BUSINESS IMPACT OF INDUSTRY 4.0

PYDATA INDY 2019

11 October 2019

OBJECTIVE

EDUCATE + SOCIALIZE
The concept of industry 4.0

IDENTIFY + DEFINE
Aspects of industry 4.0

DEEP DIVE
Into a unique IoT Example

INTRODUCTIONS

Reg *Montague*

- IPM Project Management Consultant
- BS ChemE Rensselaer Polytechnic Institute
- MS Eng Rensselaer Polytechnic Institute
- MBA, UNC Chapel Hill
- Python Intermediate
- Licensed PE, PMP, CSSGB
- APICS CPIM-F and CSCP

INTEGRATED PROJECT MANAGEMENT

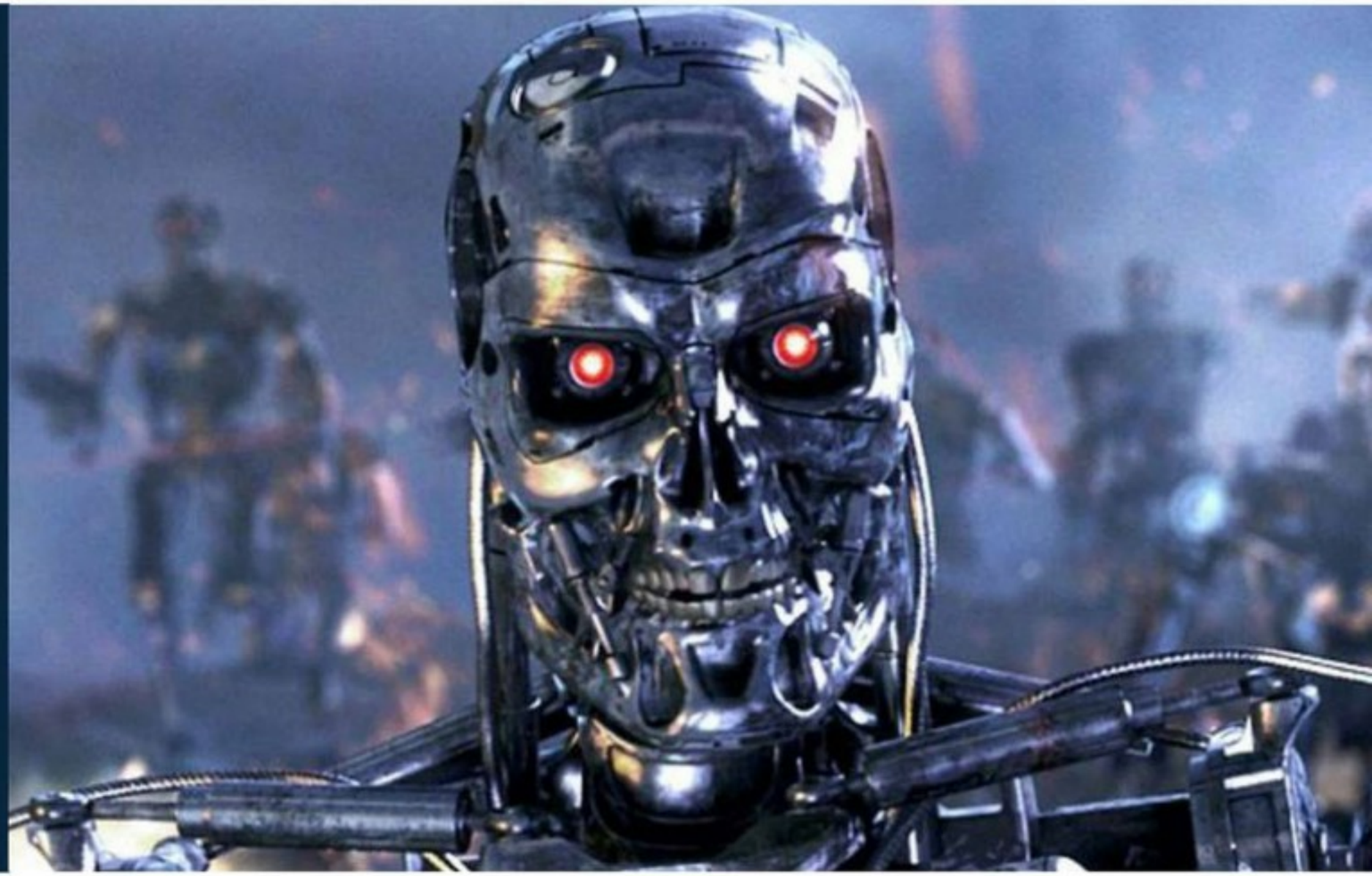
QUICK FACTS

- Established in **1988**
- More than **400** clients from Fortune 100 to start-ups
- Industries served include Consumer, Industrial, Life Sciences, Healthcare
- Services include PPM, Supply Chain Optimization, M&A, Change Management

Malcolm Baldrige National Quality Award
2018 Award Recipient

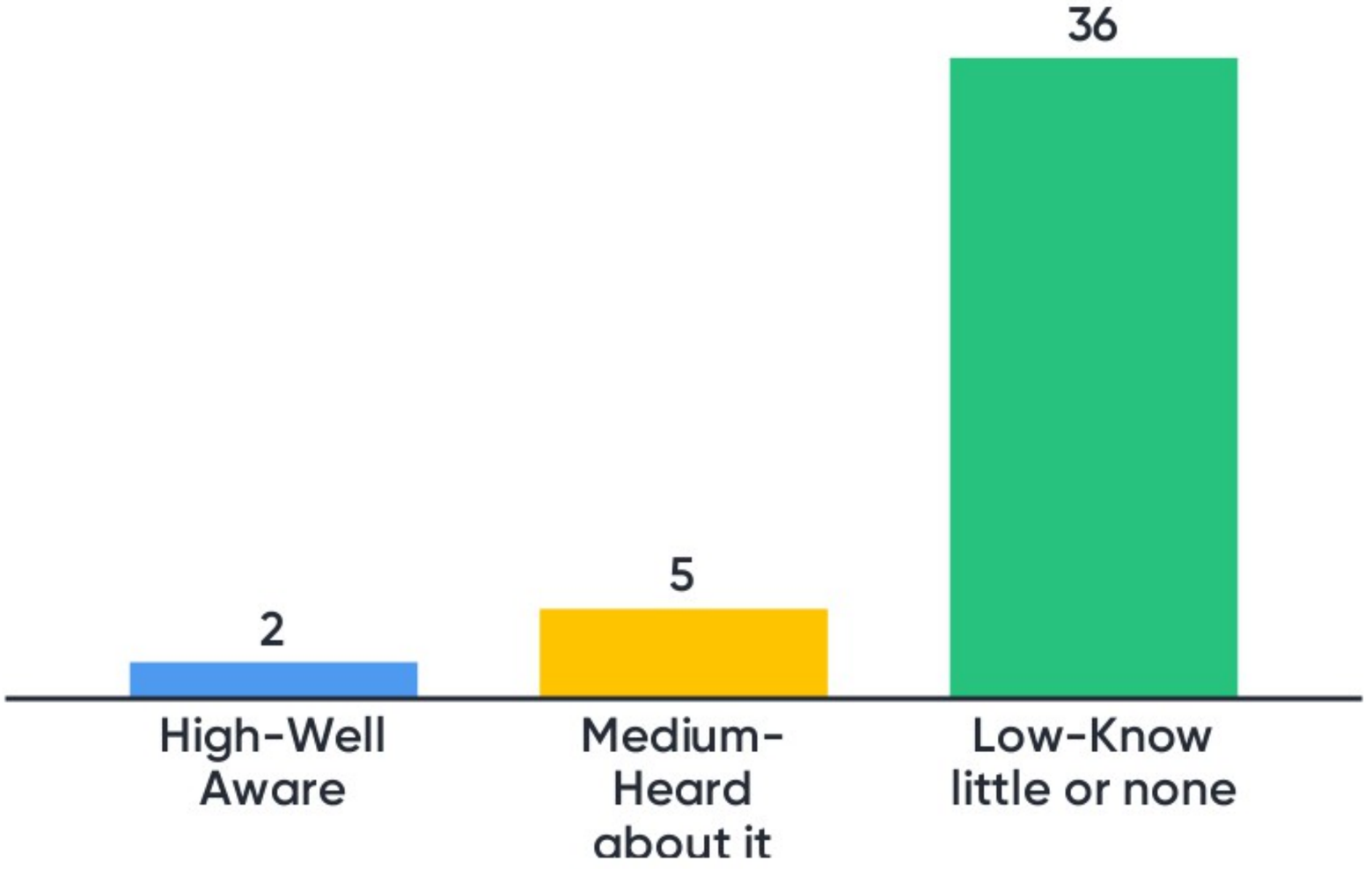
WHAT IS INDUSTRY 4.0?

