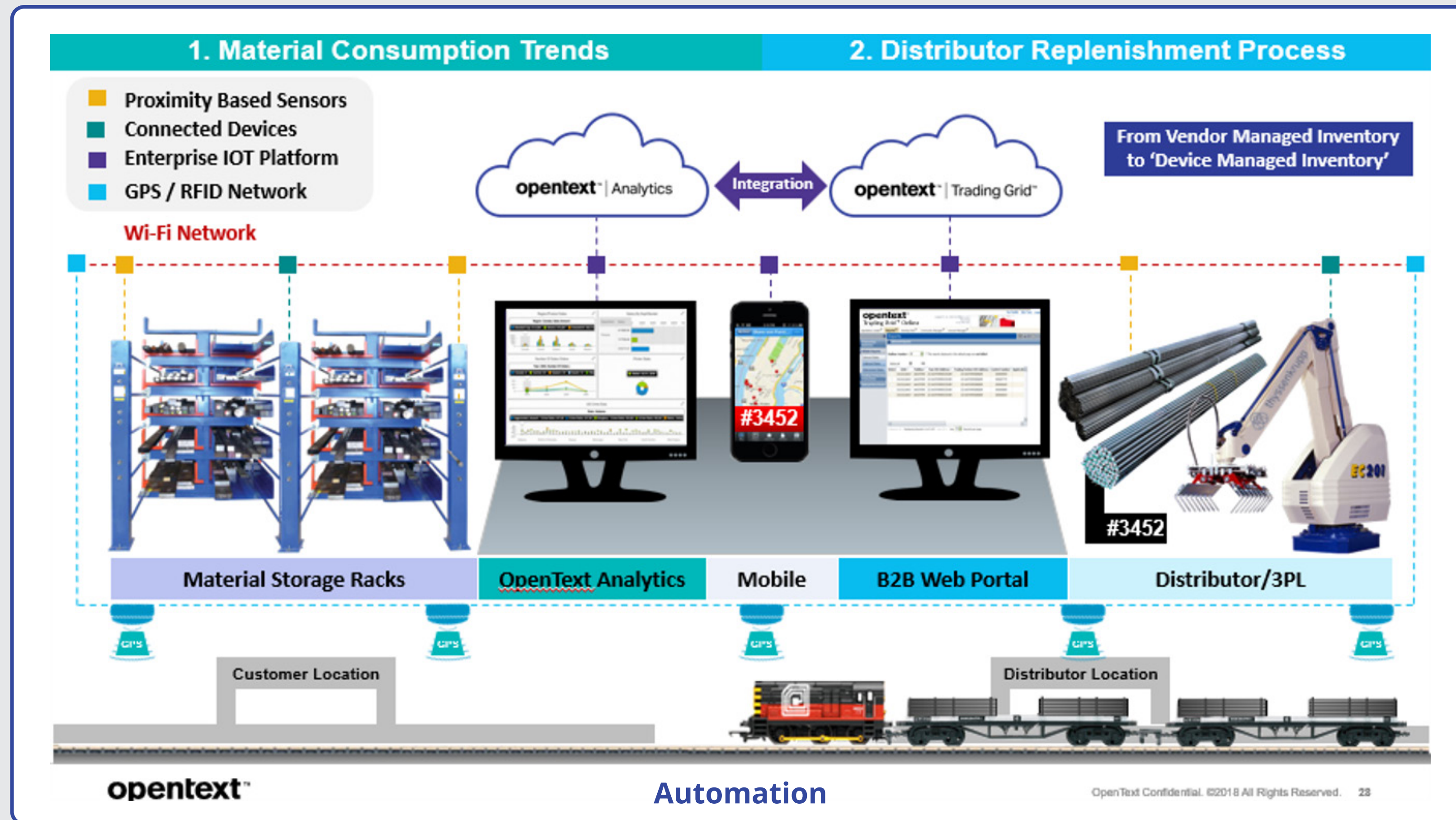
Traceability is more than just a capability for quality and recall readiness. Traceability key for building trust and ultimately, enhancing brand value. Customers – whether in B2B or B2C markets – expect to receive both quality and reliability in the product they ordered.

