



# A reality check for today's C-suite on Industry 4.0

The time for experimentation  
is ending

KPMG International

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## Eric A. Logan

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## Paul Juras

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# Contents

**06** **Success on the transformation journey demands informed CEOs navigating precise roadmaps**

**10** **Focus on value and performance first — not technology**

**16** **The journey to value starts with one critical question: Why?**

**20** **The i4.0 enablers that are crucial to success**

**26** **Conclusion: Attention, CEOs: Action that defines the winners**

**28** **How KPMG can help**

**30** **i4.0 Leaders at KPMG**



# Foreword

## Let us be candid: a message to CEOs and leaders

As the Fourth Industrial Revolution (i4.0) catapults manufacturing into the next generation, business leaders are facing profound pressure to navigate the historic changes sweeping over every industry.

In my daily encounters with business leaders, it becomes clear that true progress remains limited. Bold digital transformation is being thwarted by familiar roadblocks — a lack of strategic direction, confusion, fear of disruption and ROI uncertainties, to name a few. It is not a pretty picture.

The world has changed since KPMG's 2017 report ***Beyond the Hype***. Unfortunately, the void between C-suite ambition and tangible transformation remains real and, dare I say, troubling.

Few organizations are achieving transformation at the scale and integration needed for new levels of value to emerge. Instead, 'pain point' technology solutions and siloed piloting programs proliferate. Businesses meander along the i4.0 road with no clear view of the future. Pilot project overload looms. Costly initiatives are banished to the back burner. You get the picture.

This report examines what some firms are doing right and what others must do better to manage the most complex business challenge to emerge in generations. My own challenge here to CEOs

and their organizations is direct and urgent. Pursue an informed, strategic, value-based approach to i4.0. Then map out a bold new journey toward holistic transformation.

Change for the future is not about adopting shiny new technology or impressive shop-floor gadgetry. This is a strategy and operating-model challenge. It is an overarching *business issue* that transcends yesterday's world of simple IT innovations. The C-suite needs to become bolder in vision, strategy and action, while inspiring every employee to join them.

The revolution has begun. The time for experimentation is coming to an end. It is time to exercise leadership today that drives truly historic, unprecedented change for tomorrow.



**Doug Gates**  
Global Sector Chair,  
Industrial Manufacturing and  
Aerospace and Defense  
and Sponsor for Global i4.0  
KPMG in the US





# Success on the transformation journey demands informed CEOs navigating precise roadmaps

Change is inevitable. Successful i4.0 transformation is not.

We see companies racing ahead today with i4.0 initiatives of every shape and size amid the proliferation of technological hype. No one wants to be left behind. Make no mistake, a true paradigm shift is unfolding around an i4.0 technology market that is skyrocketing toward a projected value of US\$152 billion by 2022.<sup>1</sup>

The i4.0 market we are seeing is too often characterized by manufacturers — assisted by technology companies — creating functionally siloed projects that employ a variety of i4.0 technologies. The depth of integration into organizational strategies, and the creativity of applications, varies widely. Few have developed holistic, end-to-end interconnectivity — our definition of the highest level of i4.0 maturity — among today's breakthrough i4.0 tools and technologies.

“Our message to the vast majority of businesses is simple but urgent — you cannot buy your way to i4.0 maturity,” says Mun-Gu Park, partner and i4.0 country leader, KPMG in Korea.

“Driving true and sustained value from i4.0 demands the integration of automation, data, advanced analytics, manufacturing and products, in a way that unleashes unique new competitive advantages.”

The road is complex. Success requires CEOs and C-suite leaders to step up as dedicated agents of change, overseeing development and execution of intelligent and integrated i4.0 roadmaps into the future. These leaders will offer clear strategies at the enterprise level — abolishing functional silos and integrating people, processes and technologies.

<sup>1</sup> Marketsandmarkets.com, May 2017. <https://www.marketsandmarkets.com/Market-Reports/industry-4-market-102536746.html>



“Focus on the big picture. For example, sensors can be used to generate predictive maintenance solutions — but the information obtained is not being fed back to the R&D teams. The result? Value is being generated for the customer — but the opportunity to improve the product is missed,” says Naoko Chida, senior manager, Consulting and i4.0 country leader, KPMG in Japan.

Lacking an intelligent destination, businesses are hamstrung by confusion, uncertainty, fear of costly failure, resource constraints, technology gaps and information overload. Everyone seems to be on the i4.0 road — but few appear certain of just where they are going. And time is of the essence. According to Verizon, manufacturing was the fastest-growing sector in IoT network connections in 2017, increasing 84 percent over the previous year.<sup>2</sup>

“Implementing i4.0 transformation with the end in mind — your destination — is the only way to succeed,” comments Bob Murphy, senior vice-president, operations and engineering services at US-based

Rockwell Automation, a leader in i4.0 transformation. “Intentional digital transformation initiatives that are intelligently architected and strategically road mapped will competently deliver the required results that can be scaled up to enterprise-wide deployment and success.”

We often wonder how deeply today’s business leaders comprehend i4.0’s potential. IoT-driven technologies, big data, augmented decision-making and advanced automation: They are all converging to redefine the value chain, potentially creating new revenue streams and a step-function change in business performance.

“As companies learn to tap into the potential of the vast amounts of data emerging across all areas of operations, decision-making and action-taking are taken to a new level,” says Thomas Erwin, global head of KPMG Lighthouse, a center of excellence for data-driven technologies. “Combine this with artificial intelligence as the next level of augmenting work with automation, and using sensors to get immediate and continuous feedback

“  
As companies learn to tap into the potential of the vast amounts of data emerging across all areas of operations, decision-making and action-taking are taken to a new level.”

**Thomas Erwin**  
Global Head of KPMG  
Lighthouse, CoE for  
data-driven technologies

<sup>2</sup> Verizon 2017 *State of the Market IoT Report*. <https://www.verizon.com/about/sites/default/files/Verizon-2017-State-of-the-Market-IoT-Report.pdf>

“

In running various i4.0 executive workshops, we — and our clients — notice very quickly the benefit of bringing functional leaders together in one room on this issue. Those cross-functional i4.0 conversations are not happening with the frequency, urgency and dedicated attention that this movement requires.”

**Eric A. Logan**  
Partner, Advisory  
KPMG in the US

on decisions made and actions taken, and you get a glimpse of the future of organizational intelligence that lies ahead of us. This scenario presents humans with a unique opportunity to redefine what the future of work might look like.”

The opportunities for disruption are vast and those left behind will feel it acutely. Few smart-manufacturing initiatives we have seen appear built on the understanding that this really is a *revolution* in the manufacturing ecosystem. Nothing less. We see businesses eagerly amassing colossal quantities of new process data and customer information. Unfortunately, few possess the acumen and new skills required to exploit the data’s potential to increase performance, value and competitive advantage.

“Just because you can collect vast quantities of real-time data does not mean you should,” says Professor Paul Juras, who teaches managerial accounting and strategic cost management at Babson College in Wellesley, Massachusetts. “Doing so creates the risk of being buried in data and experiencing ‘analysis paralysis.’ And let’s face it, the analysis will have little value if the results cannot be communicated in a way that helps the implementation effort.”

### **Welcome to the new frontier — where will you land?**

The new frontier of smart manufacturing and business models makes it critical for business leaders to be better informed. How many fully comprehend what the future will look like for their industry, organization, products and customers?

We say become familiar with the intricacies of the i4.0 journey — what i4.0 is, what it can do, its potential to drive game-changing transformation. Use that knowledge to draft a strategic, sequenced roadmap toward interconnected new processes, workplace cultures and customer relationships.

Yet, as we encounter executives alluding to exciting i4.0 initiatives, the lack of alignment between different i4.0 activities, long-term organizational strategy and the macro impacts of market disruption becomes painfully clear. This is echoed by nearly half of the manufacturing CEOs surveyed in KPMG’s 2018 CEO Outlook survey who admitted that most of their technology investment is tactical rather than strategic.