MAYBE THIS IS
WHAT COMES
TO MIND.

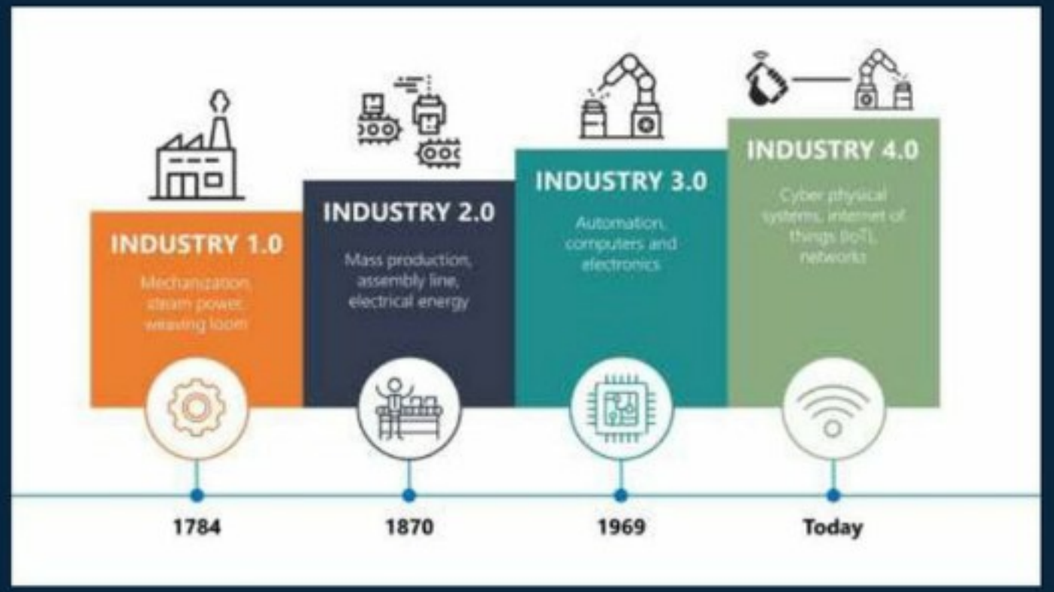


WHAT IS YOUR LEVEL OF INDUSTRY 4.0 AWARENESS?

What is your level of Industry 4.0 Awareness?



WHAT IS INDUSTRY 4.0?



Source: Foreign Affairs magazine, Dec 15, 2015

1 | ***The First*** Industrial Revolution used water and steam power to mechanize production.

2 | ***The Second*** used electric power to create mass production.

3 | ***The Third*** used electronics and information technology to automate production.

4 | ***The Fourth*** Industrial Revolution is building on the Third, the digital revolution that has been occurring since the middle of the last century. It is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres.

Some call it digital

WHAT DOES IT INCLUDE?

ALSO INCLUDES





- Robotics
- Artificial Intelligence
- Digital Twin
- Nanotechnology

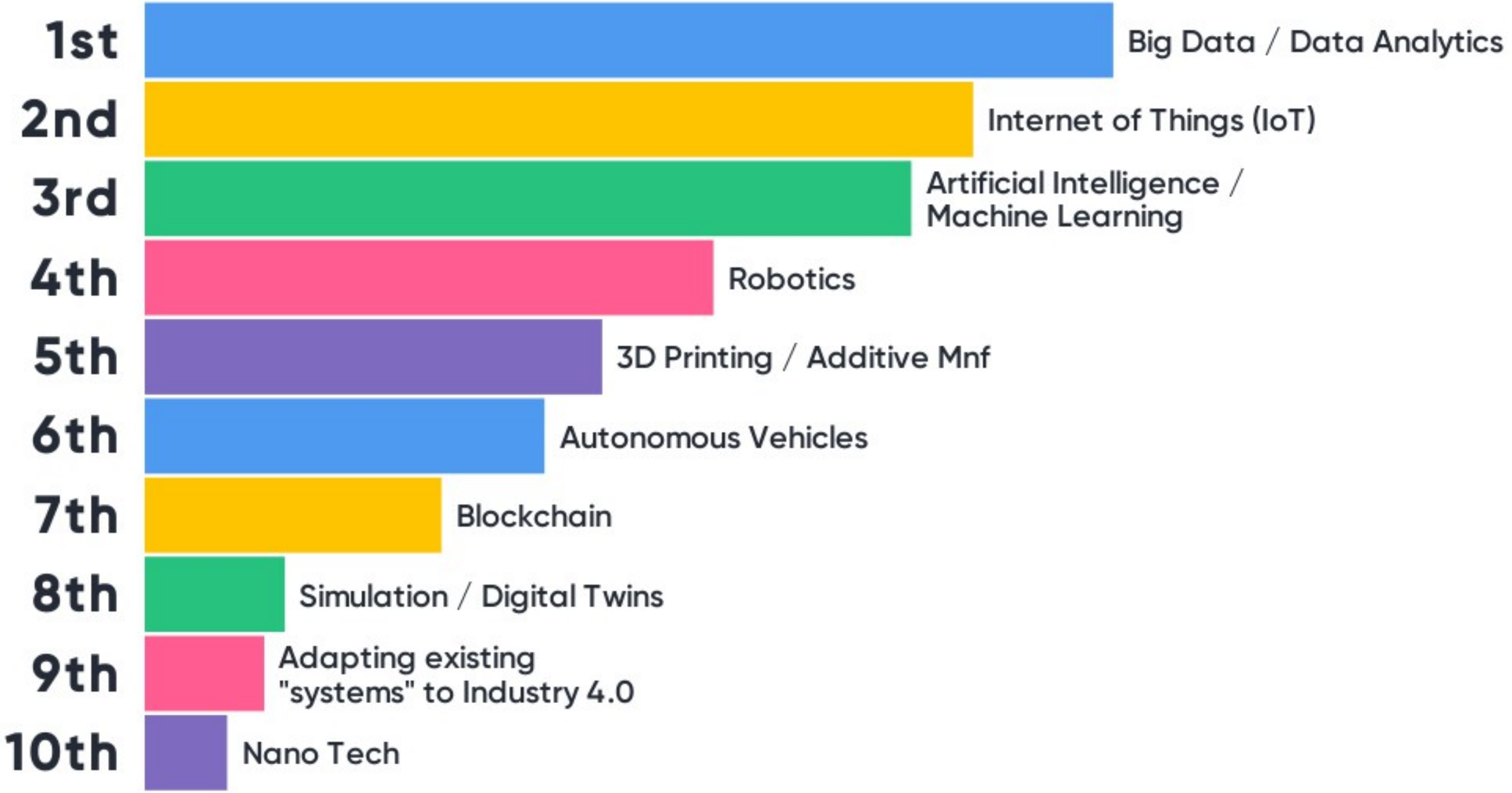
- Quantum computing
- Blockchain
- Data Analytics
- Machine Learning

- Big Data
- Internet of things
- Simulation
- Autonomous systems

- Cloud computing
- Cyber security
- Additive manufacturing
- Augmented reality
- Systems of integration


WHAT TECHNOLOGIES HAVE YOU
BEEN EXPOSED TO?