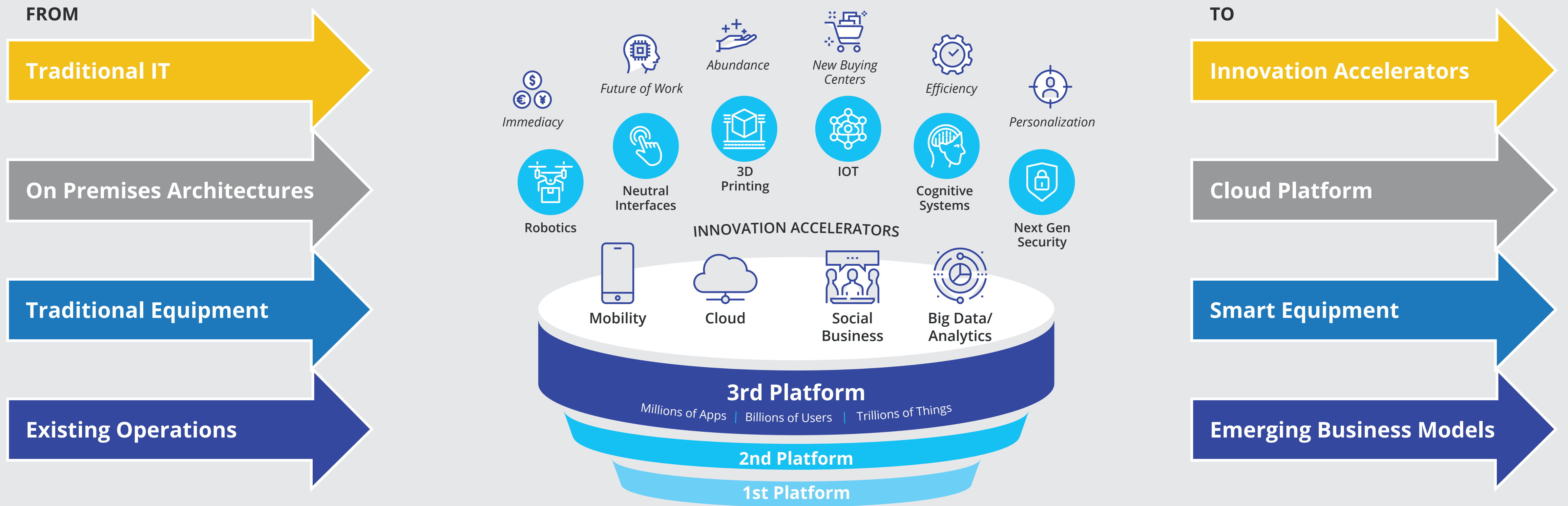**This entails mastering the following elements:**

- The ability to communicate rapidly with customer about the status of any order (Pervasive visibility)

- The ability to run automatic, machine-based proactive replenishments to guarantee product delivery and esure long-term relationships with key customers

- Using the information coming from production machines to understand the production status and anticipate possible issues such as expected breakdowns, quality issues, delays in delivery.

Source: OpenText 2021

Intelligent and Connected Manufacturing Directions Enable Smart Manufacturing

Ultimately, the move to smart manufacturing requires movement along multiple dimensions and enterprise information management is tracking these to become a modern state-of-the-art digital backbone for the smart manufacturer.

Investments around the 3rd platform, which is cloud-centric, have been a business imperative in recent years. These investments now pave the way for future innovation and set the stage for a smooth transition to the 4th Platform, which is based on cognitive and AI-based operations.

FROM

Traditional IT

On Premises Architectures

Traditional Equipment

Existing Operations

TO

Innovation Accelerators

Cloud Platform

Smart Equipment

Emerging Business Models

Immediacy

Future of Work

Abundance

New Buying Centers

Efficiency

Personalization

Robotics

Neutral Interfaces

3D Printing

IOT

Cognitive Systems

Next Gen Security

INNOVATION ACCELERATORS

Mobility

Cloud

Social Business

Big Data/ Analytics

3rd Platform
Millions of Apps | Billions of Users | Trillions of Things

2nd Platform

1st Platform

Artifical Intelligence is Going To Revolutionize The Way Information Is Analyzed

Manufacturers need to equip their workforce with technologies that create visibility, seamless data flow and offer real-time insights. AI and Machine Learning technologies play the role of the "brain" that are able to process in high volumes, variety and velocity the information, coming from the processes (and exponentially augmented by data produced by ubiquitous sensors).

To this end, companies should focus on acquiring a way to make sense of the corporate information by enabling the following three capabilities.

01
Decision Automation

○ **Conditional Decision Automation (Automating Decision-Making Process)** – This automation provides rapid identification and response for well-known and slow-to-change conditions across a variety of processes, including IoT and production health monitoring.

