

Data-Driven Transformation of Factory Operations

How to Master Digitalization on the Shop Floor in an Era of Versatile Challenges

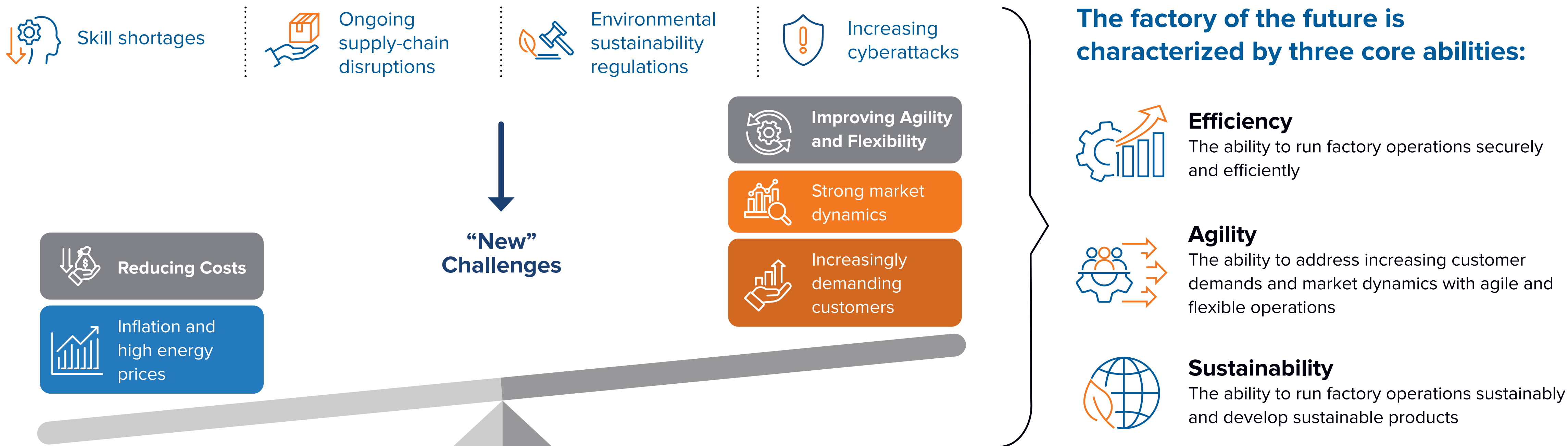


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Manufacturers must address “new” challenges in addition to balancing cost reduction goals and improving agility and flexibility.



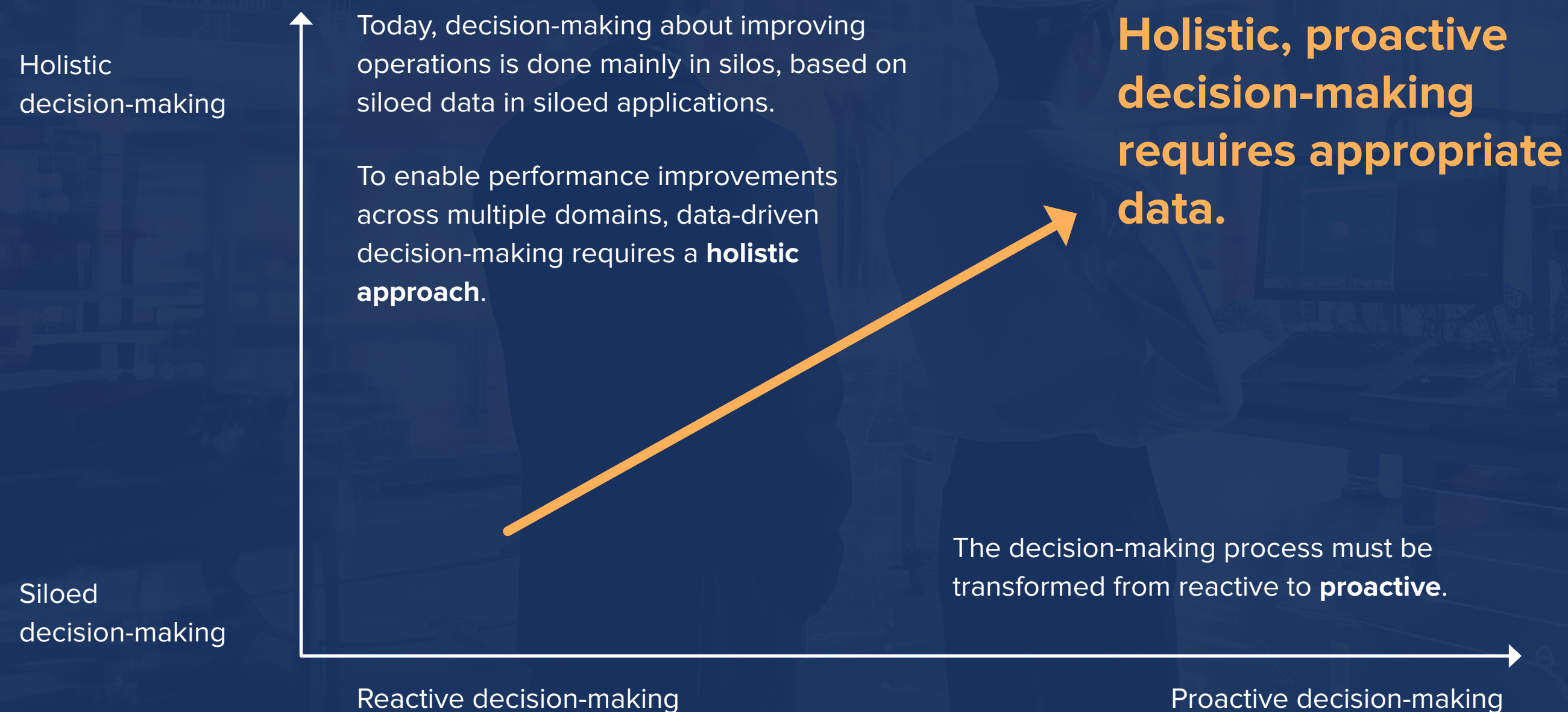
As challenges are adding up, end-to-end visibility becomes critical across all operations – from the shop floor to the top floor

Existing factories are not designed for mastering today’s versatile set of challenges. They lack full transparency and the data required – from the shop floor to the top floor – to transform factory operations and make them efficient, agile, and sustainable. This is amplified by manufacturers operating a **network of factories** with distributed production operations across multiple plants in different geographies (also due to multi-shoring sourcing strategies); this situation is prone to inefficiencies.

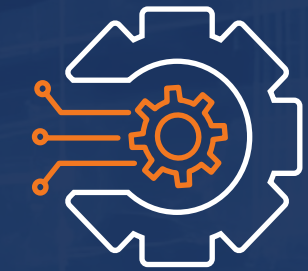
Transforming factory operations requires transforming decision-making through an approach based on data and digitalization.



To overcome numerous variable challenges, decision-making about improving factory operations and related KPIs must be transformed into a holistic, proactive process.