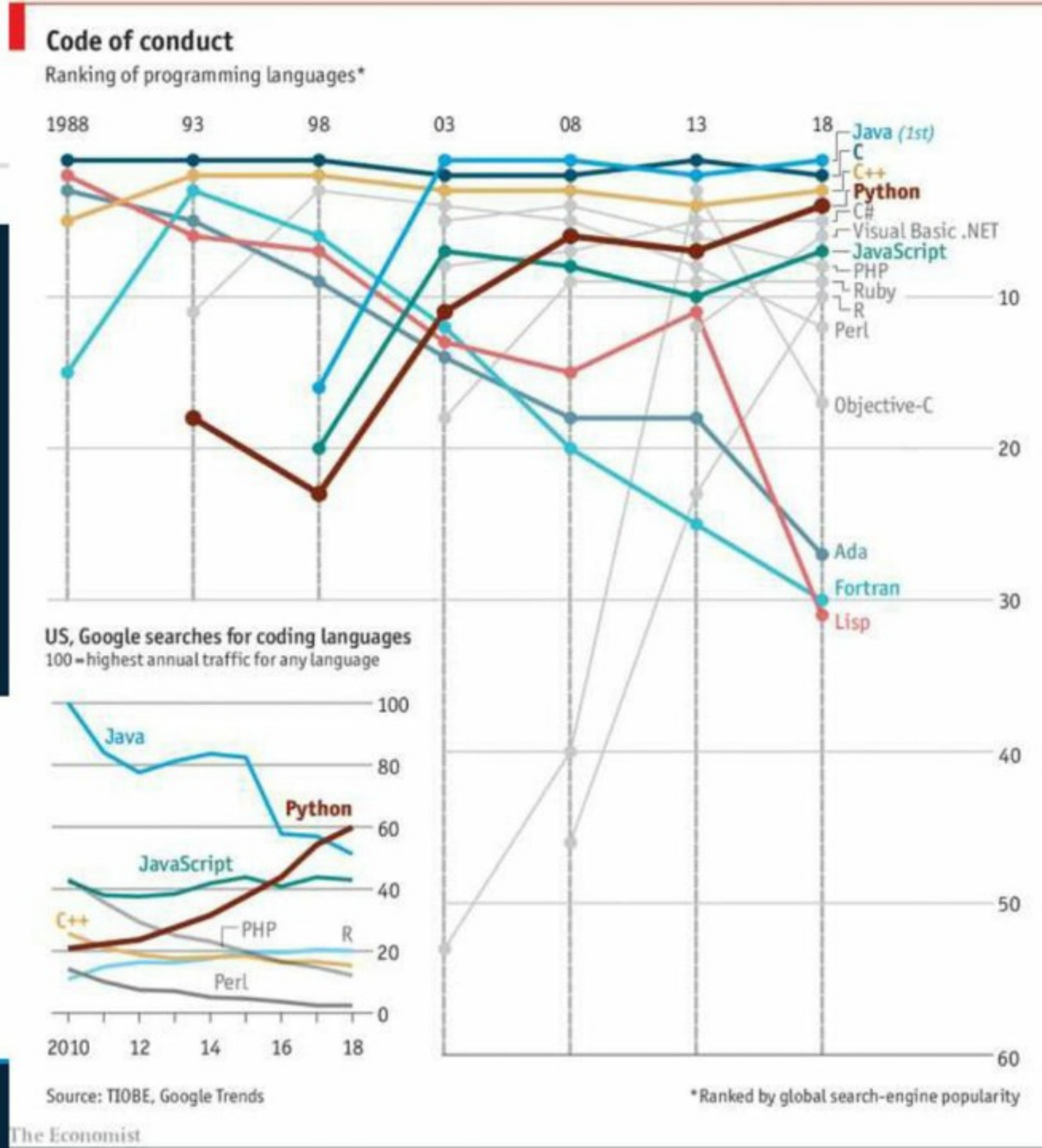
What technologies have you been exposed to?



PYTHON IS ONE OF INDUSTRY 4.0'S ENABLING LANGUAGE

"With such a rapidly growing user base and wide array of capabilities, Python might seem destined to become the lingua franca of coding…"

Source: "Python is Becoming the World's Most Popular Coding Language," The Economist, 26 July 2016



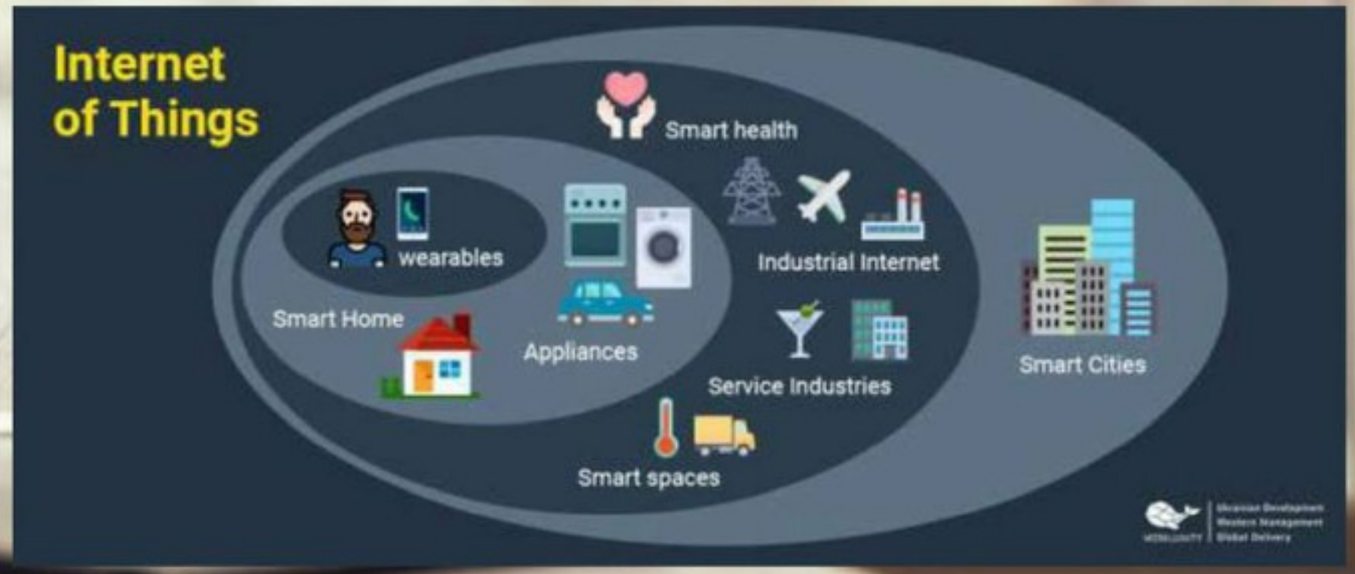
INTERNET OF THINGS (IoT)

The Internet of Things (IoT) is the extension of internet connectivity into physical devices and everyday objects. Embedded with electronics, Internet connectivity, and other forms of hardware (such as sensors), these devices can communicate and interact with others over the Internet, and they can be remotely monitored and controlled.

Example:

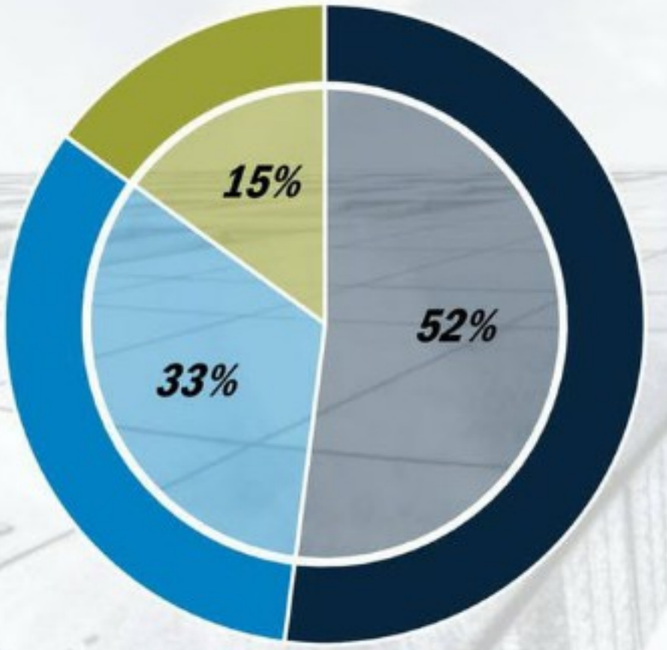
"It [3M] is leveraging robotics, IoT sensors and AI-based process management in its factories. One example is a proprietary technology platform that uses digital scans and machine learning to catch manufacturing defects and adjust the control process."

Source: Gartner



ORGANIZATIONS ARE ADOPTING ASPECTS OF DIGITAL TECHNOLOGIES.

Innovative Manufacturers Recognize the Potential of Industrial IoT and Digitalization



52%

Are not investing – risk being disrupted

33%

Of the market is at some stage of adoption

15%

Will invest in the coming year

Source: CISCO

SOME ORGANIZATIONS ARE SEEING RESULTS.