Senior executives at a leading global auto manufacturer recently articulated an array of responses to our query about what i4.0 is and how it can reshape their business. Each voiced a valid perspective on its capabilities and value. But each, typically, was focused on their siloed piece of the business — product design, manufacturing, supply chain, after-market services.

“In running various i4.0 executive workshops, we — and our clients — notice very quickly the benefit of bringing functional leaders together in one room on this issue. Those cross-functional i4.0 conversations are not happening with the frequency, urgency and dedicated attention that this movement requires,” says Eric A. Logan, partner, Strategy practice and i4.0 country leader, KPMG in the US.

The auto maker’s leadership took up our challenge to understand i4.0 more deeply and quickly realized the wisdom of mapping out a strategic, enterprise-wide journey.



## Taking action

- Success in this new manufacturing frontier falls to CEOs and C-suite leaders to act as dedicated agents of change.
- Become familiar with the intricacies of the i4.0 journey.
- Develop and execute intelligent, integrated i4.0 strategies for the future.
- Implementing transformation with the end in mind — your destination — is the only way to succeed.

## An i4.0 self-assessment quiz

### How do you compare to what the trailblazers are doing?

- Are you planning ahead with a clear and strategic *vision* concerning future capabilities and competitiveness?
- Is your strategy driven by *performance* and tying proven opportunities to growth, progress and innovation?
- Are you focused on how *smart products* and *smart processes* can be linked?
- Are you moving toward large-scale and proactive integration across every aspect of your company's *value chain* — from product design and production to marketplace delivery and customer experience?
- Is senior management actively exploring and learning about *every opportunity* i4.0 has to offer?
- Is your leadership *thinking big* and *acting boldly* to nurture innovation, while encouraging disruptive thinking to upset the status quo?





# Focus on value and performance first — not technology

New roadblocks continue to appear as companies race toward greater i4.0 competence. Many are still blinded by the technology. They fail to focus on opportunities to enhance performance and value across the entire spectrum of the value chain. (See centerfold infographic on page 14 for how value can be maximized by taking an enterprise approach across the entire value chain.)



We see a marked difference when companies engage us with strategic business transformation objectives (versus one-off implementations) in mind.”

**Howard Heppelmann**  
Vice President and  
General Manager,  
Connected Operations  
PTC Inc.

Real interconnectedness can only be attained through a cross-functional approach, with new value opportunities explicitly identified. We use cross-functional teams and a performance- and value-based approach to defining the i4.0 roadmap. This helps companies focus on the appropriate scalable initiatives enroute to a more connected environment. The critical component, however, is that strategy and business-related questions are answered *before* the technology questions.

“We see a marked difference when companies engage us with strategic business transformation objectives (versus one-off implementations) in mind. They are knowledgeable about the benefits of enterprise interconnectivity, decisive about their digital requirements, clear about the strategic value they are pursuing and

understand the urgency to act in order to seize opportunities and/or mitigate risks. Their confidence is a direct reflection of the mandate and support they are receiving from top leadership,” says Howard Heppelmann, vice-president and general manager, Connected Operations at leading Industrial IoT software provider PTC Inc.<sup>3</sup>

Unfortunately, many companies launch i4.0 initiatives aligned around a specific technology — augmented reality or digital twinning, for example — rather than as a component of an integrated plan or roadmap. Diverse projects or use cases are simultaneously conducted — but rarely aligned. This picture is complicated by the traditional organizational structure in which projects are managed within separate functional groups.

<sup>3</sup> PTC Named a Leader in Industrial IoT Software Platforms by Top Independent Research Firm.  
<https://www.ptc.com/en/news/2018/ptc-named-a-leader-in-industrial-iot-software-platforms>



## In their words:

### Timely insights from leading IoT software provider PTC

**Howard Heppelmann**  
Vice President and General Manager, Connected Operations, at top-rated industrial IoT software provider, PTC Inc.<sup>4</sup>

At PTC, we have had the honor of engaging thousands of companies on the topic of Industry 4.0. While pilots and test beds are normal in the development of new technologies, the value equation grows exponentially when the market transitions to repeatable use cases (patterns) that are rooted in proven, high-value ROI. The smart, connected-operations market has reached the traditional inflection point where early adopters focused on technology are rapidly giving way to CEO-led initiatives to drive digital transformation encompassing the full potential of connected products, connected operations and connected supply chains. While CEOs are endorsing digital transformation at an exponential rate, the vast majority of industrial companies are still moving too slowly and have failed to grasp the enormous opportunities and equally enormous threats this fourth industrial revolution presents to their organization. They are engaging their organization as if this were a traditional IT project that will be execution levels down in the organization. They have not yet recognized that in order to capitalize on the full value-chain spectrum, and the opportunity to drive new levels of business performance and value through interconnectedness, nearly every function of their organization will need to participate in the transformation.”

“

If you are like many companies with isolated or technology-led i4.0 initiatives already in play, it is time to take stock, evaluate the results from your efforts to date and engage the C-suite to pursue a more-strategic vision that includes performance and value creation.”

**Michele Hendricks**  
Executive Director for Global i4.0  
KPMG in the US



## Figure 1. A performance-led approach

We have found that most companies start with technology and work backwards to apply it

Most common approach we see...



...resulting in a **technology** based approach

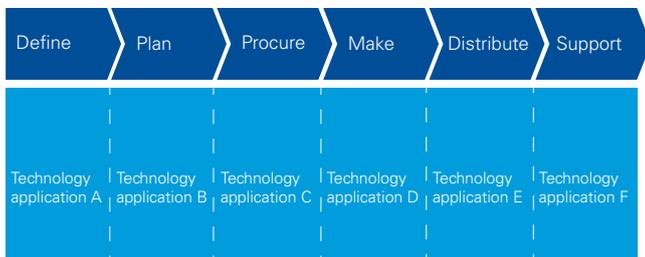
The leading companies reversed the sequence...



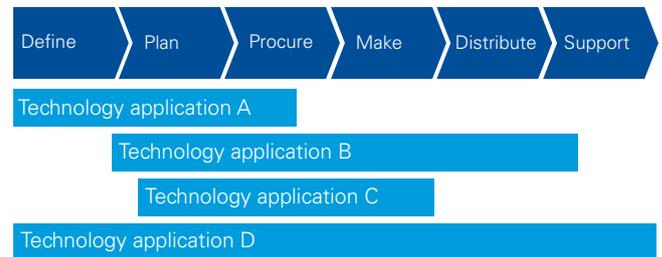
...resulting in a **value** based approach

We also frequently see a functional based approach that limits i4.0 value capture and deployment

Illustrative functional-based approach...



...rather than a cross-functional approach



Ultimately, these businesses are working backwards. Yes, analytics tools will deliver new customer insights. Digital twinning may improve design and performance. Robotics and machine-to-machine capabilities can accelerate production. So your factory might run a bit more smoothly. Costs could decline. Customer satisfaction may rise. But *maximizing* i4.0 value hinges on interconnected technologies whose vast capabilities are integrated at a product and value-chain level. (See Figure 1.)

“If you are like many companies with isolated or technology-led i4.0 initiatives already in play, it is time to take stock, evaluate the results from your efforts to date and engage the C-suite to pursue a more strategic vision that includes performance and value creation,” says Michele Hendricks, executive director for global i4.0, KPMG in the US.

“Avoid analog thinking in a digital world,” warns Philip Harris, associate partner and i4.0 country leader, KPMG in the UK. “Functional silos are the historical legacy of a time when we kept things simple so that we could make decisions in our heads. Now, technology frees us to look broader and further, finding the sweet spot of performance for the organization as a whole.”

### The need for speed should be obvious by now

Today’s global leaders on transformation have bolted from the starting blocks with a vengeance. Forrester Research is projecting that global purchases of technology software, hardware and services by businesses and governments will rise by 4 percent this year. Software and tech consulting services spending are expected to show the strongest growth — spending in both categories jumping by more than 6 percent this year alone.<sup>4</sup>

That is not surprising, considering the explosive and sustained growth of the so-called Big 5 technology giants that are among firms and start-ups disrupting every sector. Apple, Alphabet, Amazon, Facebook, Microsoft are, combined, worth in excess of US\$3 trillion.<sup>5</sup> And the disruptors are growing by the day.