○ **Algorithmic Decision Automation (Creating Decision Support Tool)** – This automation provides the business benefit of rapidly predicting upcoming problems or immediate opportunities where conditions change continuously and data is highly variable, including IoT use cases, real-time promotions, quality controls, and inventory outage predictions.
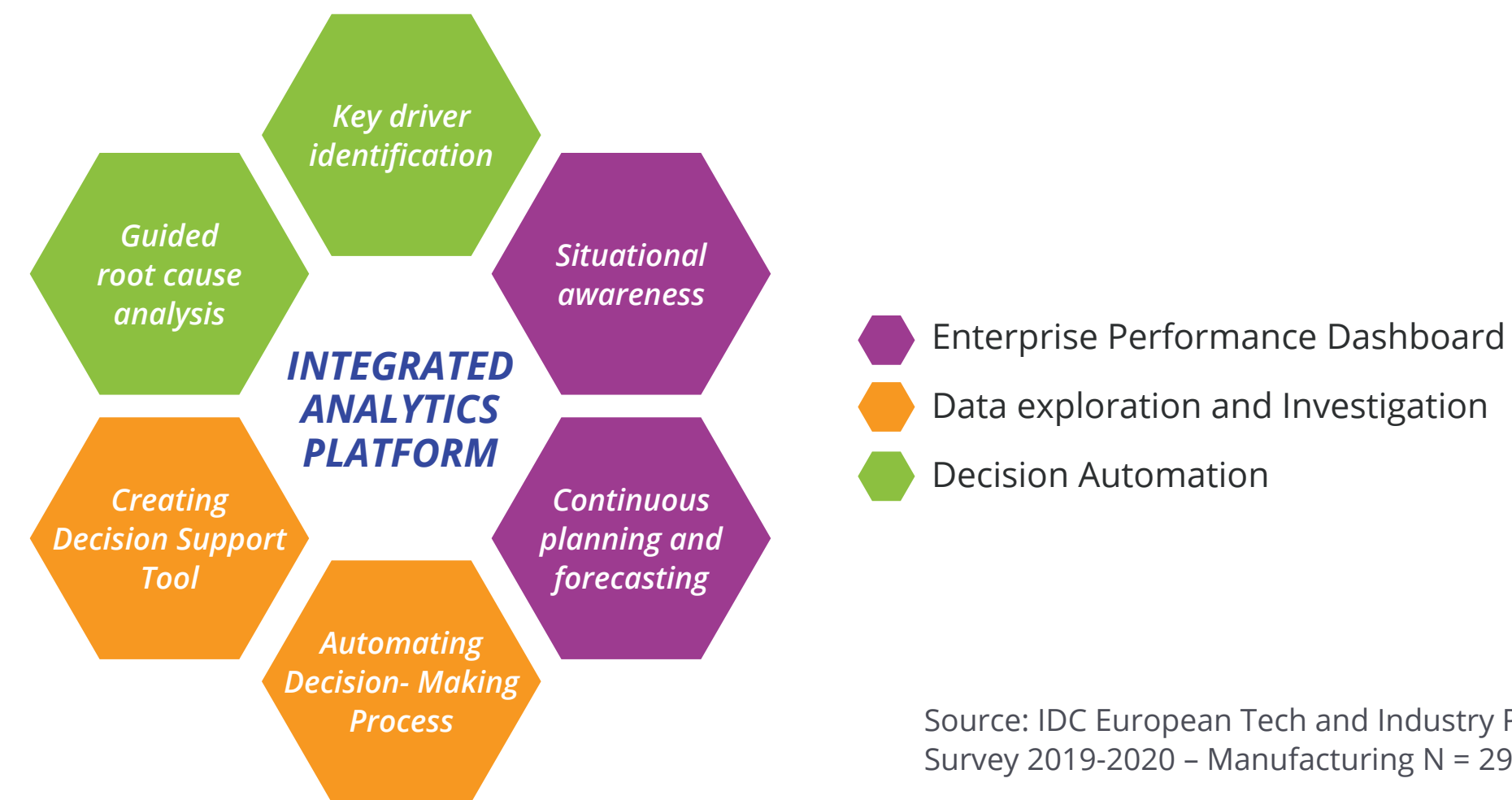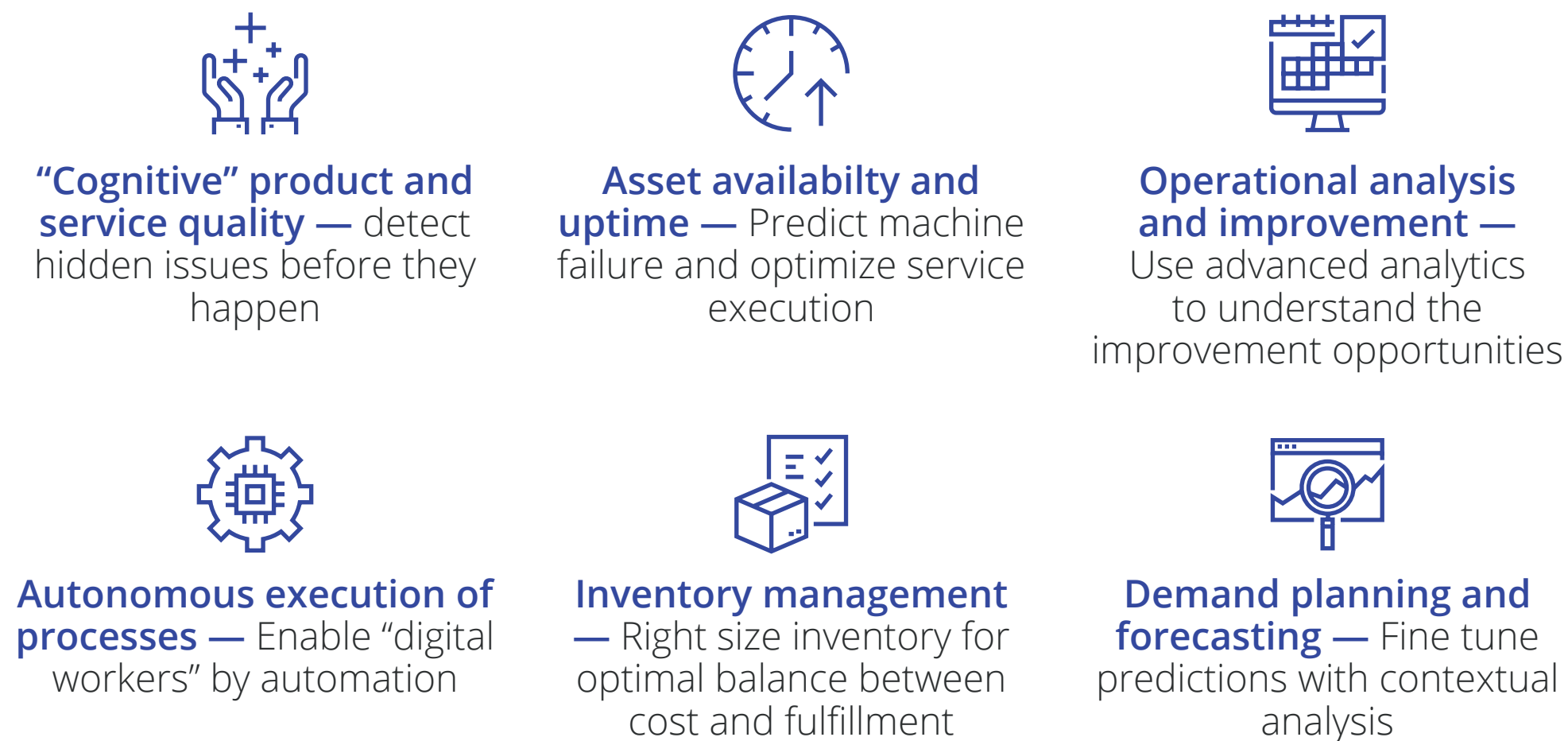
02
Enterprise Performance Dashboard