Digitalization is a major enabler of holistic performance improvement, because it:



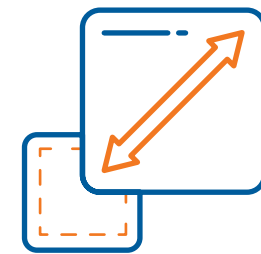
- Helps to utilize data for decision-making much better than before through the use of appropriate technologies to capture, manage, contextualize, and analyze and visualize data from multiple sources
- Enables data-driven, holistic, and proactive decision-making

However, digitalization projects are often stuck in proof-of-concept mode, with an unclear ROI or a lack of willingness among workers to support change; in some cases, insufficient cybersecurity concepts prevent factories from successfully transforming into factories of the future that can master all challenges.

To make digitalization a success, manufacturers must consider the three imperatives: **impact, scale, and trust**.

The Three Key Imperatives for the Successful Digital Transformation of Factory Operations

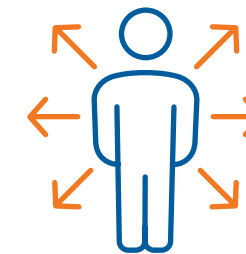
Scale



Digital transformation initiatives need to enable scalable KPI improvements.

This requires a data management approach which supports scalable KPI improvements from asset level to the factory network and which is based on scalable IT infrastructures and solutions.

Impact



To achieve impact, digital transformation initiatives on the shop floor must deliver business benefits and enable measurable KPI improvements.

This requires holistic, proactive, data-driven decision-making.

Trust

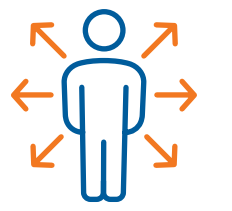


Digital transformation initiatives must support trust among all relevant stakeholders in the enterprise and ecosystem.

This includes the factory, which should become a trusted enterprise member, a trusted supplier for customers, a trusted ecosystem partner, a trusted employer, and a positive contributor to society.

To master digitalization on the shop floor in an era of versatile challenges, these three imperatives **must** be considered equally, otherwise factory digitalization will be unsuccessful in the long term.

Digital transformation initiatives must deliver business benefits and enable measurable KPI improvements, but they require the right data.



Impact

Measurable KPI improvements can relate to:



Improving overall equipment effectiveness (OEE) (e.g., higher asset availability, higher throughput or lower scrap rates, or quality issues)



Increasing operational agility/flexibility/resilience on the shop floor, warehouse, or in the supply chain (e.g., higher order fulfillment rates)



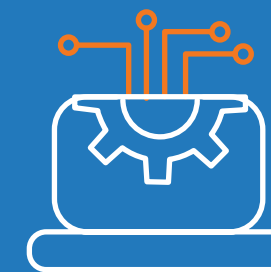
Improving ESG metrics (e.g., reduced waste, energy and/or water consumption, product carbon footprint)



Improving worker experience (e.g., fewer health and safety incidents)

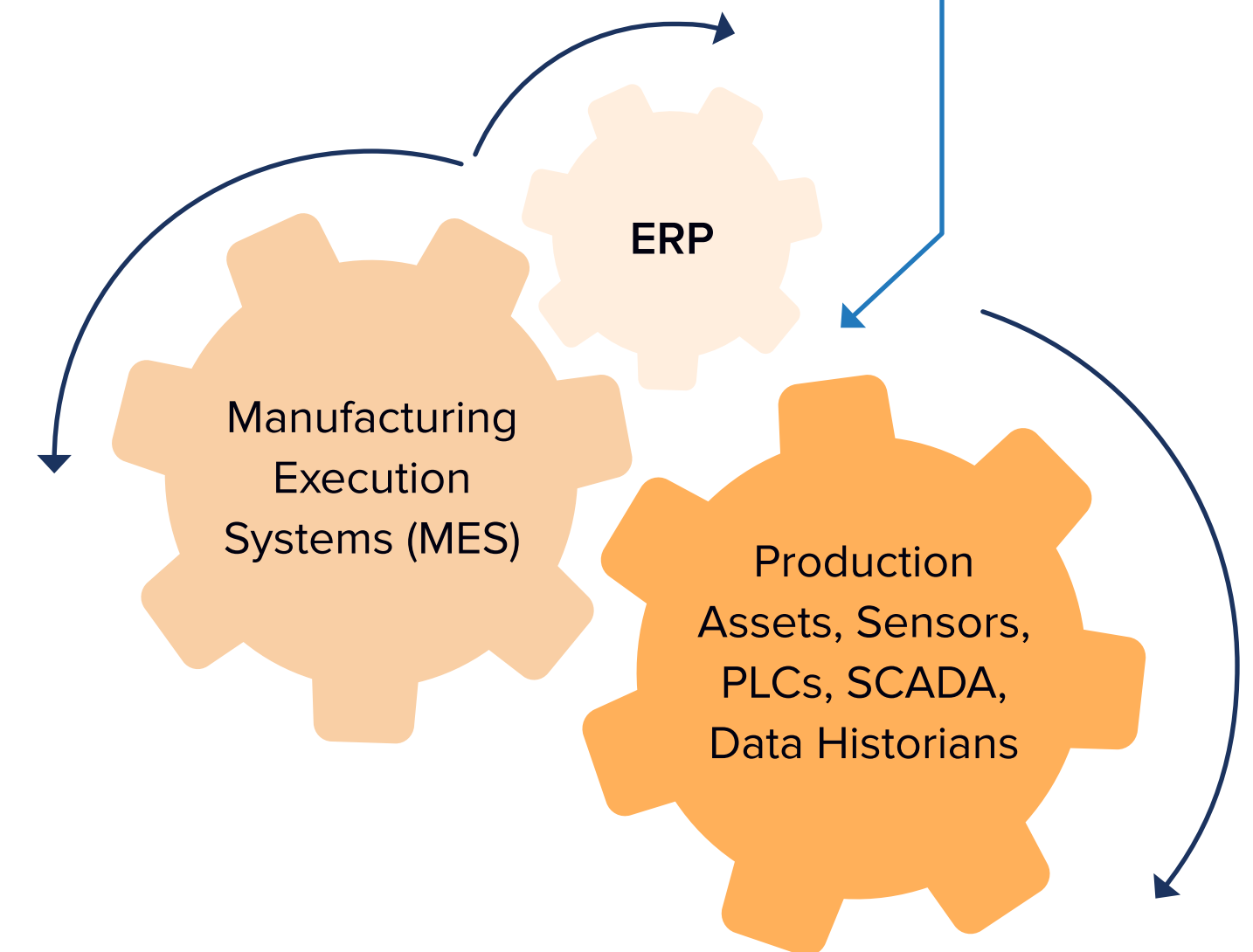
To achieve measurable KPI improvements requires **transparency and end-to-end visibility** across organizations' operations.

This requires the availability and meaningful analysis of relevant data, from the shop floor to the enterprise level.

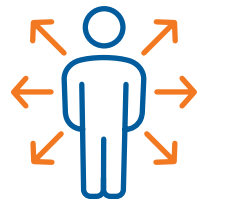


IT/OT integration is the first step in moving data from the single asset level to the enterprise level. This is the foundation for improving the availability of relevant OT data through IT.