According to KPMG International’s 2018 Global CEO Outlook survey, meanwhile, just over half of the manufacturing CEOs we surveyed said they are actively looking to disrupt the sector in which they operate.

“What surprises me the most is that companies are failing to see the impending disruption that integrated data and IoT is bringing to every industry. Manufacturers large or small are in no way insulated from this disruption,” says Greg Corlis, managing director, Advisory and global IoT leader, KPMG in the US.

<sup>4</sup> Forrester *Midyear Global Tech Market Outlook For 2017 To 2018* <https://www.forrester.com/report/Midyear+Global+Tech+Market+Outlook+For+2017+To+2018/-/E-RES140272>

<sup>5</sup> Reuters News — *Apple races toward US\$1-trillion valuation with Amazon hot on its heels.* <https://www.theglobeandmail.com/business/technology/article-apple-races-towards-1-trillion-valuation-with-amazon-hot-on-its-heels/>



## Case Study

### The KPMG case for i4.0 success:

## Transforming a global pharmaceutical giant — one step at a time

A multinational pharmaceutical set out on an ambitious i4.0 transformation journey that began with the initial goal of enhancing performance within its manufacturing processes and supply chain. But the organization's original business plan for digital transformation — one year in the making — was deemed to provide inadequate return on investment and was therefore postponed by the management board pending revisions.

The business turned to KPMG's digital experts for insights and guidance on how best to quickly strengthen its plan and position it for immediate implementation. The joint team worked to streamline the existing substantial plan. They took its diverse technology initiatives and realigned them within a structured i4.0 roadmap, prioritized and sequenced for performance and value.

The KPMG team's revised approach revealed to company leaders the critical importance of putting performance ahead of technology — and not jumping too soon to solutions. Instead, processes and decision making were mapped at an enterprise-wide level. Prioritizing of activities then determined where digital would most help achieve the company's business strategy. Crucially, these select initiatives were deliberately sequenced in a way that optimized returns for the company.

The result? The revised transformation plan has created a precise new path promising significantly improved returns — a fourfold ROI increase from original forecasting. And a shorter timeframe than initially anticipated now exists. The company's i4.0 journey is underway with full board approval and much anticipation of the exciting changes ahead.

Businesses need to respond now, as we continue to stress to the organizations and leaders we encounter.

"The coming decade and beyond is expected to produce a massive realignment in every industry and slower-moving players will become irrelevant on tomorrow's redefined playing field," says Martin Saier, manager and i4.0 country leader, KPMG in Germany.

"Businesses have no time to lose in their quest to respond to how future value will be derived via i4.0 amid the changing ecosystem of new business models, products and markets," he adds. "I emphasize with clients the critical need to choose a long-term view that transcends short-term, siloed, technology-led gains."



## Taking bold action

- A cross-functional, performance- and value-based approach toward strategic, scalable initiatives is critical to success on today's historic i4.0 journey.
- The journey cannot begin without a clear understanding of your business goals and a precise roadmap for the future.
- To drive interconnectedness, break down siloed, tech-first approaches to innovation.
- Avoid analog thinking in a digital world — and act with a sense of urgency!

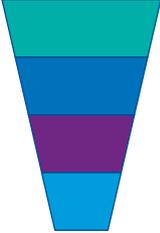
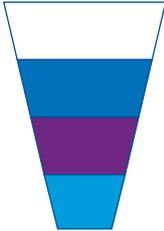
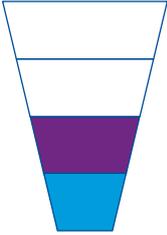
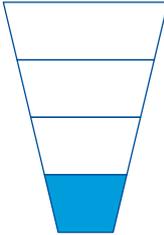


What surprises me the most is that companies are failing to see the impending disruption that integrated data and IoT is bringing to every industry. Manufacturers large or small are in no way insulated from this disruption. ”

### Greg Corlis

Managing Director Advisory and Global IoT leader  
KPMG in the US

## KPMG i4.0 value framework — typical returns based on value category

| Value category  | Typical value levers  | Value ranges <sup>(a)</sup>  |
|---|---|--|
| <b>Enterprise value</b><br>  | Product portfolio<br>Product/customer segmentation<br>Product architecture<br>Product design<br>Technology<br>Innovation  | 20-30%<br>  |
| <b>Network value</b><br>    | Manufacturing footprint<br>Sourcing strategy<br>Supply chain design<br>Make versus buy decisions  | 10-20%<br> |
| <b>Planning value</b><br>  | Operating systems and practices<br>Organizational policies and procedures<br>Production volumes<br>Supplier costs   | 5-11%<br> |
| <b>Execution value</b><br> | Operating efficiency<br>All costs paid: <ul style="list-style-type: none"> <li>— Labor costs (wages)</li> <li>— Taxes</li> <li>— Production system refresh</li> </ul> | 3-6%<br>  |

Note: (a) Value ranges are inclusive of values in lower categories. Value will differ based on level of organizational maturity and cost structure. Percentages are based on total revenue.

## Sample of questions that illustrate the difference in value creation opportunities...



|                             |  |   |   |   |  |   |   |
|-----------------------------|--|---|---|---|--|---|---|
| <b>Enterprise value</b><br> | What are the portfolio options between products and services?                                | What is the business case and product lifecycle management process?   | What components will be purchased versus internally produced?             | What products should be manufactured and how can alignment with demand be assured?    | How can inventory alignment with customer demand be ensured?               | How are changes to customer requirements and demand variability absorbed? | How are customer needs fed into the manufacturing process, or new products and services altogether? |
| <b>Network value</b><br>    | What opportunities exist for collaborative design, and with who — who owns design authority? | What are the capabilities of potential partners?<br><br>Is there a strategic value to supply/production location? | Who should the suppliers be and where should they be located?             | What should be the size, focus and location of facilities?                            | What should be the size and location of the distribution network?          | What should be the distribution footprint and channel choices?            | Where and how will the aftermarket be serviced?   |
| <b>Planning value</b><br>   | What is the structure of communication with collaboration partners?                          | How can the necessary assets and capabilities to deliver product be acquired?                                     | What is the methodology for flowing down requirements to the supply base? | What are the optimal operational processes (quality, planning, materials management)? | What are the optimal policies for transportation and inventory management? | How are the delivery routes and speed optimized?                          | What procedures will ensure part replenishment and customer feedback loops?                         |
| <b>Execution value</b><br>  | How is the effectiveness of the design process managed?                                      | How is business case adherence tracked?   | How do I ensure price and service efficiency?                             | What people and tools are needed to ensure operational efficiency?                    | How are inventory movements optimized?                                     | What processes ensure delivery schedule adherence?                        | How will unfulfilled demand be addressed?   |

## ...and how enabling technology can be applied to those elements of the value chain



|   |  |
|---|--|
| <b>Shop floor</b><br>                                 | <b>Robotics</b><br>The use of computer-controlled robots to perform manual tasks, such as those on an assembly                     |
|   | <b>3D printing</b><br>The of creating a 3-D object using layers of material formed under computer control process                  |
| <b>Analysis</b><br>                                   | <b>Sensor technology</b><br>A sensor that is able to detect environmental conditions and respond to them                           |
|   | <b>AI and machine learning</b><br>Enables new insights and decision making from large datasets                                     |
|   | <b>Digital twin</b><br>Provides digital replicas on which to diagnose issues and test operational changes                          |
| <b>Communications, storage and infrastructure</b><br> | <b>Augmented reality</b><br>Allows new visualizations of data to enhance worker productivity                                       |
|   | <b>Communications network infrastructure</b><br>Allows data transfer between machines and humans and extensive system integrations |
|   | <b>Big data platforms</b><br>Stores, manipulates, and presents data, while also allowing new levels of operational control         |
|   | <b>Digital supply chain</b><br>Real-time visibility to supply and demand to remove latency across network                          |
|   | <b>IoT enabled cyber security</b><br>New cyber security techniques necessitated by newly digitized and automated operations        |



# The journey to value starts with one critical question: *Why?*

Before embarking on an improvised journey, we urge CEOs, C-suite leaders and their companies to ask themselves: *'Why? Why are you pursuing change?'*



Perhaps you desire only one of these outputs. Each represents potential outcomes — ‘destinations’ for using i4.0 enabling technologies. But it is critical to have a clear understanding of the anticipated end-game. ”

## **Ravind Mithe**

Partner, Operations Advisory and i4.0 country leader  
KPMG in India

Understand the different levels of value and the associated impact to the organization. “Are you trying to simply improve operational metrics? Change operating policy and procedure? Significantly improve the effectiveness of your network? Potentially create new products and service offerings? These are all questions companies need to address,” says Ravind Mithe, partner, operations advisory and i4.0 country leader, KPMG in India.