The Internet of Things in transforming manufacturing

FANUC saved $40 million by reducing downtime

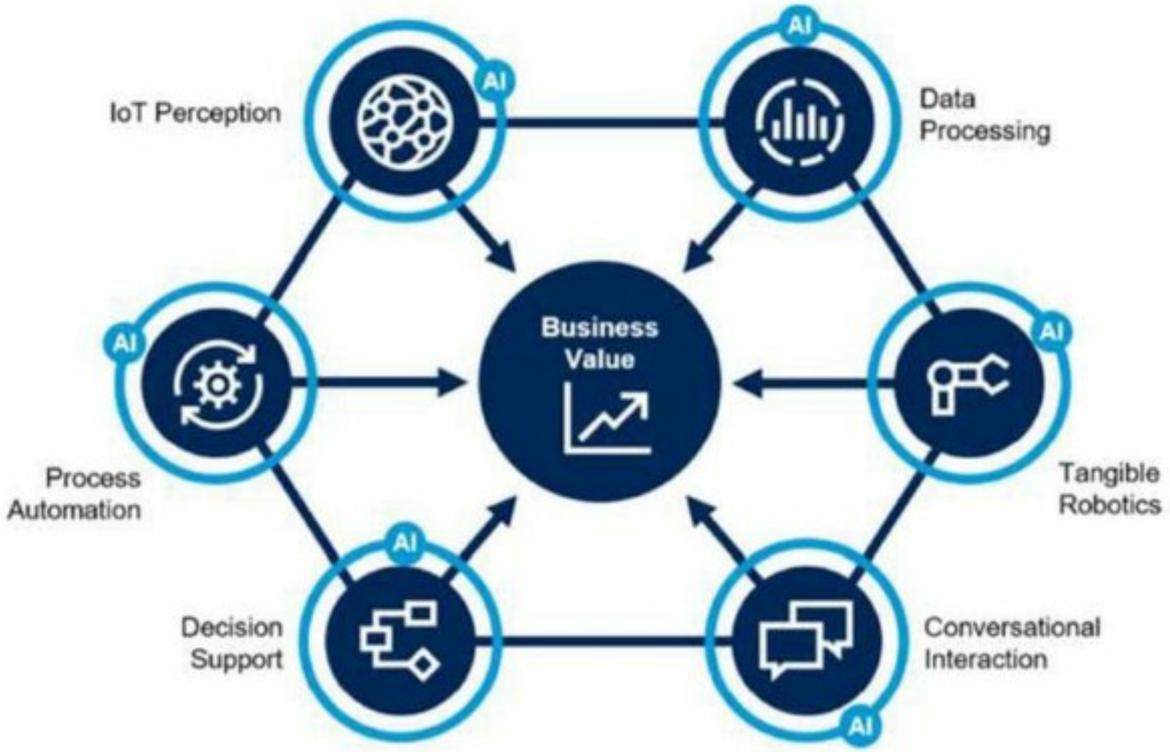
20%

Sub Zero cut new product introduction (NPI) cycle time by ***20%***

16%

Stanley Black & Decker reduced labeling error rate by ***16%***

ARTIFICIAL INTELLIGENCE (AI)



ARTIFICIAL INTELLIGENCE (AI) applies advanced analysis and logic-based techniques, including machine learning, to interpret events, support and automate decisions, and take actions.

Example:
AI Customer Service Bots are in use by Consumer Products firms to provide customer support.

Source: Gartner

MACHINE LEARNING

MACHINE LEARNING (ML)

uses algorithms and statistical models that computer systems use to effectively perform a specific task without using explicit instructions, relying on patterns and inference instead.

Example:
"In planning, PepsiCo is using machine learning to improve daily forecast accuracy, allowing algorithms to parse datasets too large for human planners."

Source: Gartner

AUGMENTED / VIRTUAL REALITY

VIRTUAL LEARNING (VR)

augmented reality (AR) and mixed reality (MR) are changing the way in which people *perceive* the digital world... The ability to communicate with users across many human senses will provide a richer environment for delivering nuanced information.

Example:
"McDonald's is also investing in…augmented reality to manage storerooms, the priority is having store staff spend their time focused on customers, not back office work."

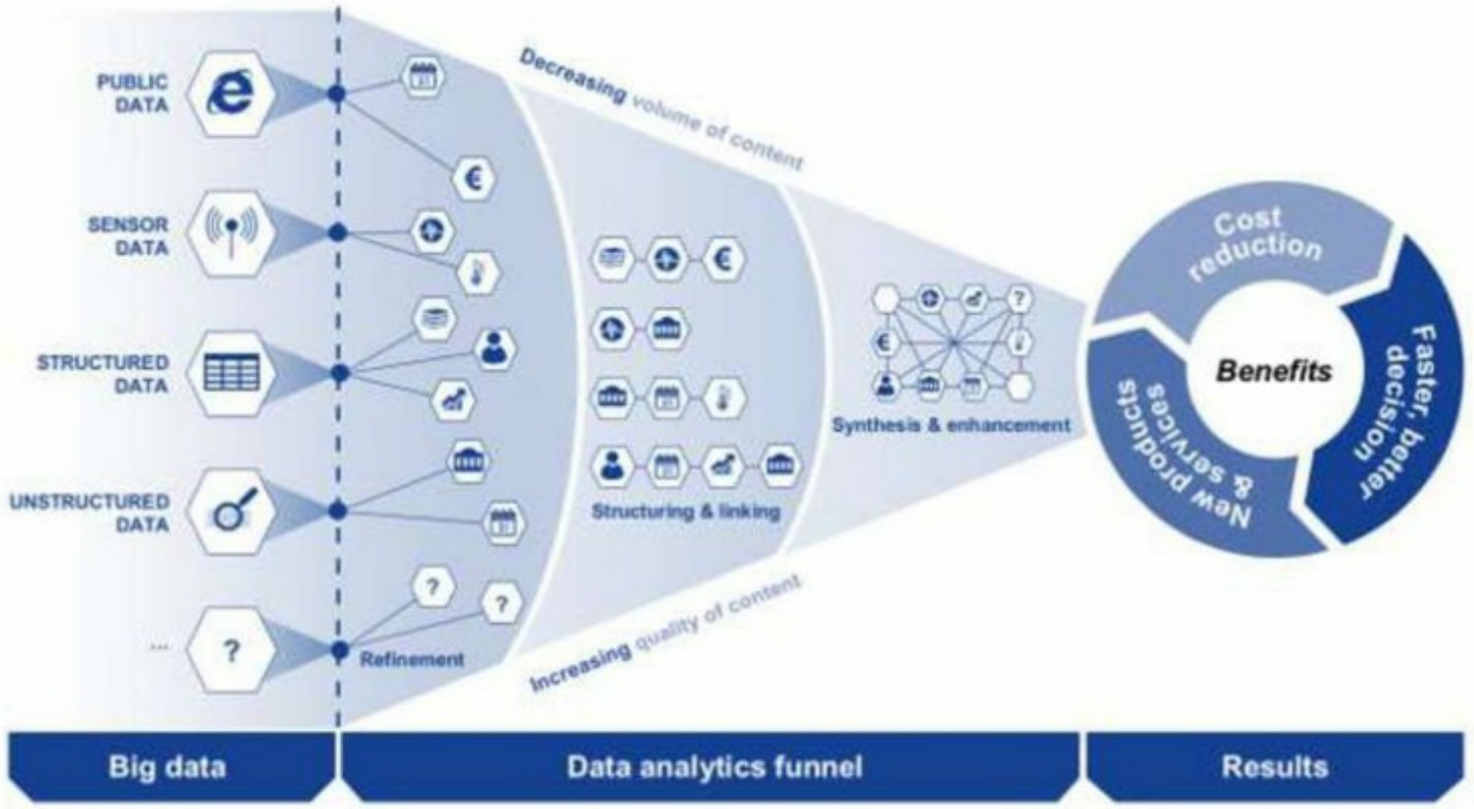
Source: Gartner

DIGITAL TWIN

THE DIGITAL TWIN is a functional, system model of the real-world object. The digital twin includes the real-world object's data structure, metadata, and critical variables. The digital twin corresponds to a unique physical thing. You can use the digital twin to query the state of the real-world.

Example: BMW has also created a 3D digital twin of its factory space that is accurate down to the millimeter and can be used for future modifications and performance calculations.

BIG DATA



BIG DATA VS. "REGULAR DATA"

VOLUME

As of 2012, about 2.5 exabytes of data (10^9 Gigs)

VELOCITY

Near real-time date is often available

VARIETY

Messages, images posted to social networks; readings from sensors; GPS signals from cell phones, etc.