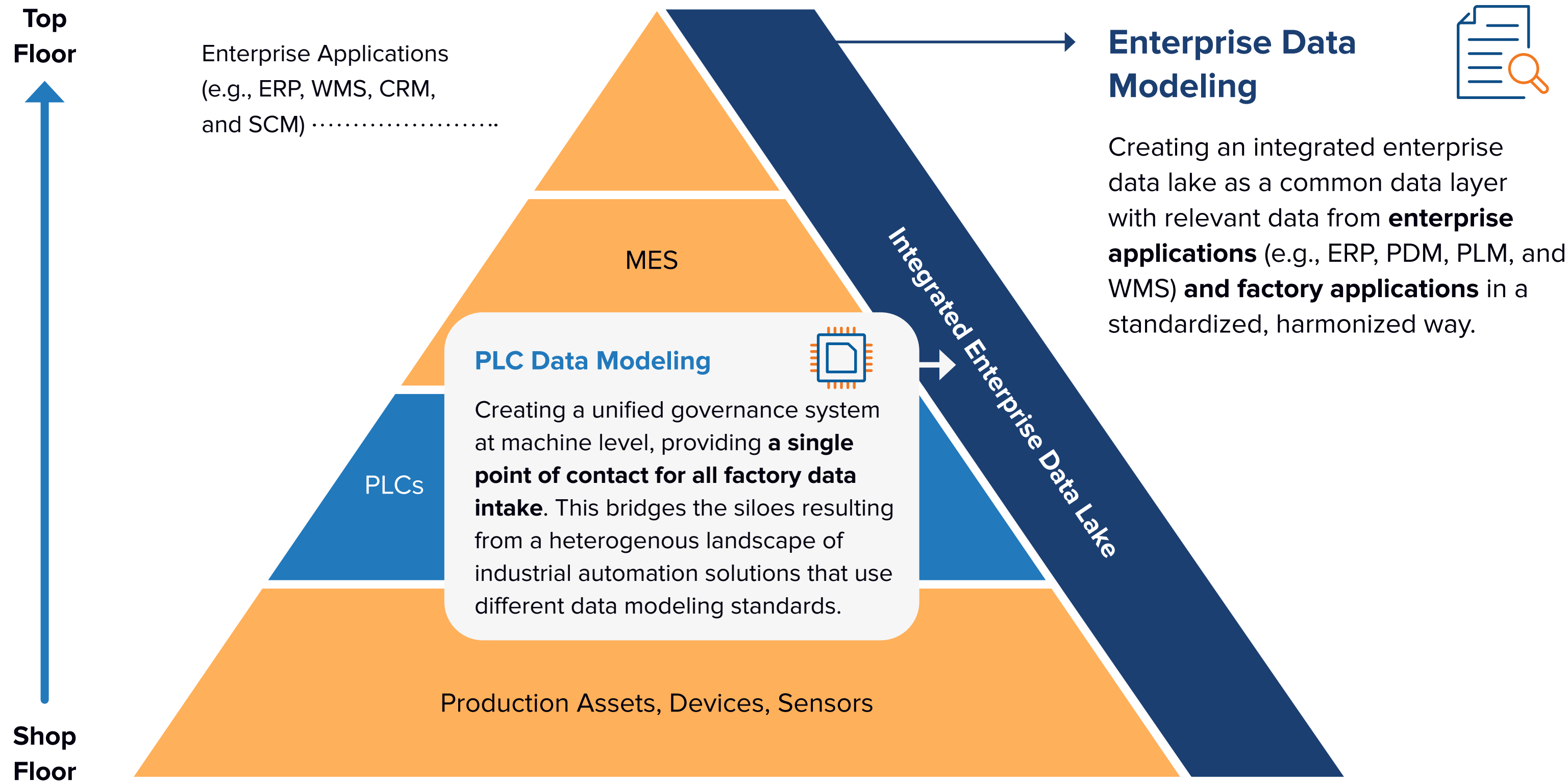
Enterprise
Factory Network
Plant Operations
Production Line
Single Asset



Performance improvements must be holistic, but they require a solid data foundation based on harmonized data modeling, from the shop floor to the top floor.



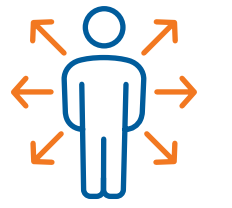
Impact



Benefits of an **integrated enterprise data lake** utilizing a common data model:

- It makes data available to any application, enabling the **analysis of data from multiple domains** and different sources. (e.g., production, sales, and warehouse) as a basis for improvements.
- It allows **holistic, data-driven decision-making** aimed at KPI improvements across multiple domains rather than only siloed improvements in selected domains.
- It allows the execution of new data-driven use cases, as **data can be added to the data lake as needed**.

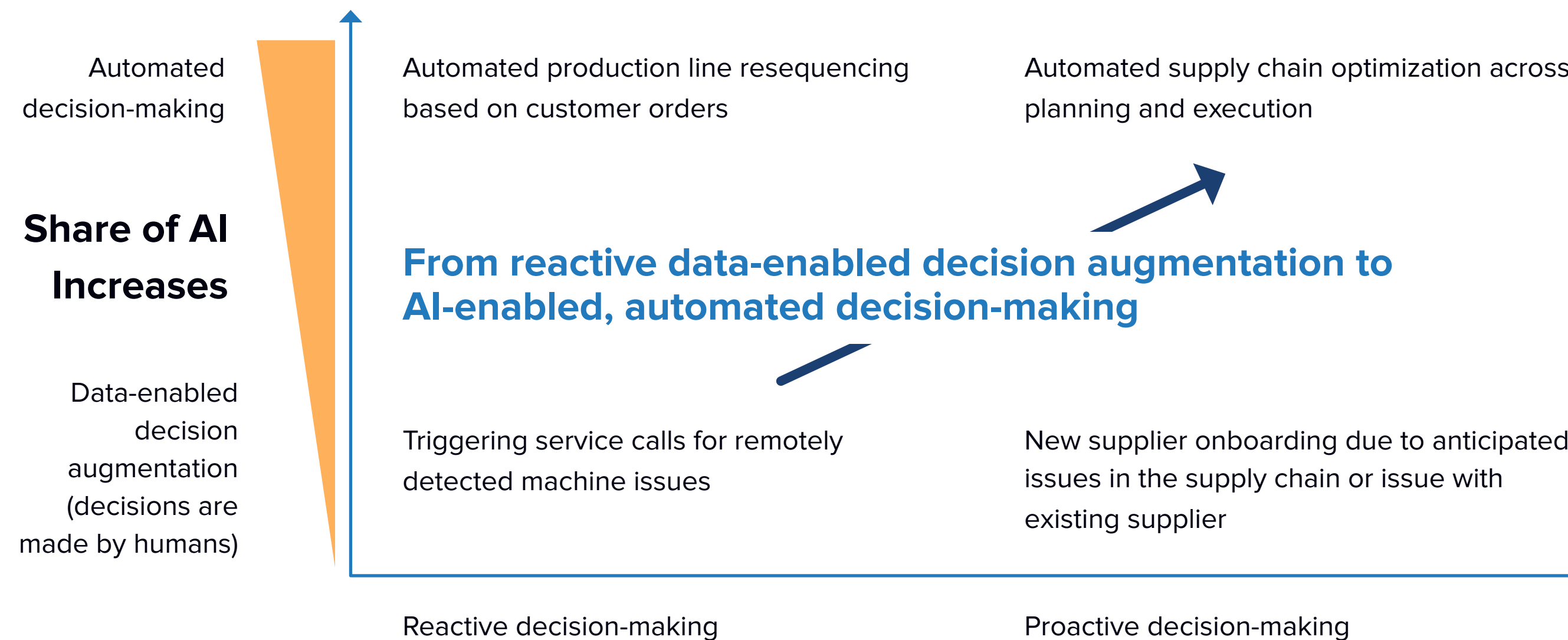
The factory of the future requires holistic, proactive, data-driven decision-making — which is automated and enabled by AI.