○ **Continuous planning and forecasting –** This is the ability of using the most recent available data across the organization for on-going forecasting process.

○ **Situational awareness** – It provides capabilities for instant access or notification of the current state of the enterprise based on real-time internal and external data contextualized by human expertise.

03
Data exploration and Investigation

○ **Key driver identification** – It provides decision support capabilities that not only identify what happened but also provide information on why it happened and what can be done about it.

○ **Guided root cause analysis** It provides decision support capabilities via automation to understand why something happened without requiring users to spend endless hours on manual data crunching activities.
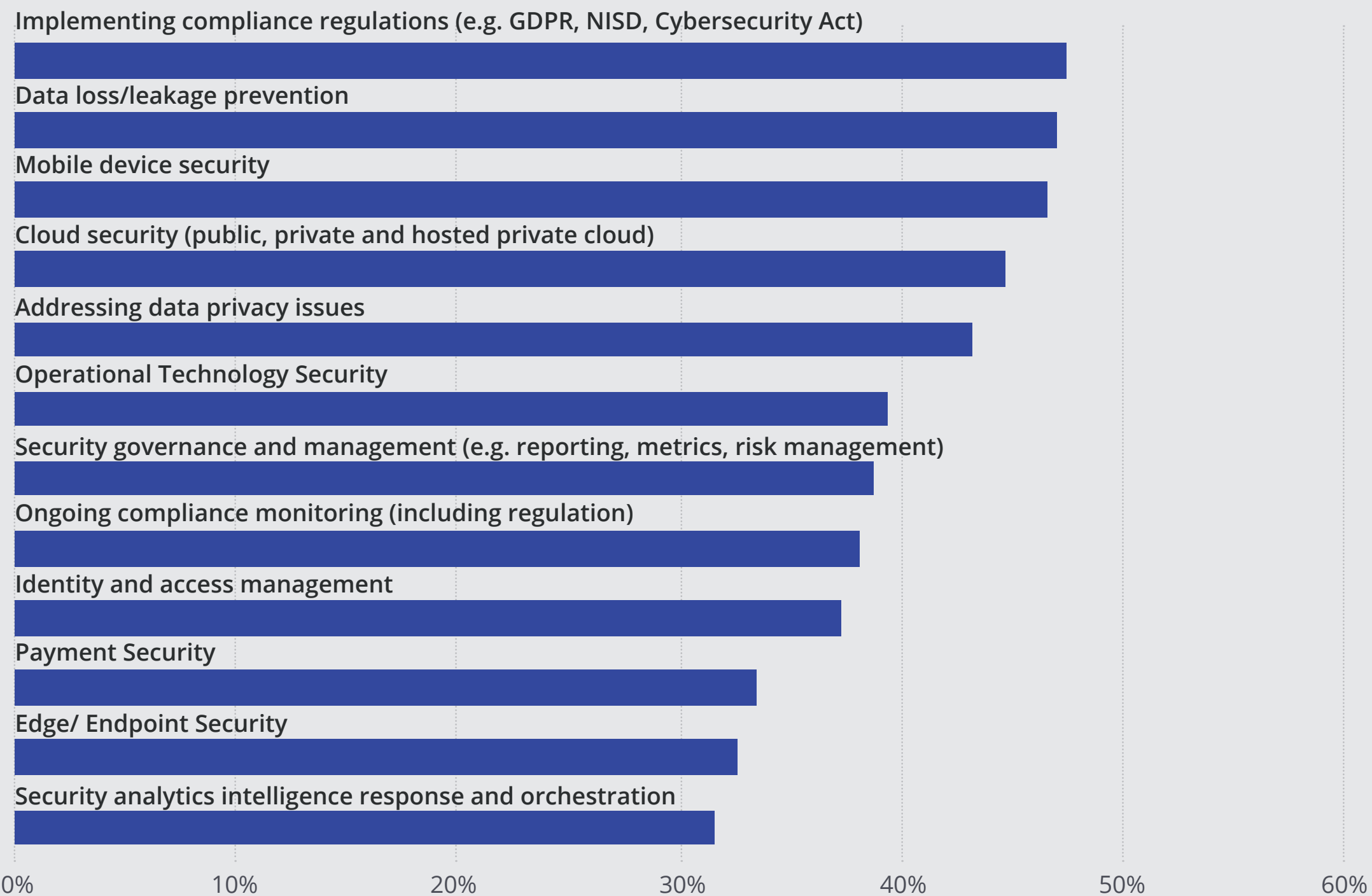
KEY USE CASES and VALUE OPPORTUNITIES

"Cognitive" product and service quality — detect hidden issues before they happen

Asset availabilty and uptime — Predict machine failure and optimize service execution

Operational analysis and improvement — Use advanced analytics to understand the improvement opportunities

Autonomous execution of processes — Enable "digital workers" by automation

Inventory management — Right size inventory for optimal balance between cost and fulfillment

Demand planning and forecasting — Fine tune predictions with contextual analysis

INTEGRATED ANALYTICS PLATFORM

- Key driver identification
- Situational awareness
- Guided root cause analysis
- Continuous planning and forecasting
- Creating Decision Support Tool
- Automating Decision- Making Process

● Enterprise Performance Dashboard
● Data exploration and Investigation
● Decision Automation

Source: IDC European Tech and Industry Pulse Survey 2019-2020 – Manufacturing N = 290