Source: Harvard Business Review

WHEN IMPLEMENTING, HAVE THE OUTCOME IN MIND

PREDICTABILITY

Supply, demand, quality, assets: IoT, AI, mobile, cloud

VISIBILITY

Track and trace, sense demand, see inventory, trucks: IoT, mobile, cloud

DECISION MAKING

Six Sigma, S&OP, order management: Data access, advanced analytics, AI

SPEED

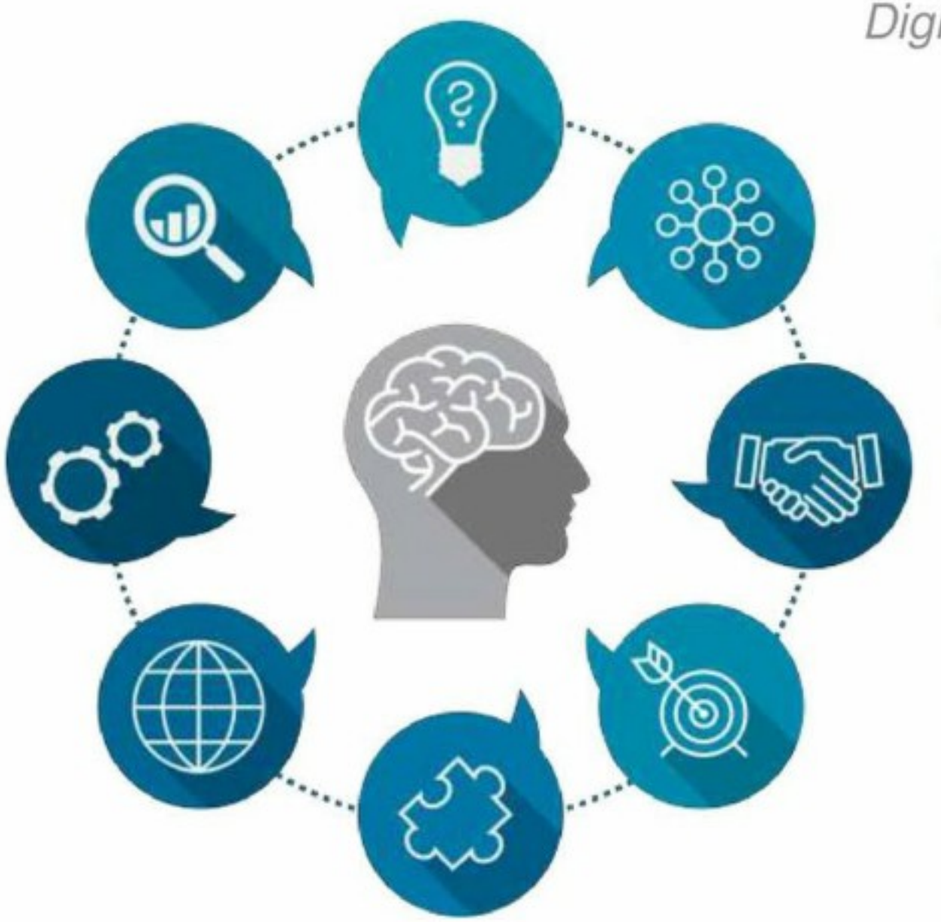
Ubiquitous access to data, product and process development and optimization

COST REDUCTION

Decision automation, information access

Don't implement just because the tech is cool, it must have an ROI

46% OF MID-MARKET FIRMS ARE ADOPTING SYSTEMS TO INCREASE VISIBILITY



Digitization Enhances Business Visibility, Intelligence, and Decision-Making

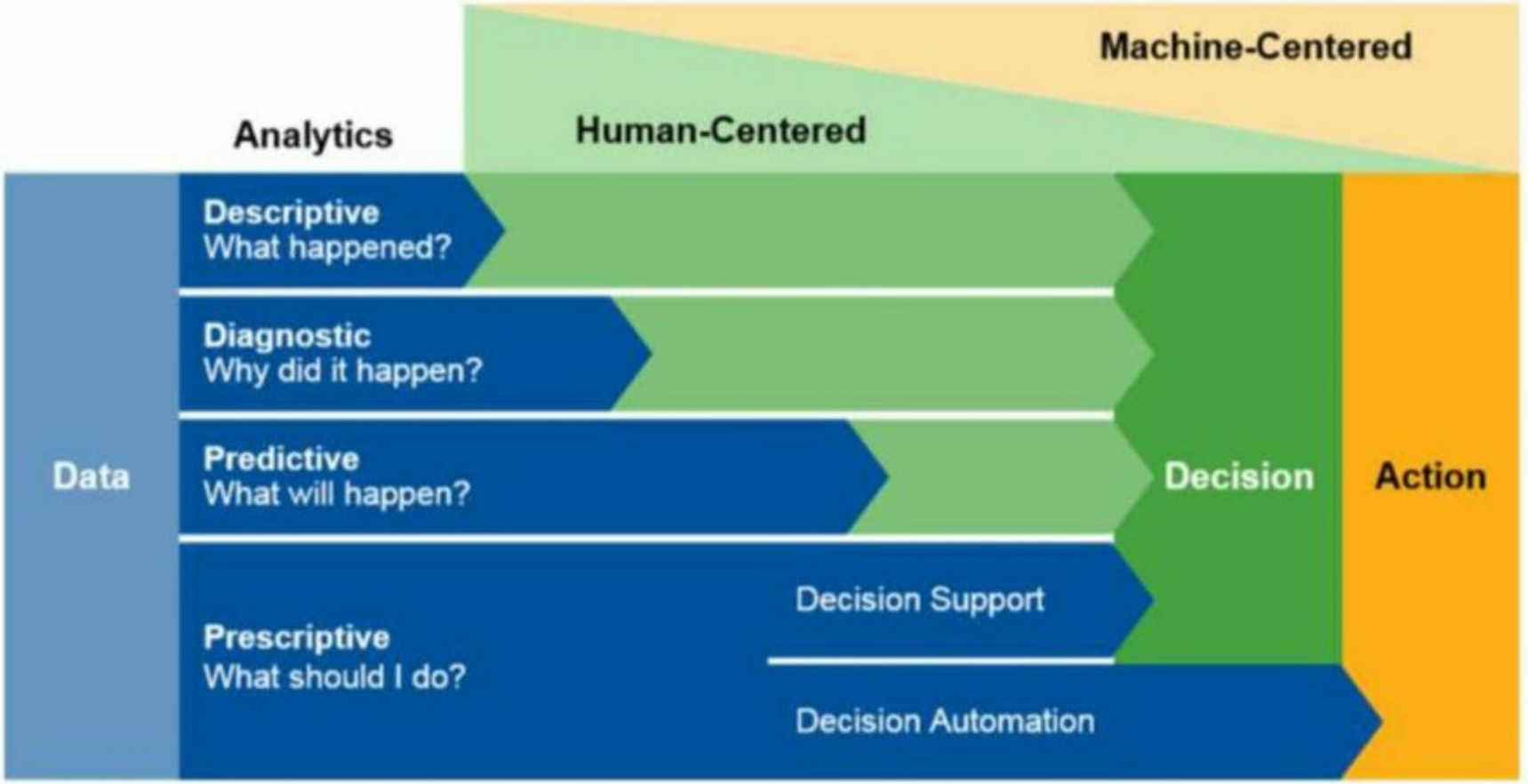
ENTERPRISES

MID-MARKET

51% of enterprises and ***46%*** mid-market companies adopting M2M and IoT solutions to gain visibility beyond factories, spanning the entire supply chain.

Source: CISCO

DATA PLAYS A SIGNIFICANT ROLE IN A SHIFT TO DIGITAL



Source: Gartner (October 2016)

The availability and effective application of data is fundamental to becoming digital