Impact

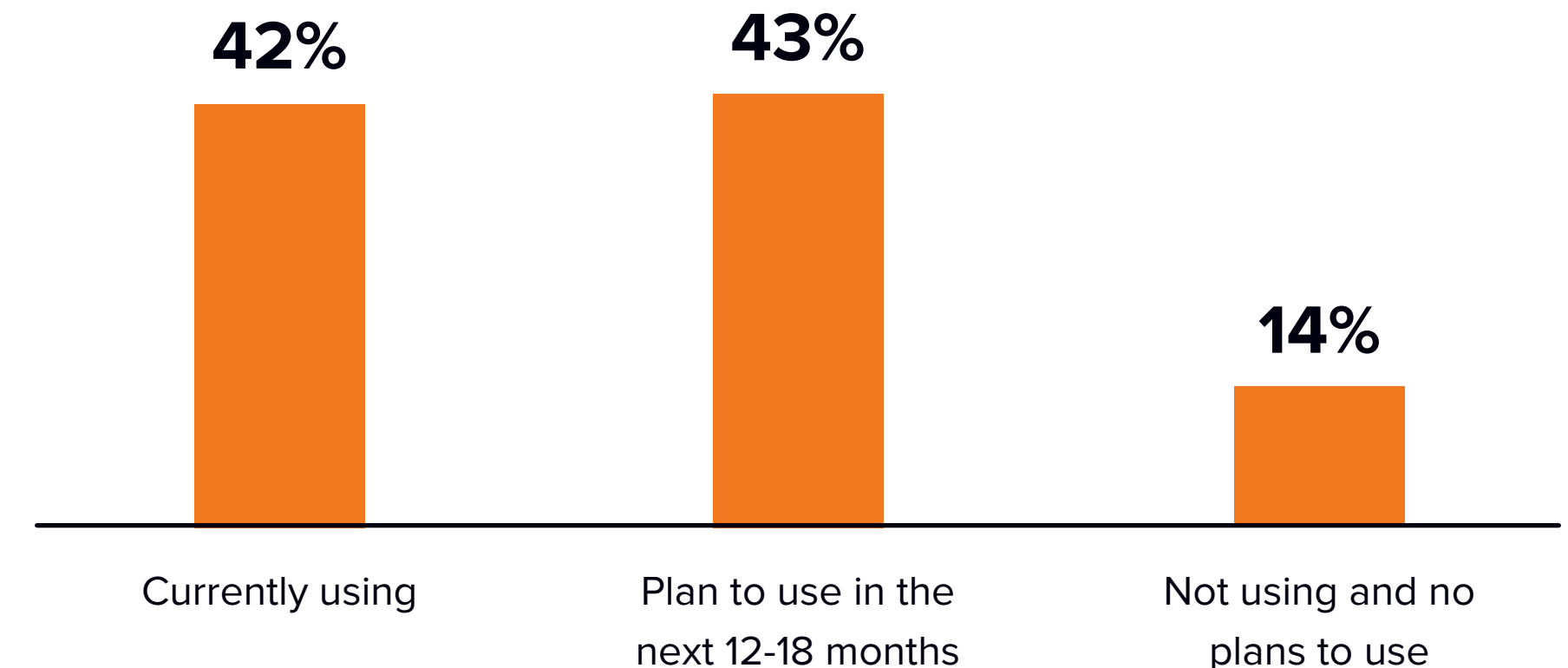
 To enable agile, flexible factory operations, the speed and quality of decision-making must be improved. This can be achieved through an AI-enabled, automated decision-making process.

Examples of Use Cases Aimed at Improving Factory Operation Performance

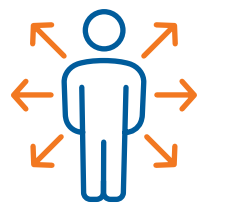


The larger and more comprehensive the data foundation (e.g., integrated enterprise data lakes), the better AI can be used for holistic automated decision-making; this, in turn, will drive further adoption of AI.

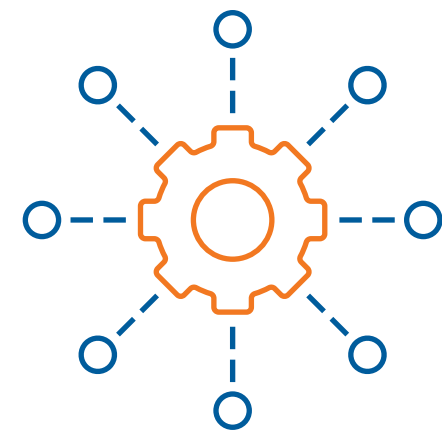
AI Adoption Plans to Support Digital Transformation Initiatives on the Shop Floor



To achieve holistic optimization, challenges related to improving data availability across the factory must be addressed.



Impact



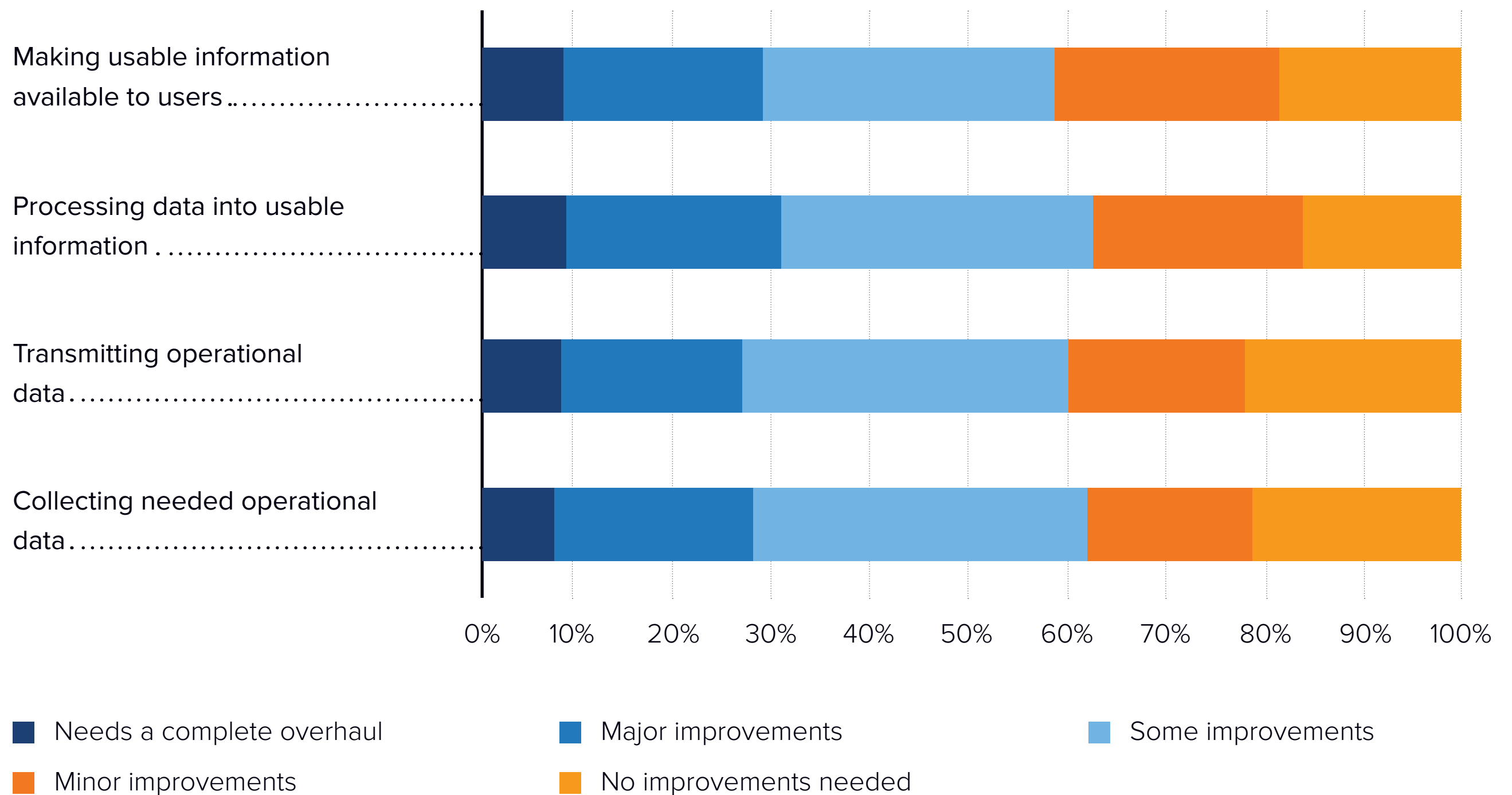
Only **53%** of production assets are instrumented and integrated into a network. The reasons for this are security-related concerns, legacy OT