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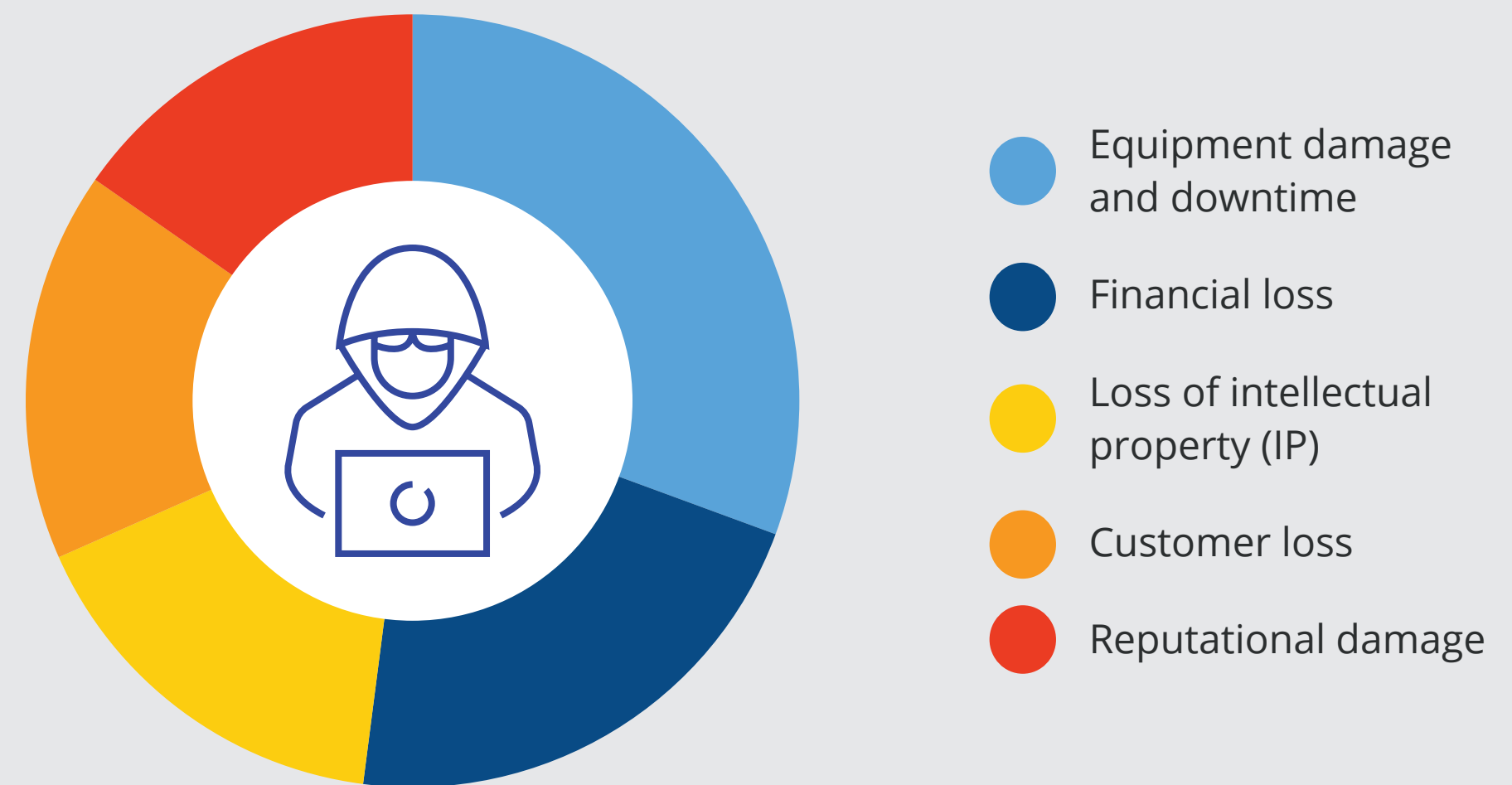# Cyber Security Has Direct Business Impact

Manufacturing companies worldwide are involved in a number of initiatives aimed at making their organizations better able to cope with the challenges of digital transformation.

Implementing compliance regulations (e.g. GDPR, NISD, Cybersecurity Act)

Data loss/leakage prevention

Mobile device security

Cloud security (public, private and hosted private cloud)

Addressing data privacy issues

Operational Technology Security

Security governance and management (e.g. reporting, metrics, risk management)

Ongoing compliance monitoring (including regulation)