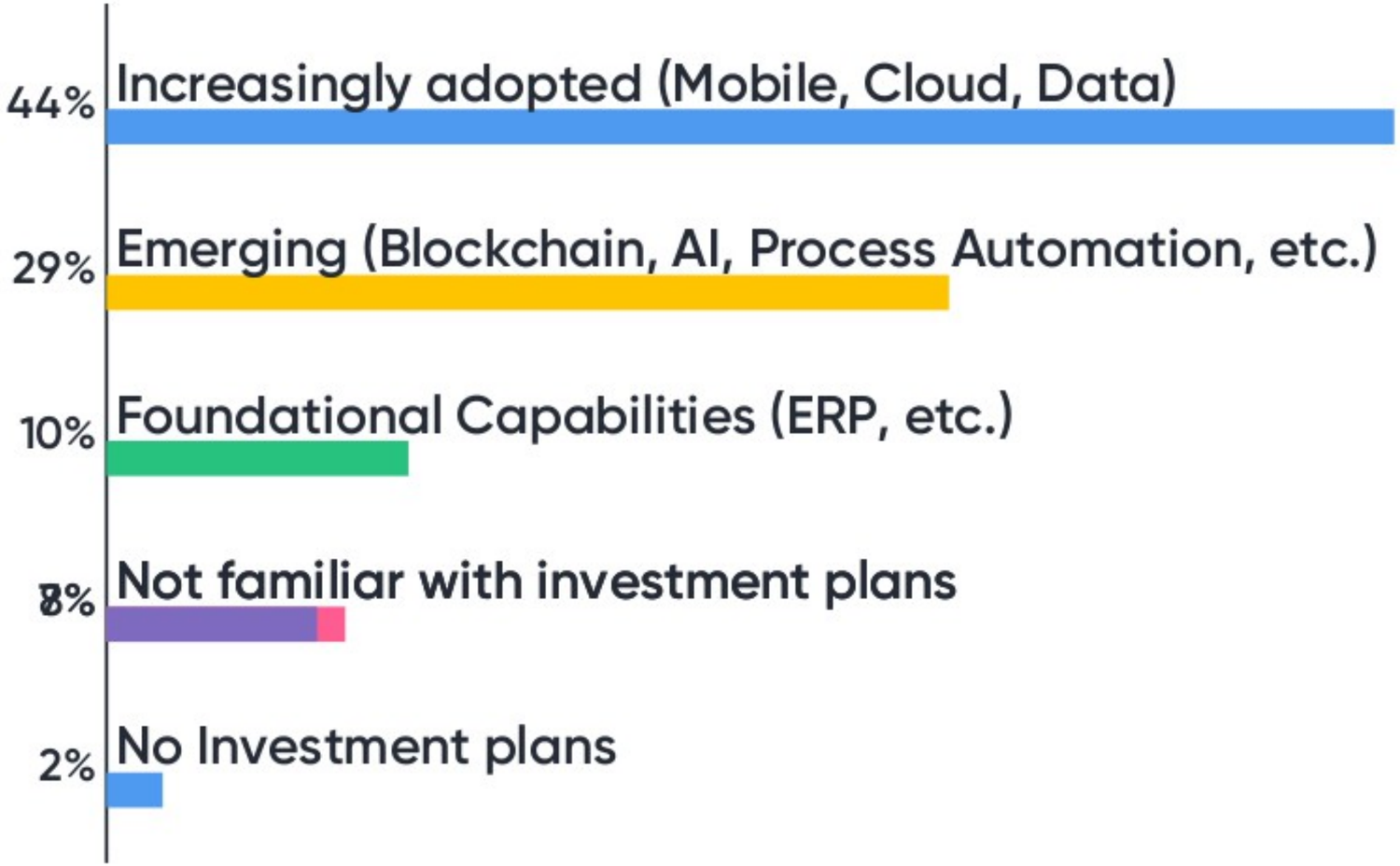
ADDRESS THE FOUNDATION BEFORE INVESTING IN SIGNIFICANT TECH

Foundational	*Increasing Adopted by the Market*	*Emerging*
Capabilities and Technology		
• Enterprise Resource Planning	• Cloud applications	• Blockchain
• Product Life Cycle Management	• Mobile	• Artificial intelligence
• Supply Chain Planning	• Data and Analytics	• Process Automation
• Sourcing/Procurement		• Internet of Things
• Manufacturing Execution & Operations Management		• Advanced Analytics
• Supply Chain Execution		
• Demand Management and Forecasting		

The denser your technology roadmap is, the higher the maturity needs to be

HOW WOULD YOU CHARACTERIZE YOUR LIKELY INVESTMENTS IN THE NEXT 2-5 YEARS?

How would you characterize your likely investments in the next 2-5 years?



ADDING SENSOR IS ONE WAY TO BECOMING DIGITAL

SITUATION

A medical equipment manufacturer is looking to apply Internet connected sensors, such as RFID readers, to their surgical systems and products. This creates a technology ecosystem that automates many of their customers administrative business processes allowing focus to shift to patient care.

IPM'S ROLE

IPM is leading the effort to assess and apply RFID technology into their surgical system.

INDUSTRY 4.0 CONNECTION OR OBSERVATIONS

Data Analytics used to assess:

- Product usage
- System diagnostics and service requirements prior to system malfunctions
- Surgeon patterns and trends

CHALLENGES

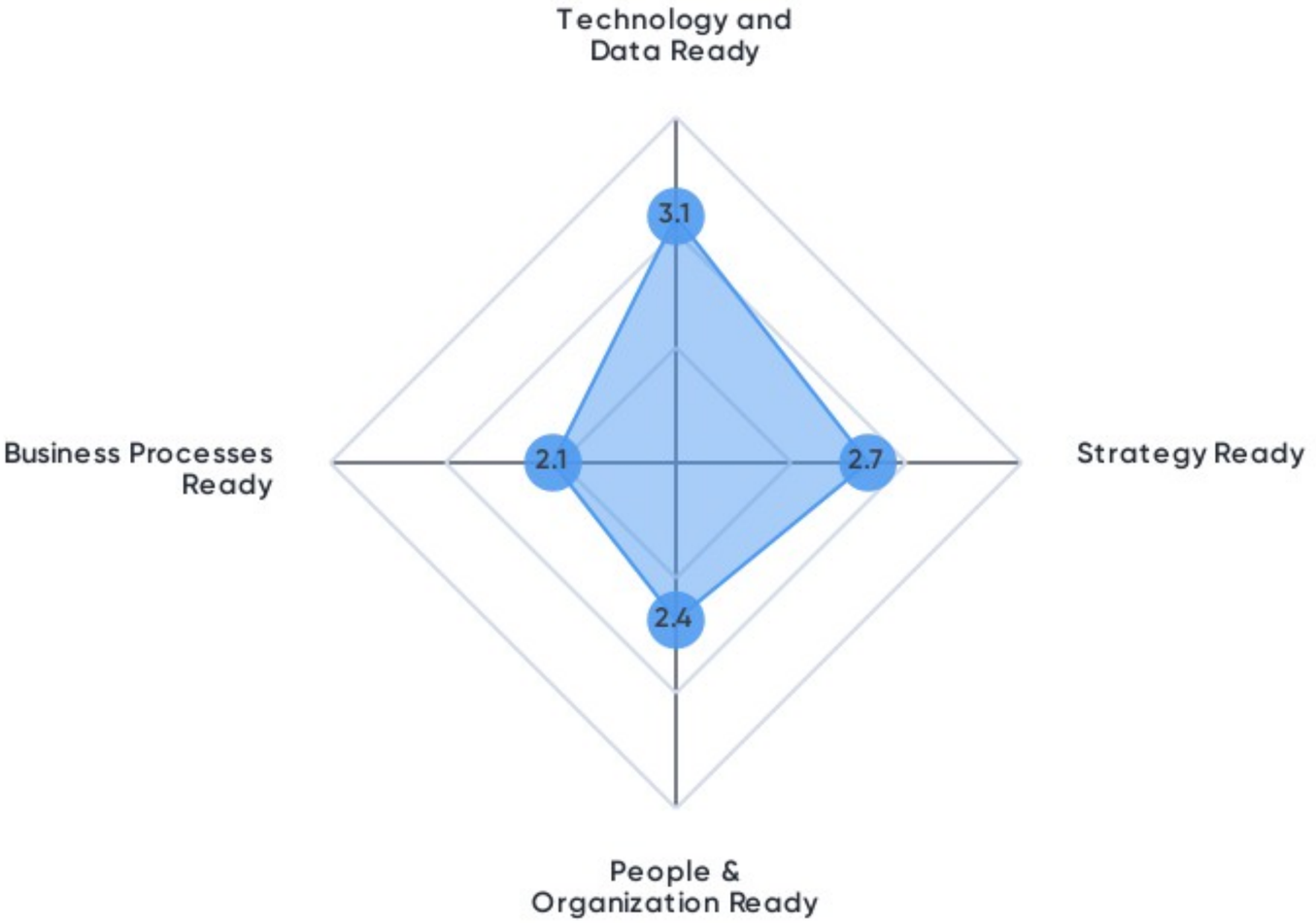
Inventory and systems are located at customer sites.


ARE YOU READY FOR
INDUSTRY 4.0?

READINESS SELF-ASSESSMENT

	1	2	3	4
STRATEGY	• Rudimentary Strategy Development	• Integrated sub-strategies *(pointed in the right direction, but not supporting each other)*	• Integrated sub-strategies *(some pointing in the right direction with limited support of each other)*	• Clearly articulated integrated strategy • Alignment between Business, IT, Digital and Supply Chain Strategies • Organization makes decisions based on business cases • Ability to execute
PEOPLE & ORGANIZATION	• IT: focused on keeping the lights on/routine maintenance | data • Training is limited • Staff have limited data skills	• Non-integrated IT Dept • Some training	• Staff have critical data skills such as statistics • Six Sigma capabilities	• IT dept integrated with the business, works as a partner • Staff have Digital Dexterity • Training is widely available
BUSINESS PROCESS	• Ad hoc business processes	• Limited documentation	• Well-documented • Moderate adherence	• Well-documented • Nearly complete adherence
TECHNOLOGY & DATA	• Highly dependent on spreadsheets • Disjoined ERP Systems • Multiple versions of the truth • Fragmented data	• Multiple non-integrated enterprise platforms, dedicated but siloed	• ERP has been partially implemented	• Integrated enterprise platform • Information is coherent across all platforms and operates in a seamless ecosystem