“Perhaps you desire only one of these outputs. Perhaps a bit of all,” Mithe continues. “Each represents potential outcomes — ‘destinations’ for using i4.0 enabling technologies. But it is critical to have a clear understanding of the anticipated end-game.”

It is also important to recognize the sphere of influence regarding your value choices. Control of operational value levers can be kept within the four walls of the organization. But

once you move to supply chain and product levers, it extends both upstream and downstream of the four factory walls.

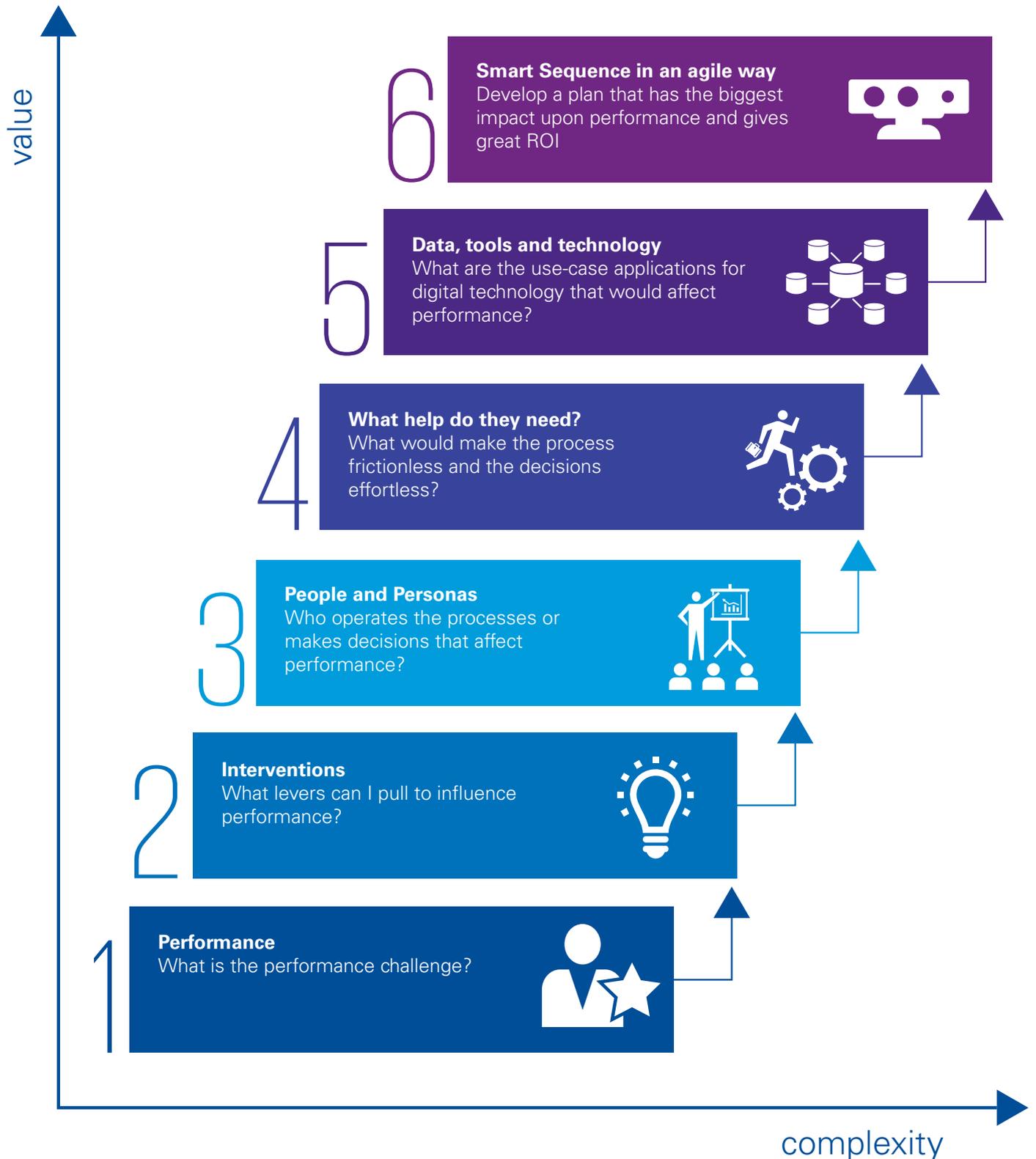
“At one level, digital is simple: it is about making your processes as frictionless and your decisions as effortless as possible, in line with your performance goals,” KPMG’s Harris notes.

So which i4.0 playing field are you going to be on — purely operational or transformative across the enterprise?

Exactly what, then, does your organization need to look like tomorrow to be competitive or disruptive? Start with value objectives and performance drivers. (See Figure 2.) And in mapping out a smart i4.0 journey, look beyond the factory floor. The potential for an exciting new business model promising unprecedented value awaits.

## Figure 2. What does a performance-led approach look like?

Starting with performance ensures that all digital activities and projects are driven by strategy — not by technology or data.



“

Elements of the value chain were incorporated into their overall strategy. And that's how companies should be thinking today as they pursue i4.0 transformation. Understand the *value* and *performance* factors of the business and then pursue the appropriate *technology* and related capabilities.”

**Carmelo Mariano**

Partner, Advisory and i4.0 project and country leader KPMG in Italy



**Case Study**

**The KPMG case for i4.0 success:**

Lamborghini shifts gears into smart manufacturing's fast lane

Legendary exotic car maker Lamborghini decided to shift gears on production and build a new smart factory from the ground up for its new Urus — the world's first 'super sport utility vehicle.'

The famous auto manufacturer turned to KPMG's experts for their guidance and collaboration as it set out to build what would be its first factory of the future. The i4.0 journey began with a targeted customer market in mind for the new model. And with a clear understanding of the needs and preferences of the targeted market segment, the client and KPMG collaborated on a comprehensive i4.0 strategy that defined how the factory, its technology and its processes should work.

With a strategic i4.0 roadmap and its precise objectives in hand, KPMG developed and implemented the complex IT platform that manages manufacturing operation in the entire assembly and finishing halls. The factory features an unprecedented modular design, using digital sensors and robots in a collaborative environment.

Boasting the most-advanced Industry 4.0 standards, the futuristic facility merges virtual worlds and live production by integrating robotics and machine-to-machine collaboration with Lamborghini's skilled production workers. Each vehicle moves along the production floor via automatic guided vehicles (AGVs) that autonomously transport each car to the appropriate work island.

Electronic monitoring, data collection and reporting from every corner of the shop floor are available instantly and workers can control every aspect of production on site — or remotely from any location — using tablets that fully eliminate reliance on paper documents.

“Our ground-breaking Lamborghini project proved again the critical importance of considering value before technology on the i4.0 journey,” says KPMG's Italy-based project leader Carmelo Mariano. “Elements of the value chain were incorporated into their overall strategy. And that is how companies should be thinking today as they pursue i4.0 transformation. Understand the value and performance factors of the business and then pursue the appropriate technology and related capabilities.”

Today's informed manufacturers clearly see how fully integrating i4.0 across the enterprise will create new levels of value. Even more is achieved when suppliers and value chain players are also brought into the i4.0 environment. Unprecedented visibility, responsiveness and operating-capital flexibility awaits.