Identity and access management

Payment Security

Edge/ Endpoint Security

Security analytics intelligence response and orchestration

0%   10%   20%   30%   40%   50%   60%

Manufacturers see operational loss as being their greater concern regarding a security attack. Effective management of cybersecurity has a direct business impact that cannot be underestimated.
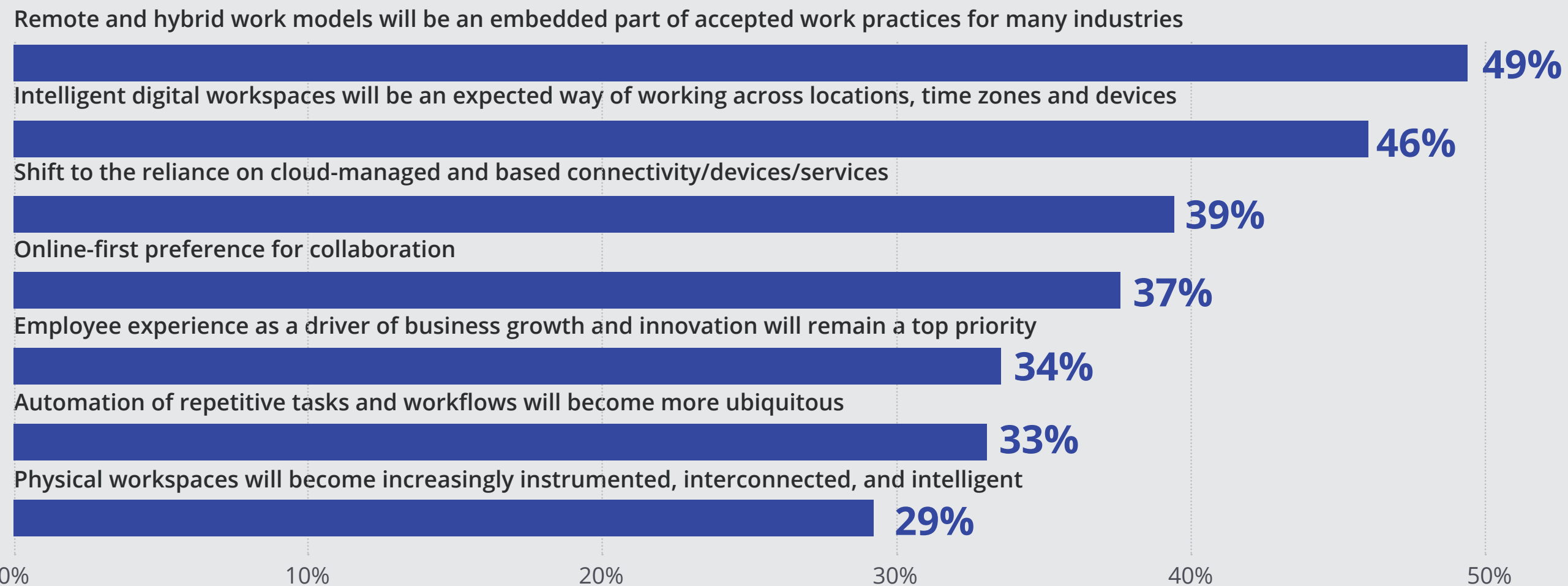
What is your organization's greatest concern regarding a security attack?

- Equipment damage and downtime
- Financial loss
- Loss of intellectual property (IP)
- Customer loss
- Reputational damage

New changes to the work models are here to stay

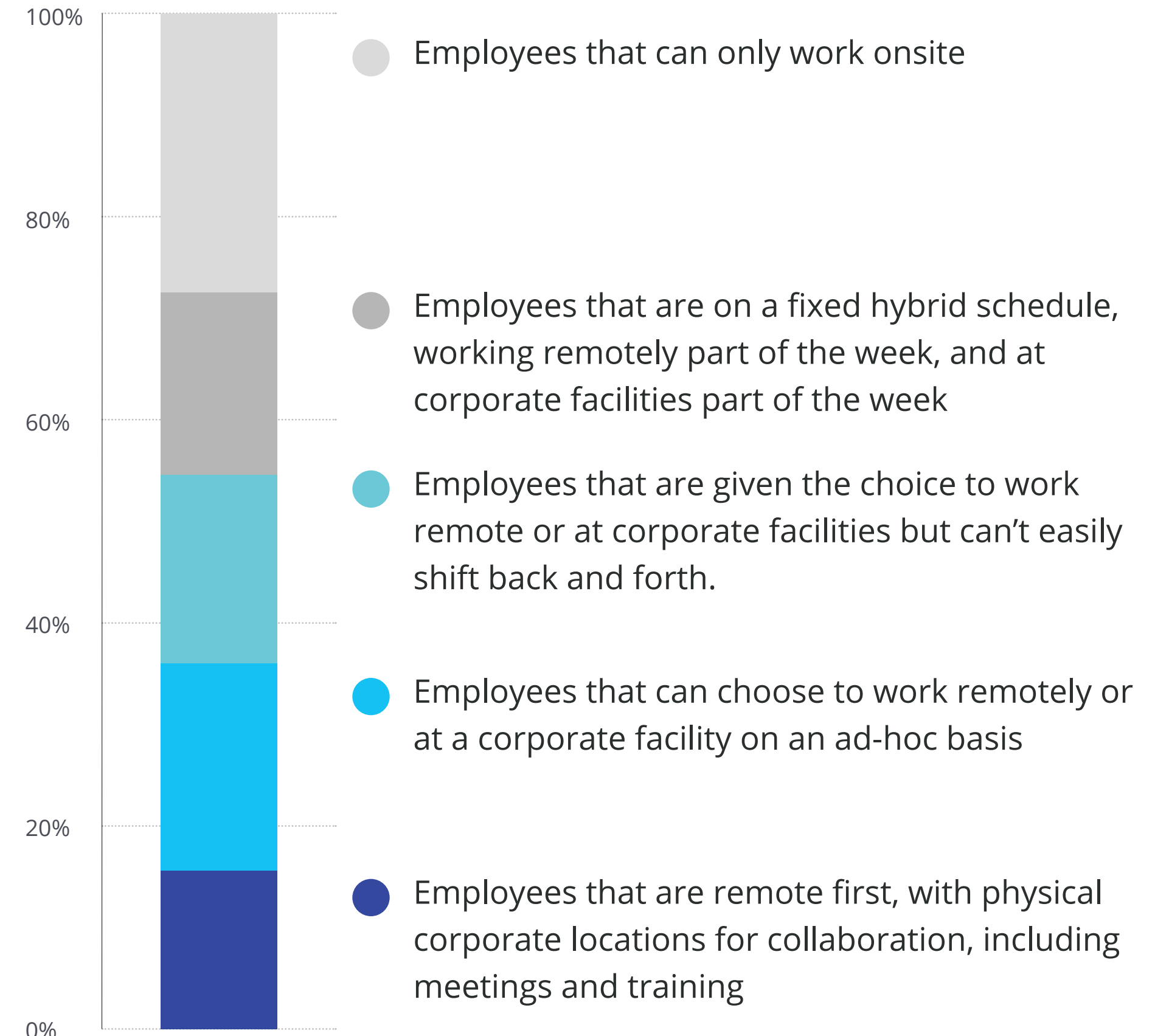**Q. In your opinion, which work practices and technology advances emerging from the pandemic are most likely to endure?**