Organizational Readiness Self-Assessment



A PM PERSPECTIVE: EXECUTION RISKS

- Organizations are still trying to figure it out
- Most of the Industry 4.0 technology is in its infancy
  - *The market is still learning how to apply Industry 4.0 technology*
- Difficult to articulate benefits and quantify KPIs and ROIs
- Often deal with people that don't have execution skills *(researchers, startups, etc.)*
- Intellectual property issues may crop up on emerging technologies

A PM PERSPECTIVE: APPROACH TO ROAD MAPPING

DEVELOP YOUR STRATEGY

- Understand the overall business strategy
- Ensure the SC, IT, and Data Strategies are aligned with the business strategy
- Ensure your data infrastructure is mature
- Know your overall maturity
- Ensure the SC and IT Strategies are complimentary
- When investing in technologies use cost/benefit analysis
- Consider the organizations risk tolerance
- Consider cloud, mobile, and data as first steps

SOLVE A PROBLEM

- Map the process
- Understand the problem being solved.
- Understand the root cause(s) of the problem.
- Measure current state (metrics to be improved)
- Determine improvement objective (metric)
- Determine possible solutions including process, technology, etc.
- Conduct cost/benefit analysis of solutions
- Pilot solution
- Evaluate pilot
- Expand if successful; revisit (iterate) if needed

THANK YOU

CONTACT US:

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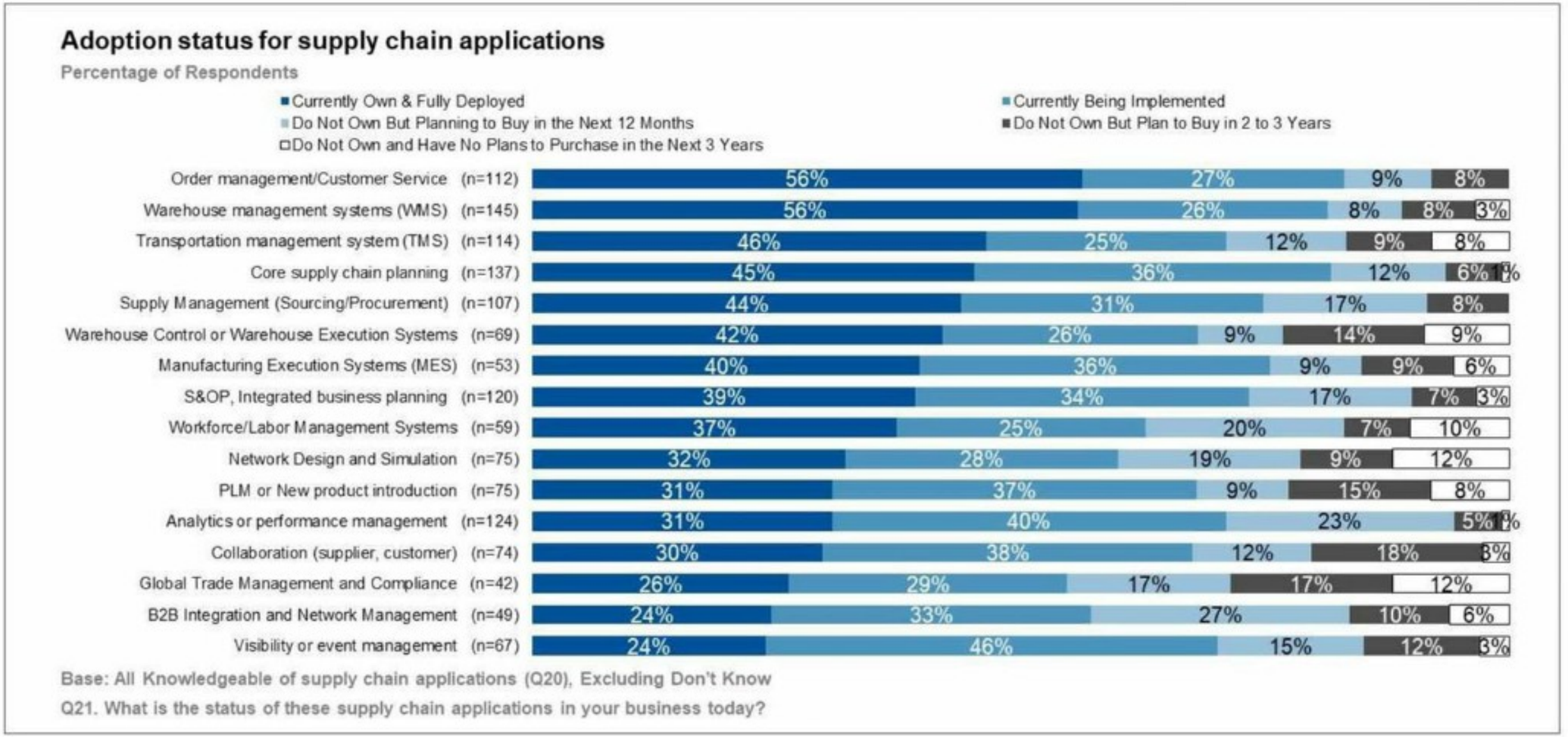
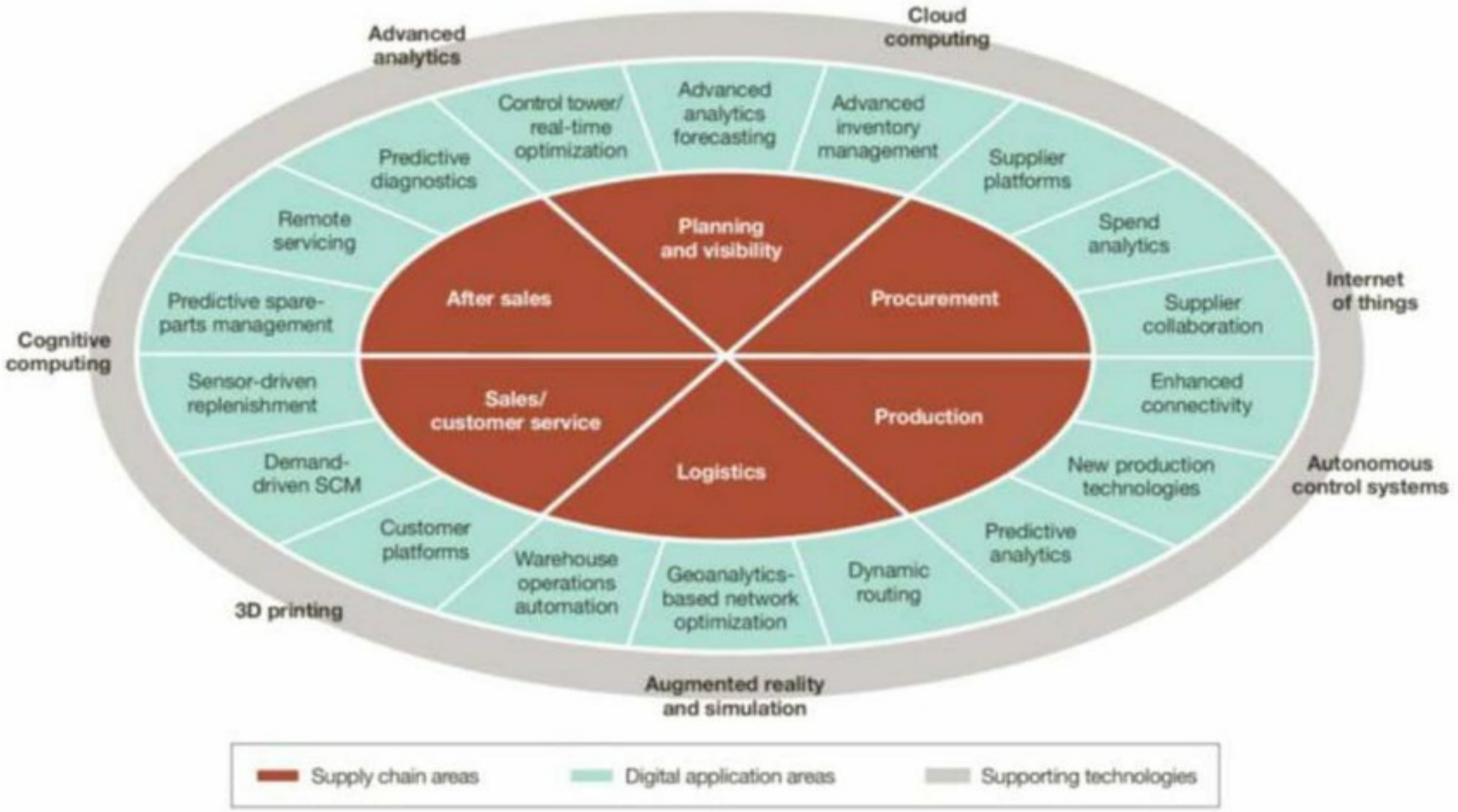
APPENDIX