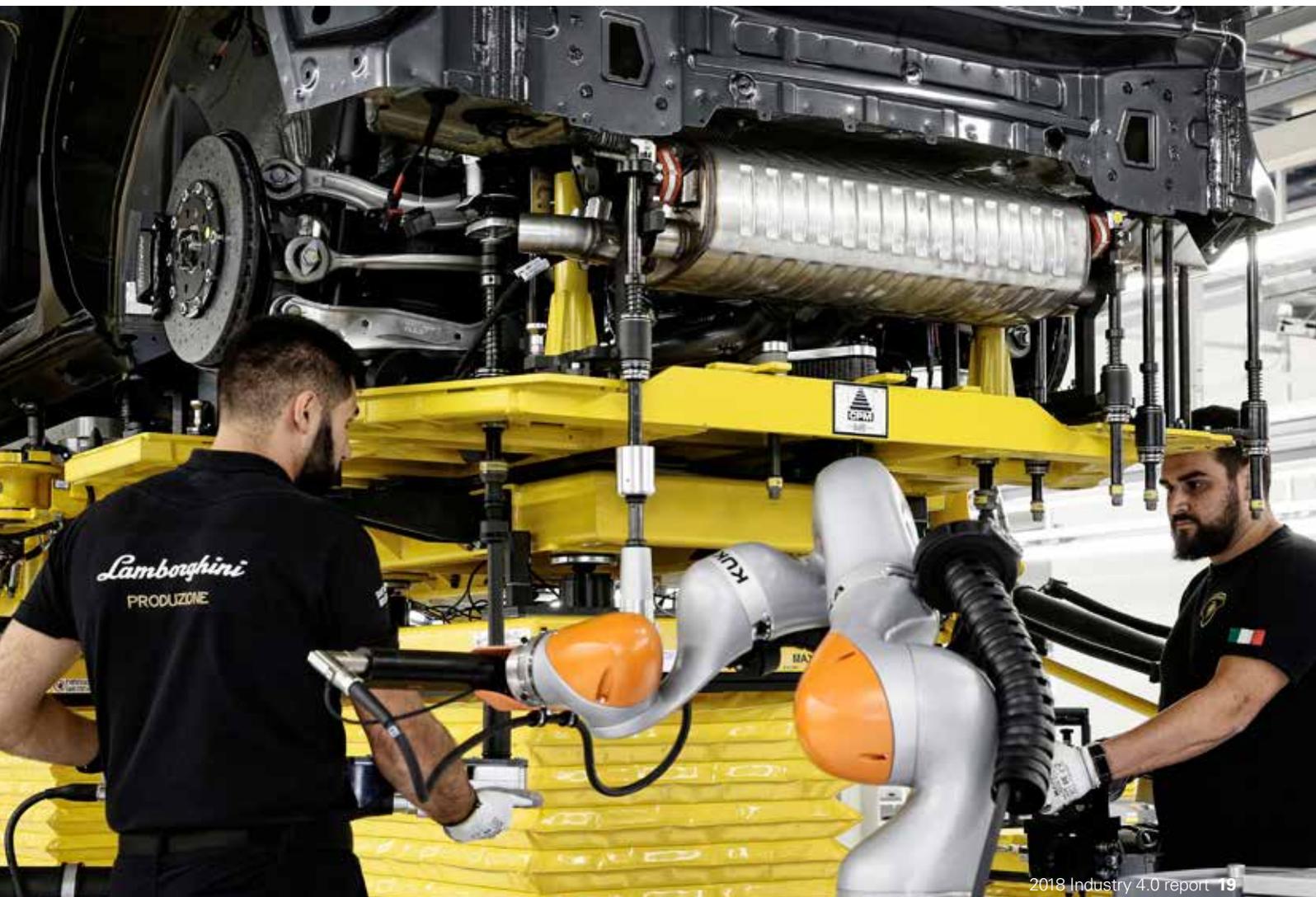
The real value emerges as today's value chain is reshaped into tomorrow's i4.0 *value network*. Data is shared flexibly between various nodes in the supply chain. Decisions and demand signals are shared in real time across the network. Data sources are integrated across systems. New opportunities are uncovered and dramatic performance improvements emerge.

"An i4.0 value network, with supply chain control towers, allows the extended supply chain to work as one virtual organization that can dynamically adjust to meet customer needs. Clients that have adopted these models have dramatically improved supplier responsiveness and on time in full, while reducing demand and supply disruptions and better balancing inventory positions across all nodes of the network," says Rob Barrett, principal, Procurement & Operations Advisory, KPMG in the US.



## Taking bold action

- Before embarking on an improvised journey, CEOs need to ask 'Why?'
- Know why you are pursuing change.
- Know where you want to play on the value-chain spectrum — executional, operational, network and enterprise, or marketplace?
- Integrating i4.0 across the enterprise will create significant new levels of value — reshaping the value chain into an interconnected value network.

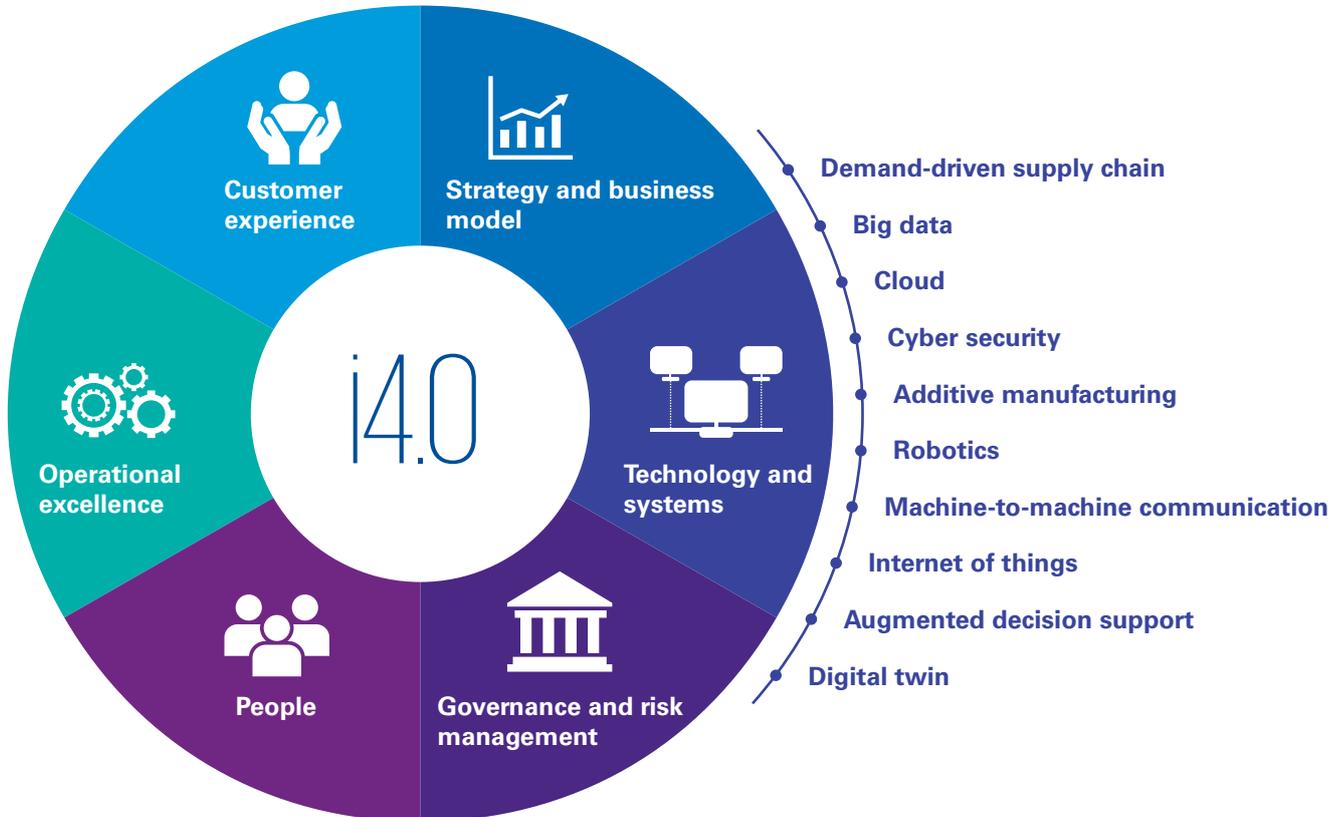




# The i4.0 enablers that are crucial to success

Businesses must understand the importance of continually measuring and driving the evolution of the i4.0 enterprise. That makes it imperative to implement what we consider *critical enablers* for success on i4.0 transformation: new metrics and incentives, new skills, change management, governance, cyber security and more. (See Figure 3.)