equipment, a lack of staff commitment, or a lack of required skills.

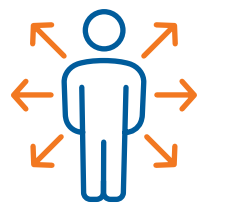
Shop floor operations are often improved in siloes, instead of holistically improving operations across the factory and the factory network.

This is due to various automation solutions from various providers typically being used in shop floor operations. As they use different data models, achieving end-to-end visibility through holistic optimization becomes challenging.

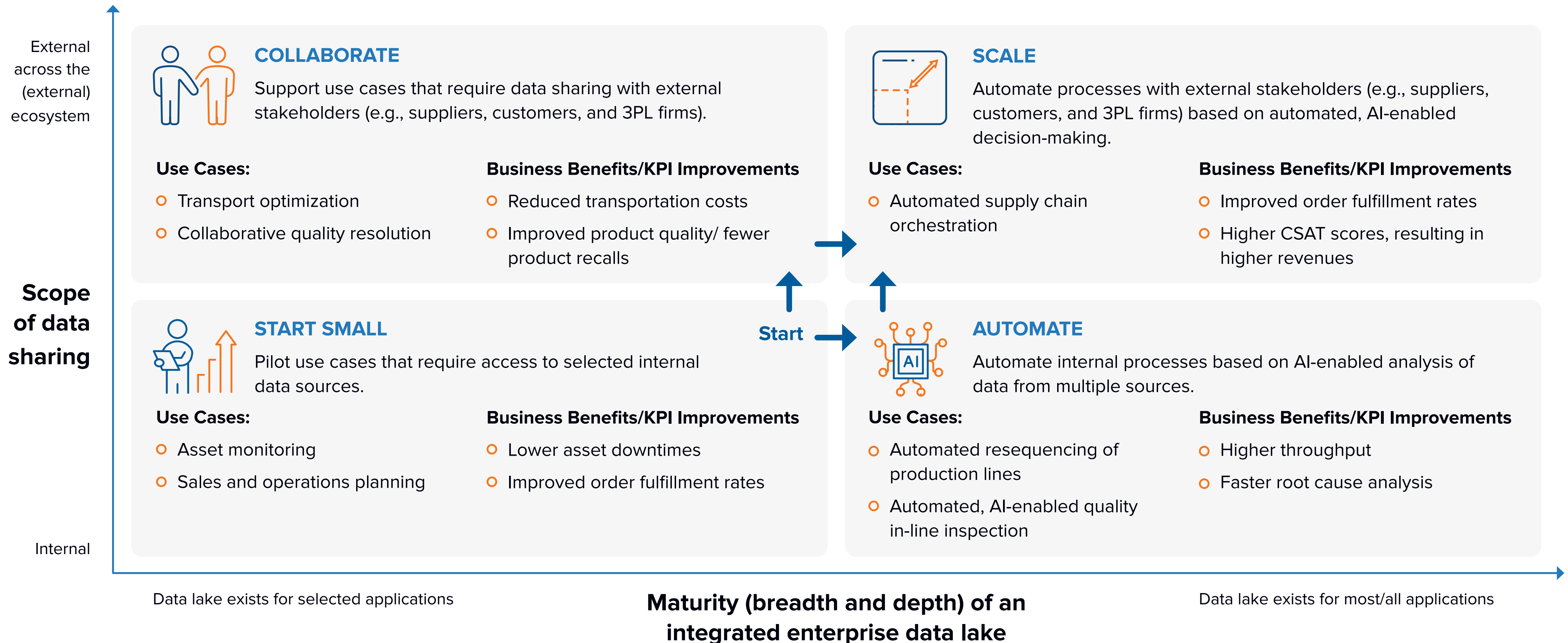
According to IDC research, much **room for improvement remains in terms of how organizations handle data** — from collecting, transmitting, and processing data to making data accessible to the relevant users.



Increased data can result in KPI improvements, impacted by data lake maturity (breadth and depth).



Impact



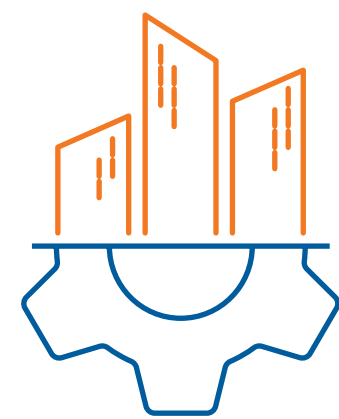
The factory of the future has a harmonized operational architecture and is supported by cloud-based data management strategies.



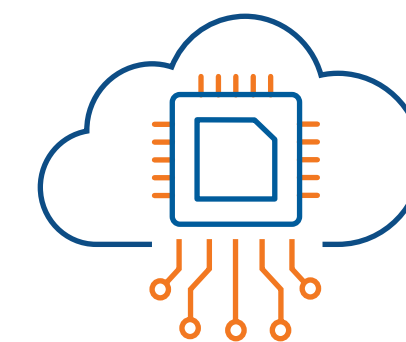
Scale

The factory of the future requires a modular approach that supports scaling toward a harmonized operational architecture.

Data management strategies with cloud-based IT infrastructures and applications as a foundation.



Robust and resilient microservices architectures based on harmonized factory operations, which are close to standard across the entire factory network, will allow the numerous site operations to be in sync and provide the capabilities to adapt in an agile way to changing market conditions, new business environments, and emerging and maturing technology improvements.



Cloud-based approaches are gaining ground among manufacturing organizations. However, organizations' focus has shifted to cloud economics. Initiatives are aimed at enabling better scalability of multi-cloud and hybrid cloud environments, including containerization, to better manage workloads in cloud environments.