Remote and hybrid work models will be an embedded part of accepted work practices for many industries
49%

Intelligent digital workspaces will be an expected way of working across locations, time zones and devices
46%

Shift to the reliance on cloud-managed and based connectivity/devices/services
39%

Online-first preference for collaboration
37%

Employee experience as a driver of business growth and innovation will remain a top priority
34%

Automation of repetitive tasks and workflows will become more ubiquitous
33%

Physical workspaces will become increasingly instrumented, interconnected, and intelligent
29%

0% 10% 20% 30% 40% 50%

To ensure the health and safety of front-line employees who must be on-site manufacturers need to communicate a change plan to minimize the proliferation of needless risks and provide guidance on how they can protect themselves.

At the same time, hybrid workplace models are creating new challenges around how to make sure lines of communications are not broken among distant workers and that the continuous change of workplace does not disrupt the core innovation delivery and operational process.

Q. By 2022, how do you expect your workforce to be working?

Employees that can only work onsite

Employees that are on a fixed hybrid schedule, working remotely part of the week, and at corporate facilities part of the week

Employees that are given the choice to work remote or at corporate facilities but can't easily shift back and forth.

Employees that can choose to work remotely or at a corporate facility on an ad-hoc basis

Employees that are remote first, with physical corporate locations for collaboration, including meetings and training

Essential Guidance

Being a digital company is more than having the right technologies.

○ Manufacturers are on the verge of a revolution in the way they use information. Everybody will need to access information through cloud, mobile tools and even wearables. Be aware: the more information that is available, the more it will be requested by shop floor users and other business units.

○ Users will want a continuous stream of information from integrated applications. In order to be relevant to the business, CIOs will need to find a way to bridge the gaps between business applications as well as to continuously update existing applications for the latest and greatest functionality.

○ Make sure you have the necessary technical and organizational foundation for smart manufacturing in place before starting the initiatives, specifically looking at how IT/OT functions need to be integrated.

Information management impacts every manufacturing process. Companies need end-to-end information management tools and Concepts.

○ Enterprise applications, content and document management, master data management, and IoT will converge to create this integrated information and process flow across the ecosystem.

○ Carefully plan the transformation steps to avoid delays. Before achieving seamless, real-time, and bidirectional data and information flows, there will be many changes and disruptions to roles and processes.

○ Consider the concrete outcomes to be a higher priority than eliminating information silos. Every piece of information has to be delivered to multiple audiences, inside and outside the organization, with the right script and context around it.

Manufacturing organizations must look to implement an integrated governance model — this will be the norm within 5 years

○ Clearly define the value that is sought through the adoption of modern technologies. Relevant business cases must be sold throughout the manufacturing organization, starting from the plant floor.

○ The fundamentals of a smart manufacturing initiative will require secure plant floor connectivity – for IP equipment and mobile devices, analytic capabilities (either in-house or sourced), robotic skills (hardware & software), system integration from shop floor to top floor and possibly customer to supplier, and IT/OT integration.

○ An evolving and ever-tightening regulatory and IT security environment must also be considered. Business and IT must work together — it's too important to be left to IT alone.

Bottom Line   Every company has to learn that new technology in an old organization just makes the old organization more expensive.

Asset Intelligence for Manufacturing from OpenText

Asset Intelligence for Manufacturing from OpenText(TM) helps organizations reduce asset loss, improve logistics and increase manufacturing efficiency.

Learn more

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