**Figure 3. Dimensions**



Source: KPMG International, Industry 4.0



Metrics on the i4.0 journey should include traditional efficiency, quality and cost benchmarks in the near term. But the challenge now is to generate deeper changes and benefits that include:

- significant, ongoing product improvement and innovation
- rising customer satisfaction and loyalty
- market share gains
- rising shareholder value
- marketplace disruption through new revenue-generating business models

“You say you ‘met your numbers’ this quarter? Congratulations, but I would say confidently that those results are not sustainable unless you have a digital transformation agenda underway,” according to Vinodkumar Ramachandran, principal, strategy practice, KPMG in India. Tomorrow’s world promises intelligent, timely, precise new forms of performance measurement. This new ecosystem offers relevant, target-based data captured by sensors and combined, analyzed and communicated instantaneously.

“Performance reporting and decision-making move into the realm of informed, data-based business insights and predictive capabilities,” adds Michael Seitz, partner, Operations Advisory and i4.0 country leader, KPMG in China. “Optimized performance, decision-making and competitiveness follow.”

The fifth generation of mobile network standards (5G), for example, is being anticipated as a revolution as fundamental as the building of railways. It will deliver immense new benefits to the enterprise market, connected factories, logistics, transportation, workforces and beyond. 5G offers the opportunity to secure the internet-enabled products and processes of i4.0, as equipment and sensors communicate directly with each other to make decisions independently of humans. What has constrained its use to date has been limited mobile bandwidth and the ability to do things both securely and quickly enough. 5G can provide this.

Some organizations will struggle to cope with the tsunami of data unleashed by 5G. But it represents a real opportunity, for those possessing the skills and technological ability, to take advantage of the rich insights it will give them.

“  
Performance reporting and decision-making move into the realm of informed, data-based business insights and predictive capabilities.”

**Michael Seitz**  
Partner, Operations Advisory  
and i4.0 country leader  
KPMG China

“  
What 5G enables is the ability to deliver high network availability, high bandwidth and low latency delay times to the edge of networks, mobile devices and sensors, in a way that we have not been able to do to date.”

**Mike Stone**

Global Head of Technology Transformation for Infrastructure Government and Healthcare KPMG International

“What 5G enables is the ability to deliver high network availability, high bandwidth and low latency delay times to the edge of networks, mobile devices and sensors in a way that we have not been able to do to date,” says Mike Stone, KPMG’s global head of Technology Transformation for Infrastructure, Government and Healthcare.<sup>6</sup>

“I absolutely believe that this is revolutionary and will be a fundamental enabler of the digital economy and i4.0, including artificial intelligence, analytics, internet of things, augmented and virtual reality, as well as robotics and driverless vehicles. There will be a huge first-mover advantage.”

5G is real and just around the corner. Organizations need to think about when equipment and services will become commercially available, how they are going to plan for this and how they can take advantage of early adoption.

“The proliferation of data and the internet of things — within and beyond factory floors — will also force a new focus on cyber risk,” according to Akhilesh Tuteja, principal, Risk Advisory and Global Cyber Security co-leader, KPMG in India. “Certainly, 5G will allow significantly greater cyber security measures to be added to the stack without slowing down systems. But that may be a few years away for most companies. In the meantime, those embracing IoT must remain vigilant about cyber risk, defenses and responses.”

**Winning the war for talent on the new frontier**

The machines are here. And with them, the need to redefine workforces. Those new workforces will feature critical new skills that drive ongoing innovation. And they’ll boast talent that productively collaborates with robotics, artificial intelligence, automation, data and analytics tools.

Disruptive new business models are already fueling an unmistakable war for talent. Our message from the front? The battle must be waged from the top. C-suite leaders need the know-how to weave workforce innovation, skills development and a change-focused culture into new business models. The winners will gain a critical edge in competitiveness and performance.

“Most organizations find attracting and retaining next-generation talent difficult when their strategy for disruption and ways of working do not align. Leading organizations are using this once-in-a-generation opportunity to revamp work and take advantage of technology, automation and skills with the human in the center,” according to Michael DiClaudio, principal, People & Change Advisory, KPMG in the US.

US-based aerospace systems maker United Technologies Corporation is demonstrating how to attract the best talent. UTC is pursuing the new skills needed for its future success. It announced earlier this year plans to hire 35,000 employees in the US over the next five years — equivalent to half its current domestic workforce.

<sup>6</sup> KPMG — *Why it’s time to plan for 5G’s revolutionary opportunities.*  
<https://home.kpmg.com/xx/en/home/insights/2018/08/plan-for-the-5g-revolution.html>

UTC's talent strategy includes competitive pay and highlighting its manufacturing facilities and workforce education programs. According to CEO Gregory Hayes, UTC is assembling a highly skilled, 21st-century team to assure competitive advantage in the digital economy. A new US\$300 million digital tech hub in Brooklyn, NY, is designed to help UTC develop and retain the talent needed to sustain its evolution.

"Do not underestimate the cool factor among data scientists," says KPMG's Michele Hendricks. "Location matters. Excitement matters. You will have trouble attracting and retaining talent if you are not building a compelling story for the future of your company and the role it will play in the changing ecosystem."

Governments the world over are adding 'fuel to the fire' with lucrative tax and trade incentives for businesses that are willing to bring i4.0 technologies into their neighborhood.

## Change management, governance and communication

Intelligent, modern change management is indispensable in the digital economy — and CEOs need to lead the way here as well. Yet we see no clear sense of urgency to create programs facilitating a seamless, continuous transition to i4.0 ecosystems.

New governance frameworks and controls will need to manage new 'digital employees' and their relationships to cognitive technologies within tomorrow's workplace cultures.

Within these cultures, smart leaders will proactively communicate directly and frequently to employees. According to Sascha Glemser, partner, Enterprise Resource Planning and Customer Advisory, KPMG in Germany. "Companies will need to articulate the i4.0 vision and sustain everyone's confident engagement along the i4.0 journey. Add to that a dose of enthusiasm, encouraging employees to participate in shaping the enterprise of the future. And these dynamic new workplace cultures will transcend the factory floor to reach every corner of the business."



## Taking bold action

- Pay close attention to the need for new metrics and incentives, new skills, change management, governance for i4.0 success.
- Shun traditional KPIs and soon-obsolete organizational dynamics. Measuring performance needs to rise to a new level.
- Prepare for 5G, as it will be a step-change for connected factories and products, and first-movers will gain competitive advantage.
- The war for talent is real — strategic transformation demands redefined workforces possessing new skills.
- Intelligent, modern change management becomes indispensable in the digital economy — CEOs need to lead the way as dedicated change agents.





## CEOs: 5 questions to ask for smarter i4.0

1

**Why** are you pursuing change? Knowing why is the starting point on the i4.0 journey. Have a precise understanding your i4.0 playing field — from operational changes to enterprise-wide transformation.

2

**What** kind of performance and value do you need to deliver as a business? Knowing what will differentiate you from competitors will help you decide how to prioritize new i4.0 technology choices *in the present and the future*.

3

**When** will i4.0 initiatives unfold within a smart sequence of ongoing change over time? Deciding what to do first, second, third and beyond will optimize your new capabilities and maximize return on investment.

4

**How** will you implement, govern the process and track change strategically to maximize performance and value capture? An informed *governance structure, approach and value-tracking methodology* will be critical to success.