Benefits:

- Enabling the scalability and benchmarking of KPI improvements (e.g., cost savings) through increased transparency across multiple production lines or networked factory operations
- Enabling a single, central point of responsibility for managing and running harmonized factory operations

Benefits:

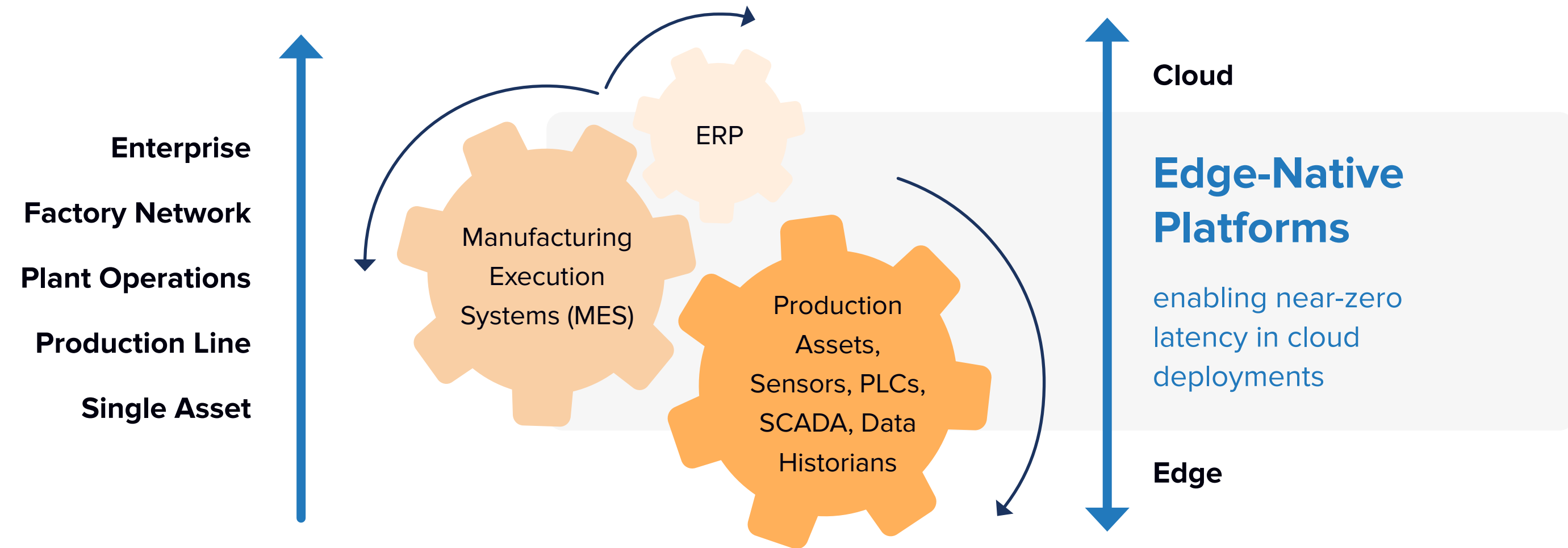
- Operational data from the shop floor can be harmonized and made accessible by transferring it to cloud-based data lakes, making it accessible to any application (e.g., for data analysis or visualization).
- Cloud-based data lakes can continuously be extended and linked with data from further domains to execute new data-driven use cases aimed at improving operations and KPIs.

Better leveraging the value of operational data from the factory floor requires a frictionless flow of data across edge, cloud, and core data center locations.



Scale

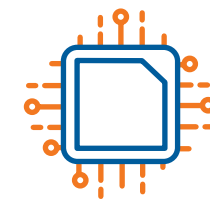
“By 2026, organizations that have embraced edge-native platforms will extract 3x more value from data and deploy projects 4x faster than those with traditional core, edge, and cloud resources.”



58%

of manufacturers are currently utilizing edge-to-cloud solutions and architectures, while another 30% are planning to deploy such solutions within the next 18 months.

Drivers of Investment in Edge-to-Cloud Architectures



AI: Manufacturers will increasingly require edge-to-cloud architectures to accommodate both AI-based use cases that require inferencing at the edge and more critical workloads that require high availability at the edge.



Cybersecurity: Cloud technologies enable standardization and automatization to eliminate or reduce silos, thus bolstering security. An edge-to-cloud architecture also simplifies the implementation of additional redundancy and backup, thereby decreasing liability, with the agreed SLAs also playing a role.

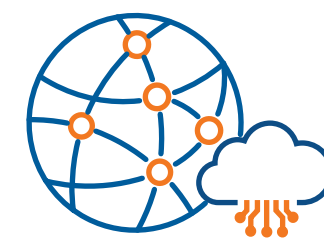
Manufacturers are investing in cloud and IIoT. However, room for improvement remains in terms of leveraging the value of operational data from the factory floor.