CONSEQUENTLY, HAVING DATA INFRASTRUCTURE IN PLACE IS CRITICAL



ERP and other connected infrastructure must be in place to go digital

THERE ARE SEVERAL AREAS OF OPPORTUNITY FOR DIGITAL TRANSFORMATION

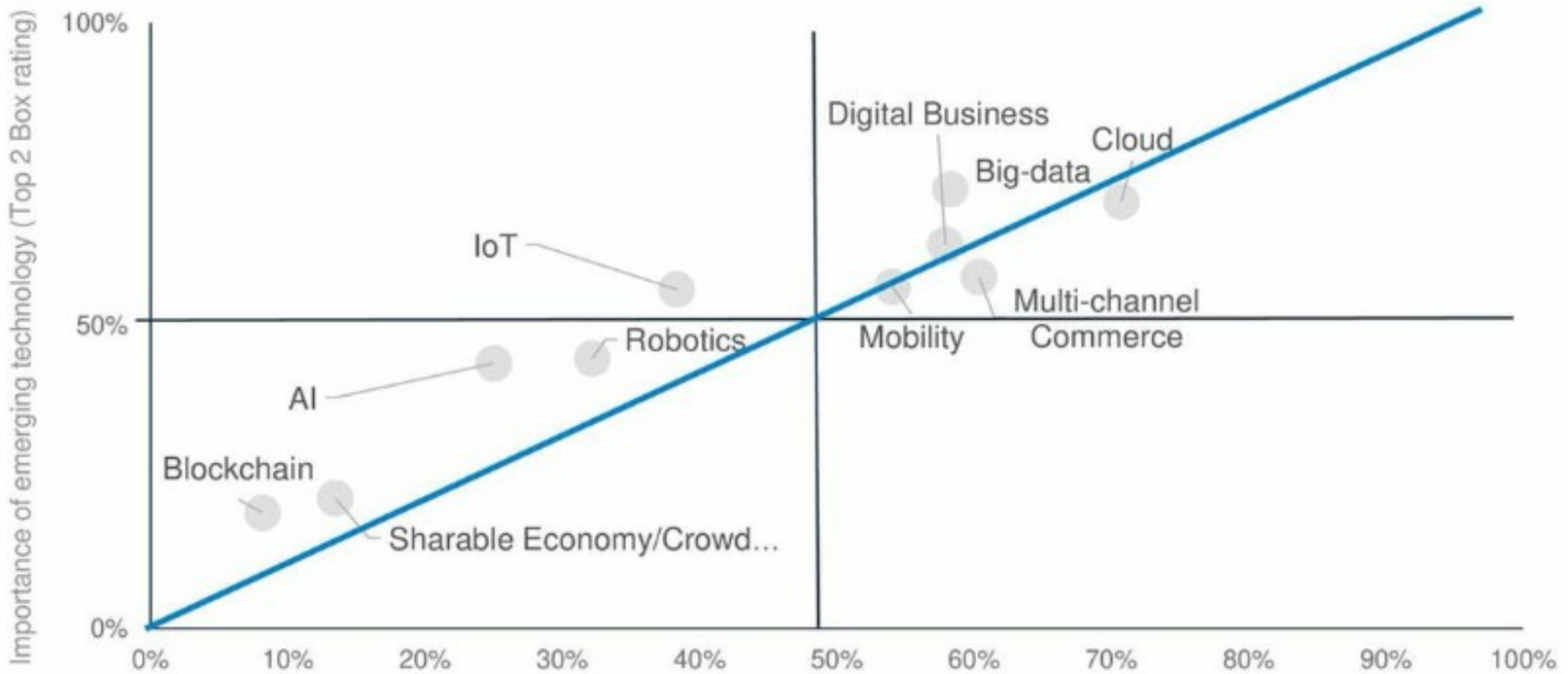


Source: Supply Chain Management Review

MOBILE, BIG DATA, AND CLOUD COMPUTING ARE BIG AREAS OF INVESTMENT AND ADOPTION

INVESTMENT IN EMERGING TECHNOLOGIES BY IMPORTANCE OF TECHNOLOGY

Importance v/s Adoption



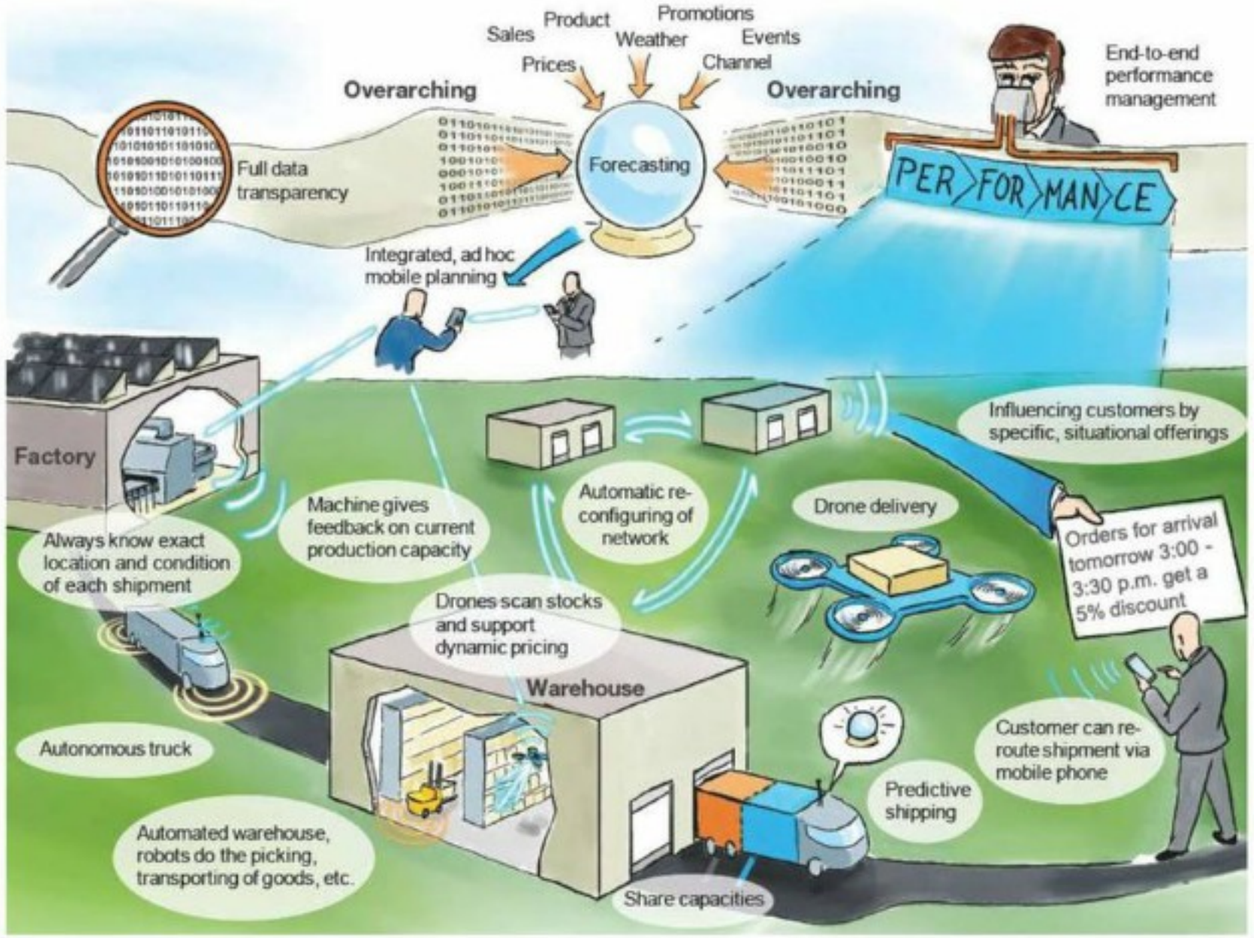
Mobile, Data, and Cloud are mature enough to be considered low-hanging fruit

BASE: ALL RESPONDENTS, N VARIES FOR EACH TECHNOLOGY

Q14. *In your market(s) and for your company how important are the following emerging technologies?*

Q15. ***Is your organization currently investing or planning to invest in any of the following emerging technologies?***

INDUSTRY 4.0 OBSERVATION: MANUFACTURING



SELECTED EXAMPLES:

Fairlife Milk and IBM Watson

Use of Analytics to improve forecasting

Reduce inventory levels

Improve product availability
(minimize stock outs)

Amazon

Drones, Warehouse, and Distribution to deliver

Gartner

"Scaling the Digital Supply Chain" is a key characteristic of top supply chains

DEFINE THE DIGITAL ROADMAP