5

**Who** do you need to include in your i4.0 future to deliver the highly specialized, cross-functional skills that maximize performance? The talent challenge is no longer an HR issue but an overarching business challenge for the C-suite.



## Case Study

### The KPMG case for i4.0 success:

## Smart farming blooms in South Korea

One of the world's largest mushroom-farming operations — a South Korean company producing more than 23 million kilograms of mushrooms annually — recognized the need to dramatically transform its sprawling organization amid rising labor costs and fierce competition in the global market.

To drive new levels of value and competitiveness in the digital economy, a bold transformation toward 'smart farming' was deemed inevitable. The company embarked on an i4.0 journey in partnership with KPMG's proven team of digital experts.

With value and performance parameters established and a comprehensive i4.0 roadmap in place, the client collaborated closely with the KPMG team to drive its ambitious transformation journey forward.

Real-time production data was collected and analyzed using IoT technology, digital sensors and a state-of-the-art data analytics platform. Manual tasks across the farming, sorting and packing ecosystem were largely mechanized using modern automation equipment and robots. The company moved from a heavy reliance on manual labor to a mechanized digital enterprise.

The result? Data analysis has revealed a new production approach that significantly improves crop yields by optimizing the fertilizer-to-soil ratios used in mushroom cultivation — generating a remarkable 30 percent increase in output.

In addition, the deployment of automation equipment and robots — combined with analysis of workers' movements in the production process — revealed new business insights. The company has therefore reorganized its factory layout, further optimizing productivity and lowering labor costs.

The company's holistic approach has dramatically improved its value, performance and competitiveness in terms of productivity, efficiency and quality — and its future prospects for success in the digital economy.



# Conclusion

## Attention, CEOs: Action that defines the winners

Our call to action for business leaders is clear. Today's i4.0 transformation challenge demands timely strategies as historic change rewrites the rules for success in the digital economy.

As we have emphasized in this report, CEOs and leaders need to 'own' the journey and conclusively address the new threats to success and survival. It is up to today's leaders to act as dedicated change agents, pursuing i4.0 intelligently and strategically.

As noted, we have seen an overwhelming lack of confidence and clarity on i4.0 among businesses today. Amid the dramatic changes engulfing every sector, few leaders appear

willing — or prepared — to pursue bold steps instead of narrow initiatives. Their focus on the business at hand is keeping leaders from looking around the corner at the future they can create. A lack of knowledge and vision persist concerning i4.0's potential — and the serious risks of inaction.

We recognize that this journey is complex. For many forward-looking companies, KPMG is serving as a 'digital guide'. Our teams are helping

them solve issues concerning their value chain, where technology fits in, and what a new ecosystem of interconnected technology looks like. We are partnering with technology providers across the entire value chain to provide a seamless, i4.0 integration. We are also providing timely insights, guidance and best practices on i4.0 change management, governance and waging the war for talent. We leave readers with these concise key take-aways as part of our call to action:



## KPMG's Key take-aways

### 1 Time for experimentation is over — be bold and strategic

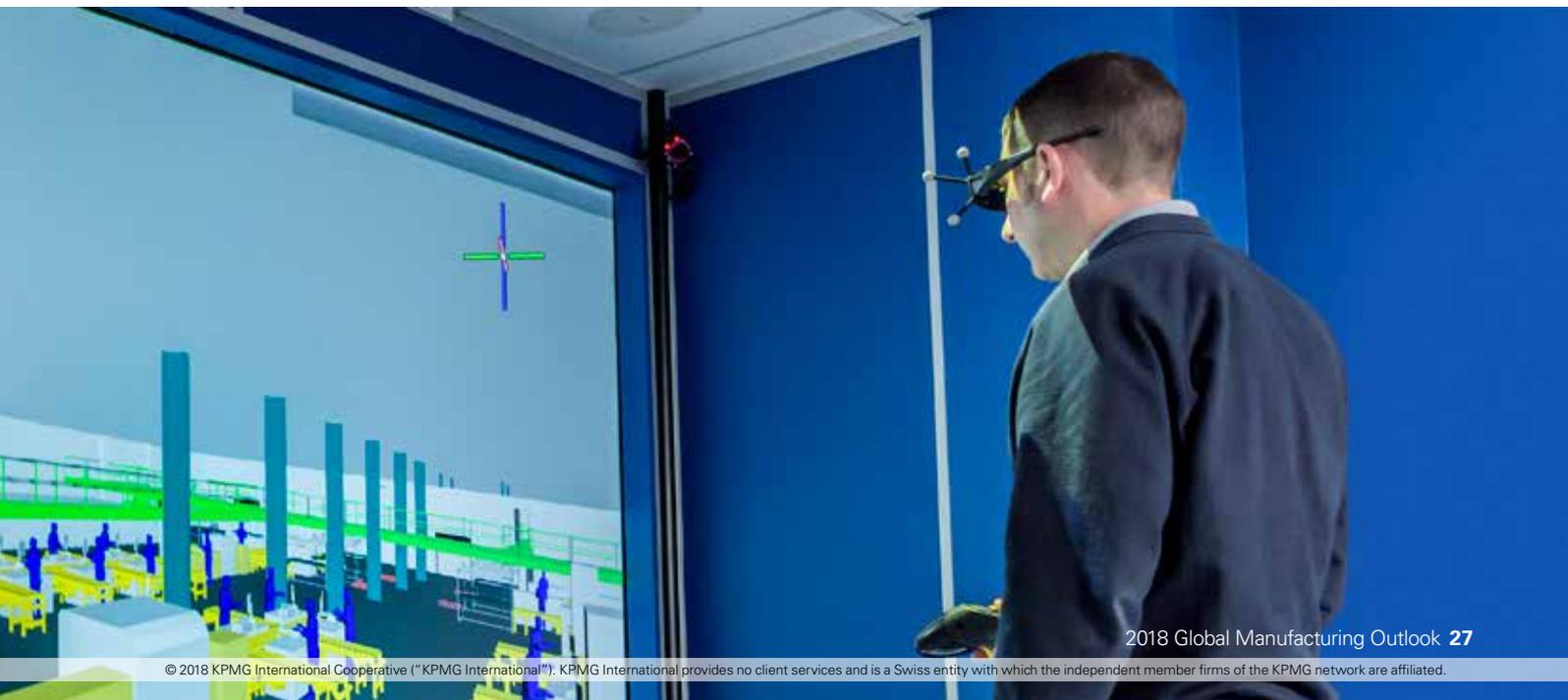
We are in the midst of a generational shift in manufacturing. The challenge for CEOs and C-suite decision-makers is nothing less than historic. View the road ahead as a pressing business issue involving connectivity. Exercise bold leadership that builds holistic strategy from the C-suite — not the plant floor.

### 2 Pursue value and performance first — not technology — for a holistic ecosystem

You cannot buy your way to i4.0 maturity. True transformation requires a precise, sequenced roadmap. Before embarking on the complex journey, ask *why* you are pursuing change. Focus on driving strategic business results first, rather than individual technologies. Redesign your organization from functional siloes to value networks and create a culture that embraces the enterprise value of new digital technologies.

### 3 Recognize today's opportunities — and the real threats to survival

It falls to CEOs and C-suite leaders to play an instrumental role in driving i4.0 transformation. Develop strategic programs that are enterprise-wide and forward looking. Rethink your current KPIs in ways that will redefine how you measure future success. Embrace 'ownership' of this historic i4.0 journey. Understand that you are at the threshold of unprecedented opportunities and new threats to success and survival — in the digital economy.



# How KPMG can help

KPMG member firms understand the challenges and opportunities facing industrial manufacturers. Every day, our people work shoulder-to-shoulder with the world's most-innovative manufacturing leaders as they pursue intelligent Industry 4.0 transformation. Our experience and research give us insights into the reality surrounding this transformative era — and the historic challenges it presents.

This report confirms our belief that to help maximize value, maintain competitive advantage and ensure competitiveness, leaders must take ownership of the i4.0 transformation journey. Understand the need to act as dedicated agents of change, while taking a holistic approach to transformation.

No matter where you are on your digital journey, KPMG member firm

professionals are available to help you find and secure value.