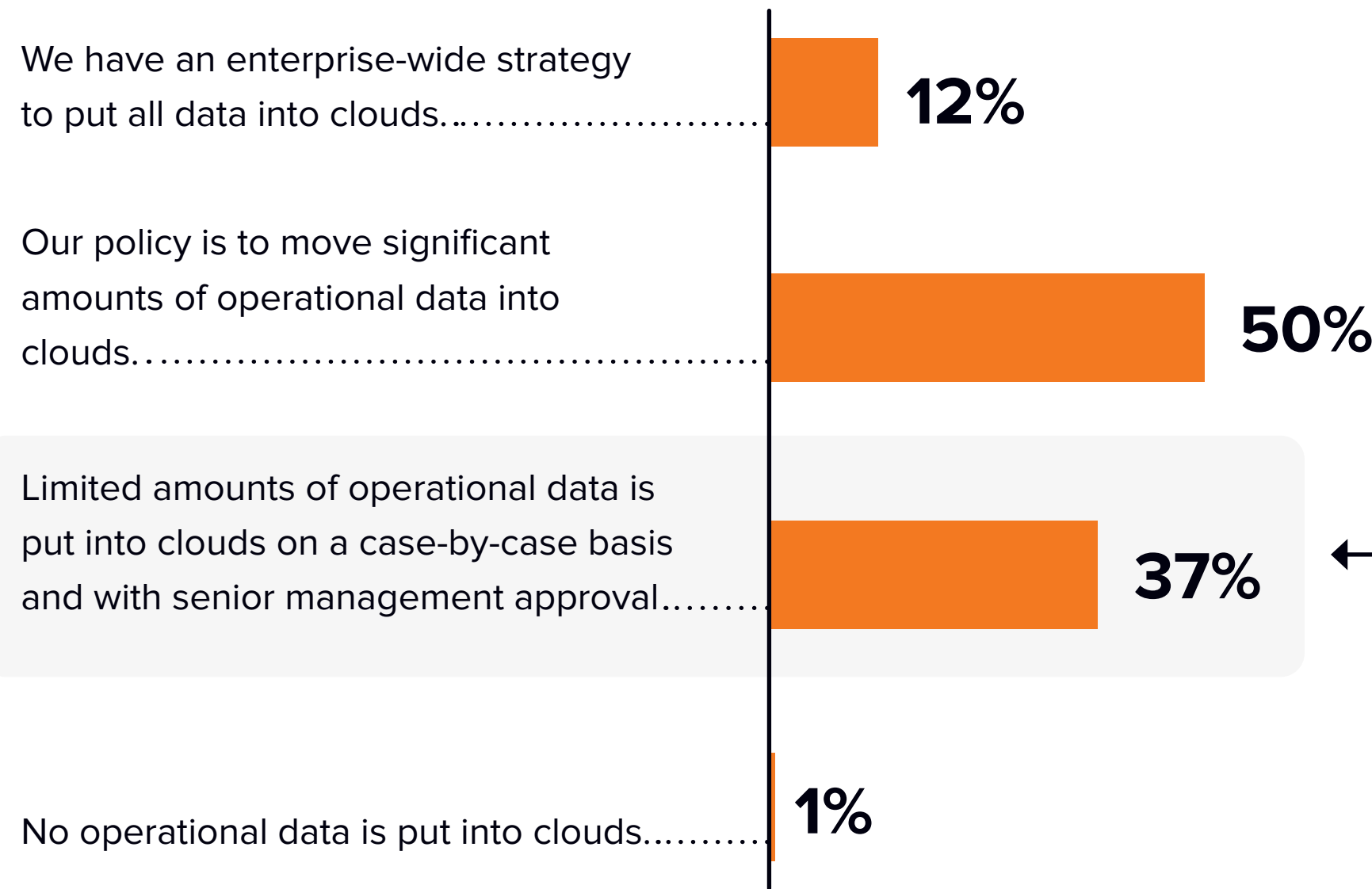
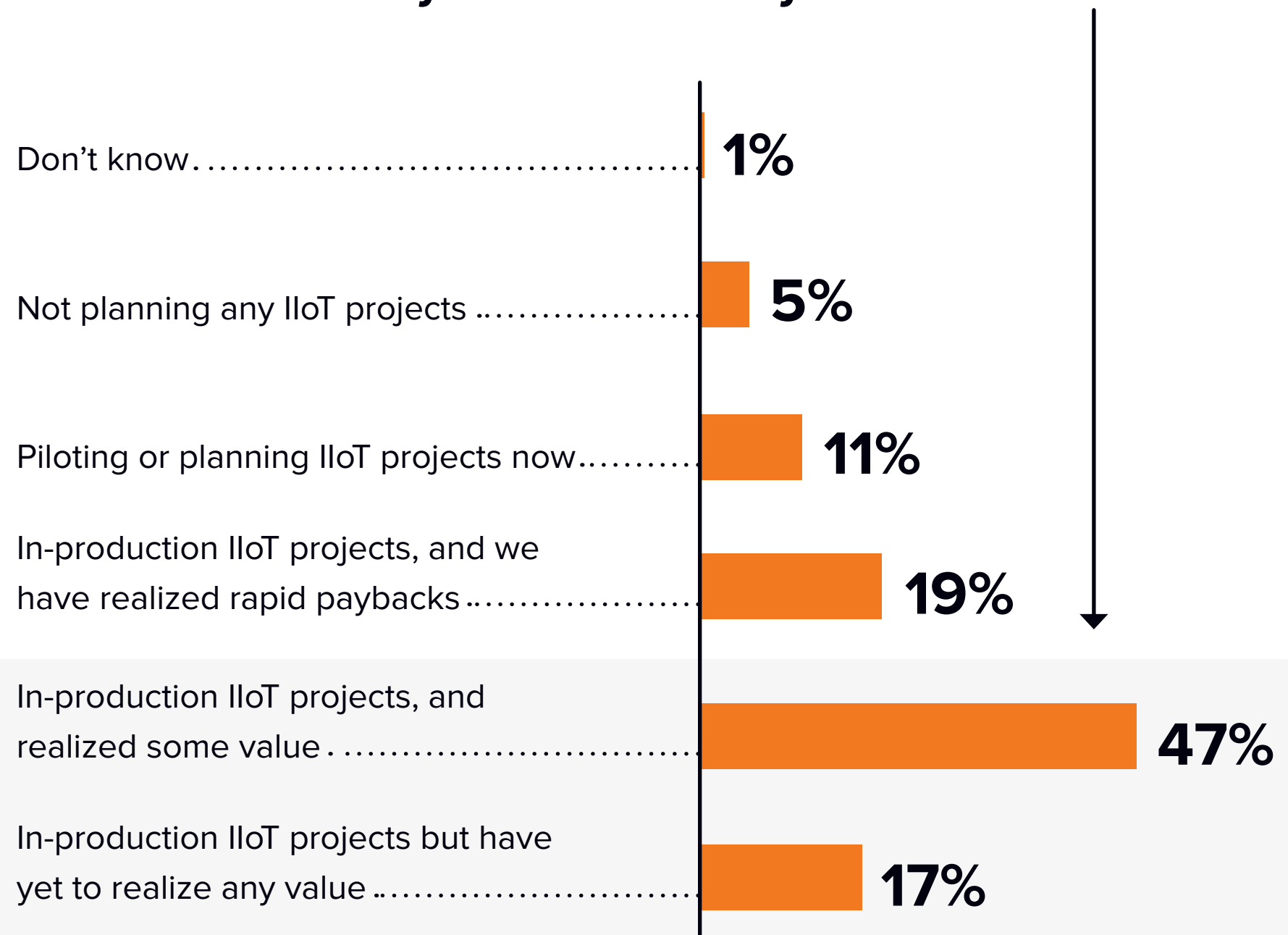
Scale



64% of manufacturers worldwide with in-production IIoT projects have realized only some value or have yet to realize any value.



37% of manufacturers worldwide are still moving operational data to the cloud (outside the corporate firewall) on a case-by-case basis only.



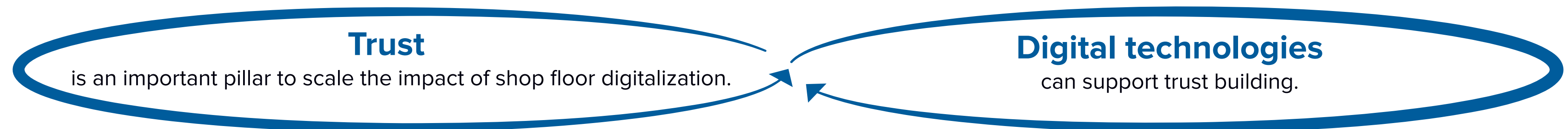
Improved levels of trust are required to realize the full potential of shop floor digitalization initiatives and to scale improvements across the enterprise and wider ecosystem.

The factory of the future will require trust – supported by digital technologies – among all relevant stakeholders in the enterprise and ecosystem.



Trust

A manufacturing organization needs to be:



Examples:



A trusted supplier

- Ensuring compliance with regulations (e.g., ESG-related, NIS2)
- Protecting against counterfeiting
- Ensuring the reliability of agreed order fulfillment to guarantee high levels of customer experience



A trusted enterprise member

- Ensuring agile, resilient factory operations to avoid customer order fulfillment bottlenecks
- Ensuring secure factory operations



A trusted employer

- Providing high levels of employee experience
- Ensuring the health and safety of workers and staff
- Serving a higher purpose than increasing profits and revenues (e.g., by being a positive contributor to society)



A trusted ecosystem partner

- Embracing ecosystem-enabled, value-driven innovation
- Ensuring secure data exchange and data sovereignty within the ecosystem



A trusted sustainability partner

- Meeting its own commitments toward net-zero goals; helping customers do the same

Examples:

- Utilizing IoT, RFID, cloud, blockchain, and other technologies to track and trace products along the supply chain
- Implementing integrated supply chain solutions to improve the resiliency, efficiency, and transparency of supply chain operations

- Implementing appropriate IT/OT cybersecurity concepts and solutions to avoid having to shut down operations due to cyberattacks

- Augmenting workers' skills with digital knowledge tools to bridge gaps
- Enabling collaboration with appropriate workplace solutions
- Enabling secure hybrid workplace concepts to attract new talent and retain existing talent

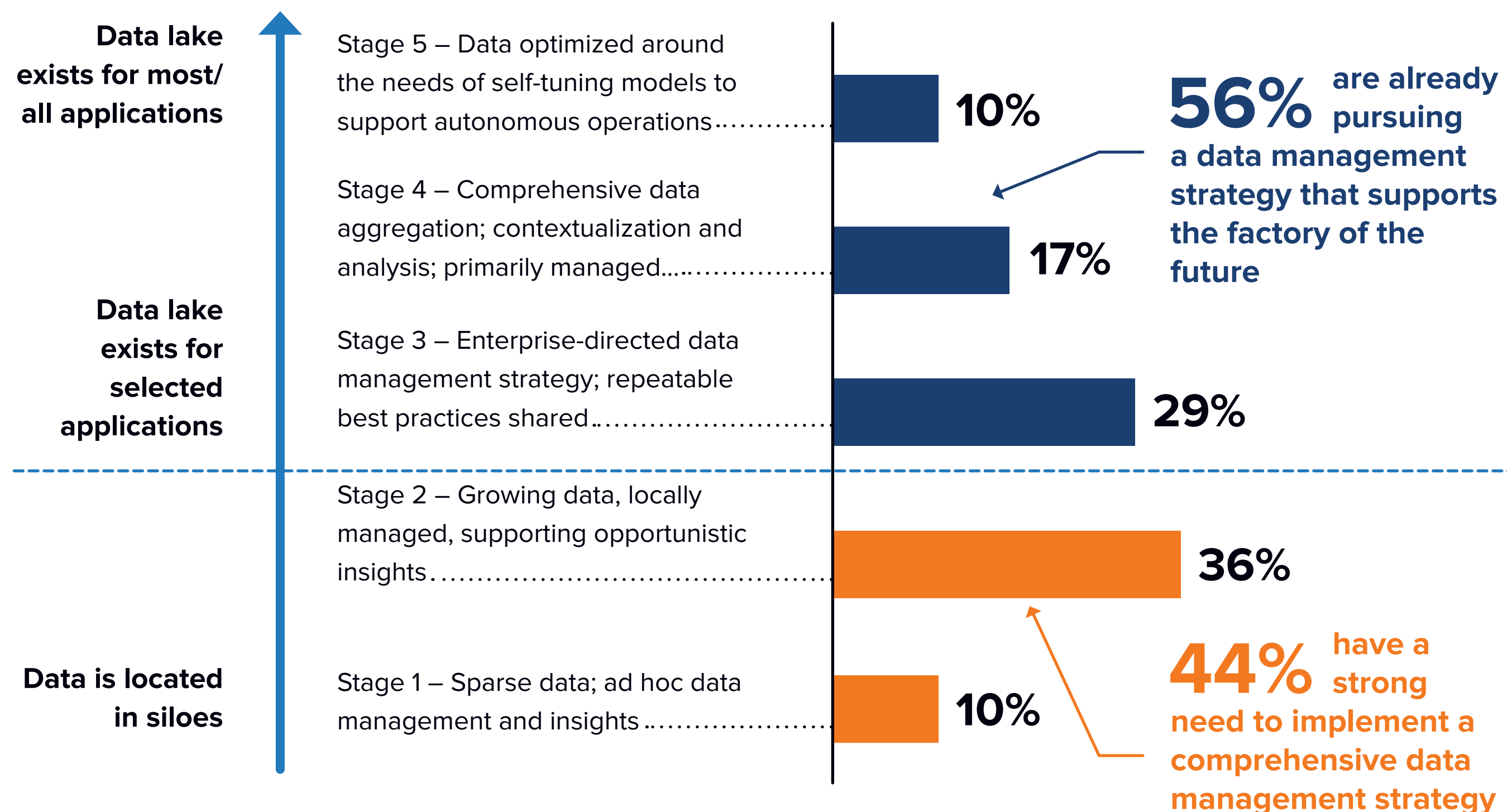
- Integrating with shared, secure industry data spaces via connectors

- Implementing solutions to help track product carbon footprints
- Implementing solutions that enable the monitoring of assets' energy consumption in factory operations, thereby helping to reduce energy consumption

IDC Recommendations

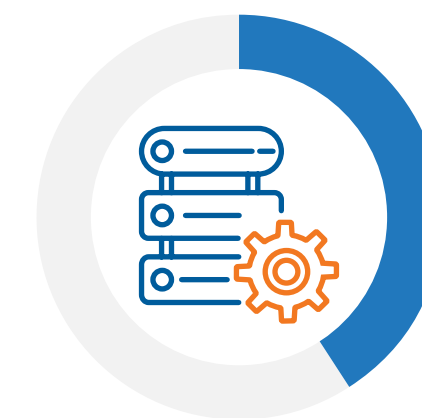
1 Successful shop floor digitalization will depend on the ability to use data effectively

Which of the following statements best describes where your organization is on the journey to data-driven options?



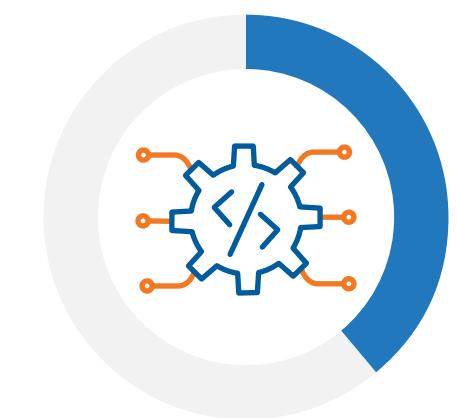
2 Utilizing and creating value from data is easier said than done

Top challenges for manufacturing organizations worldwide related to creating value from data:



41%

Issues with integration of operational data sources



39%

Issues with integration of ERP and other software or data sources

Poorly integrated operational data due to non-interoperable interfaces, inconsistent data availability, or access limits the potential to transform into a data-driven factory of the future.

This requires manufacturing organizations to partner with technology and services providers that can provide deep industry domain and technology know-how, as well as proven consulting capabilities.

Key Takeaways

Data-Driven Transformation of Factory Operations

How to Master Digitalization on the Shop Floor in an Era of Versatile Challenges



Transforming factory operations to ensure and improve efficiency, agility, and sustainability requires transformed decision-making based on data and digitalization.



End-to-end visibility across all operations – from the shop floor to the top floor – is a key requirement to attain actionable insights which empower factory transformations.



Delivering business benefits and enabling measurable KPI improvements are key for digital transformation initiatives on the shop floor to achieve **impact**. This requires holistic, proactive, data-driven decision-making.



Ensuring the **scalability** of KPI improvements requires a harmonized factory operations architecture and support from cloud-based data management strategies.



Increasing the impact of digitalization initiatives on the shop floor to their full potential and scaling improvements across the enterprise and ecosystem requires improved **trust** levels among all relevant stakeholders.

Sustainable Manufacturing

Digital Factory

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Fujitsu as Your Sustainable Factory Transformation Partner

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- Connect data and turn it into visible, actionable insights to empower better decision-making
- Strengthen operations and accelerate progress toward sustainability goals
- Increase production efficiency and reduce waste by preventing issues

Get in touch to start your factory transformation with Fujitsu.



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