Our industrial manufacturing teams help your organization to:

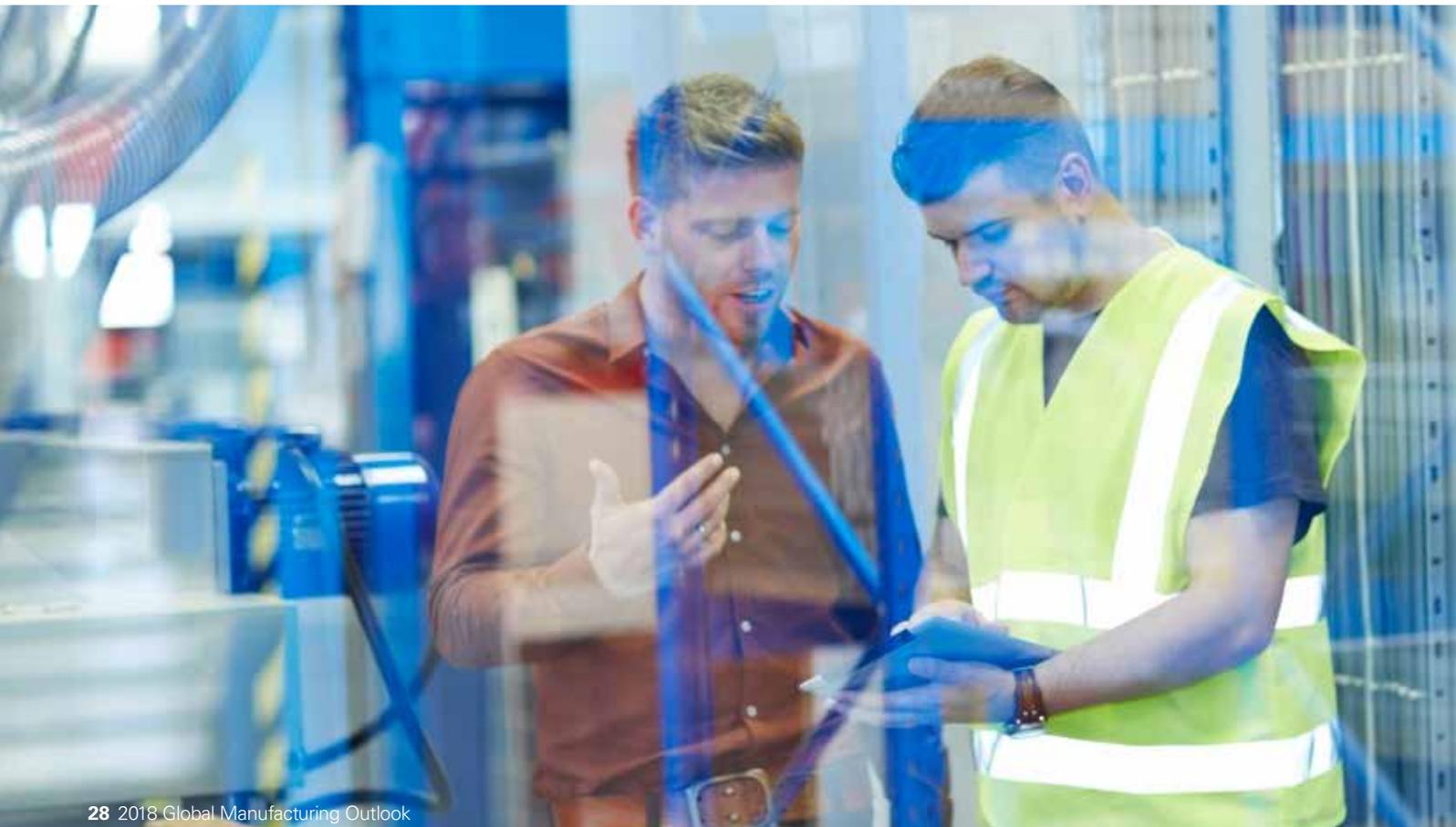
- Identify what your business should look like and where it will compete;
- Create your unique digital transformation vision, strategy and roadmap;
- Take a holistic approach that leads with value and performance;
- Implement process and technology changes to your business and operating models.

Leading industrial manufacturers select KPMG member firms because we take a technology-agnostic approach that offers clients truly independent advice and sensible choices. Businesses choose

us because they know we don't create pie-in-the-sky strategies. Our teams help clients see the *why, when, where* and *how* of their i4.0 decisions. Our teams understand how to develop business propositions that resonate with the C-suite and board.

With deep leadership in key areas such as strategy, data and analytics, cybersecurity, intelligent automation, change and risk management, and supply chain/operational excellence, we cover all the elements of the i4.0 transformation journey from strategy through implementation.

For more information we encourage you to contact any of the contributors listed in the publication or your local KPMG member firm.



## Further KPMG Insights

If you have found this publication useful, you may also enjoy these other insights from KPMG related to the topics in this report. Or visit [kpmg.com/industrialmanufacturing](https://kpmg.com/industrialmanufacturing) to find the latest thought leadership around the complexity of the manufacturing environment.



### **Global Manufacturing Outlook 8th edition: Transforming for a digitally connected future**

The 2018 survey report, *Transforming for a digitally connected future*, focuses on the hot topic of today, digital transformation. It addresses the need for manufacturers to seize the transformation opportunity lest they be left behind by new industry entrants and competitors.

This is no time for manufacturers to hide behind old business models, and our 300+ CEO respondents agree. The findings include key executives at major companies and insights from KPMG's global experts. The resulting publication provides a rare opportunity to share new ideas with clients and discuss with them the views of their peers.



### **Industry 4.0 investment — don't leave government incentives on the table**

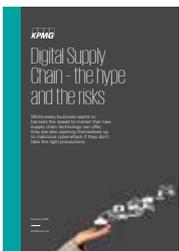
With governments the world over looking to attract smart manufacturing, KPMG's i4.0 tax practitioners examined the 10 leading manufacturing economies — plus several others vying to make their mark in advanced manufacturing — to assess i4.0 attractiveness with respect to tax and trade incentives. This article highlights the regional winners and some examples in action.



### **Data & Analytics Thought Leadership Survey | Guardians of trust: Who is responsible for trusted analytics in the digital age?**

This survey explores questions of responsibility when analytics go wrong, suggesting the need for proactive governance to build and maintain trust.

KPMG International commissioned Forrester Consulting to survey 2,190 global information technology and business decision-makers with involvement in setting strategy for data initiatives at their organizations.



### **Digital supply chain: the hype and the risks**

This report looks at how businesses who want to harness the speed to market that new supply chain technology can offer can also guard against malicious cyberattacks.

It covers the most-hyped improvements in supply chain technology and case studies and KPMG's Cyber Security approach.



### **Beyond the hype: Separating i4.0 ambition from reality**

This report offers a realistic perspective on the current state of Industry 4.0(i4.0) adoption and readiness across the market. It is based on a series of in-depth benchmarking exercises with leading industrial manufacturers around the world. And it identifies how today's market leaders are taking advantage of comprehensive i4.0 strategies to make changes to their business models, operating models and value chains.



### **JDA & KPMG Digital Supply Chain in Retail & Manufacturing: A State of the Industry Benchmark, conducted by Incisiv**

The supply chain in retail and manufacturing survey, conducted in 2018 for JDA and KPMG by Incisiv, outlines how retailers and manufacturers are leveraging innovative technologies and strategic alliances to improve speed-to-market and deliver a superior customer experience profitably. Trying to keep up with customer expectations is driving retailer investment, while agility and innovation is driving manufacturers' investment in their supply chains ability to impact every part of the supply chain.

# i4.0 Leaders at KPMG

**KPMG's i4.0 efforts are driven by a global team comprised of 20+ country and jurisdiction leaders, an executive team, and a few specialty leaders.**

## Executive team

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Executive Director | [Michele Hendricks](#)

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Canada | [Tammy Brown](#)  
US | [Eric Logan](#)

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Netherlands | [Bart le Clef](#)  
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