



Beyond the hype

**Separating ambition from
reality in i4.0**

KPMG International

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Foreword

The fourth Industrial Revolution (i4.0) is upon us. And some manufacturers are already taking the lead. This report explains what they are doing to secure value and create competitive advantage in today's environment.

Everyone wants to talk about i4.0. From industry conferences and magazines through to boardroom tables and shareholder meetings, i4.0 is at the top of the agenda. The pressure on executives to adapt and compete is tremendous.

But there is also a lot of hype. Projections for the i4.0 market run into the trillions. Forecasts for potential value creation are eye-watering. Revenue expectations — at manufacturers and at service providers — are flying high. Depending on who you talk to, the disruption for value chains, employees and business models may be fundamental.

In this environment, executives at manufacturing companies need to separate hype from reality. They need a clear picture of the current risks and opportunities. And they need to understand what their peers and competitors are doing to drive value and capture competitive advantage.

At KPMG, we want to help manufacturing organizations separate hype from reality. So, we sat down with some of the world's leading manufacturers, suppliers and innovators to find out what is really

happening with i4.0. We conducted maturity assessments, talked to executives and walked the factory floors. And, in doing so, we identified several key aspects that are separating the i4.0 leaders from the followers.

This report shares our findings. It offers a realistic perspective on the current state of i4.0 adoption and readiness across the market. 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. And it offers practical advice for those striving to adapt and compete in a technology-driven marketplace.

Indeed, what we found was that — while most manufacturers are certainly investing into i4.0 capabilities and technologies — few have achieved the scale and integration required to drive enterprise value from i4.0. There are many working towards creating the 'factory of the future' or digital enterprise, but none that yet apply those capabilities across all of the corners of their operations. Most are still experimenting with discrete pilots

About the authors

or trialing point solutions. Some have yet to start developing their roadmap for integrating i4.0 into their business and operating models.

We believe that the time for small-scale i4.0 experimentation is coming to a close. Indeed, to win in tomorrow's competitive environment, we believe that manufacturers will need to start being bolder in their vision, strategies and actions. And we hope this summary report of our i4.0 maturity assessments provides executives with some ideas on how to start.

On behalf of KPMG's global network of Industrial Manufacturing professionals, we would like to thank those organizations and executives that participated in this i4.0 maturity benchmarking exercise. Your insights and experiences offer valuable context for today's rapidly changing manufacturing environment.

To learn more about KPMG's maturity assessments or to discuss your organization's roadmap for i4.0, we encourage you to contact your local KPMG member firm.



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Table of contents

05

Overview:
Challenging
the gap

A gap between executive ambition and transformative action is emerging.

08

Strategy:
Focusing on
performance

Big value will come when i4.0 is integrated at the product lifecycle and value chain level.

10

Value:
Scaling up

Moving from discrete investments to enterprise scale will not be easy.

12

Change:
Managing the
impacts

It takes more than technology to successfully implement i4.0.

14

Products: Smart
products and
smart processes

Integrating smart products and processes to drive smart profits.

16

Supply chain:
Enhancing i4.0
value

Creating a new value network.

Overview: Challenging the gap

Manufacturing executives hear that i4.0 will be revolutionary. And nobody wants to be left behind in the race to develop the factory of the future. Yet, our discussions suggest a growing gap between executive ambition and transformative action.

Few doubt the potential significance or value of i4.0. The case for technological advancement in the manufacturing sector has never been stronger. And the expectations for i4.0 have never been higher.

Analysts suggest that the i4.0 market will be massive. Gartner believes that the Internet of Things (IoT) market will be worth almost US\$3.7 trillion by 2020. Morgan Stanley's research suggests that the cyber security market (a key prerequisite of i4.0) will be worth around US\$183 billion by then. And IDC thinks that the virtual and augmented reality market will be worth US\$162 billion. All told, current analyst estimates for the component markets of i4.0 amount to more than US\$4.4 trillion by 2020. A massive market, indeed. But, as i4.0 achieves enterprise scale, it will remain to be seen whether business leaders are willing to invest such large sums.

Clearly, manufacturers are already making investments into the implementation of select i4.0 capabilities and technologies. Interestingly, in our benchmarking discussions, the majority of organizations demonstrated only a low- to medium-level of maturity in key areas such as demand-driven supply chain, machine-to-machine (M2M) communication, and digital twinning. However, they showed somewhat better maturity in cloud, robotics, big data, cyber security and IoT technologies.

This is good news. Experience and experimentation with i4.0 component capabilities is critical to driving adoption and identifying use cases. The fact that most organizations are now investing into these technologies speaks to the growing maturity of the market and the disruptive impact that executives expect i4.0 to unleash.

Dig a little deeper, however, and it quickly becomes clear that few have achieved a high level of maturity and an end-to-end holistic i4.0 environment. Investment into robotics, M2M, IoT and the like have been strong. But most are largely focused on solving a particular pain point for the organization. Projects tend to be isolated, of limited scope and driven through functional silos. And, as a result, few have managed

to translate their investments into enterprise-wide value.

We believe that the real value of i4.0 comes not from the component technologies or capabilities but rather through the integration of automation, data, analytics, manufacturing and products in a way that delivers unique competitive advantages and unlocks new business and operating models. And this cannot be accomplished without achieving larger scale, greater integration across functions and a willingness to disrupt the status quo.

Our discussions with leading manufacturers reinforce our view that success in i4.0 is not about how much you invest; the winners will not be those with the deepest pockets. Rather they will be those that are able to take bold action and clear steps towards developing and executing an enterprise-wide i4.0 strategy and roadmap aligned with their long-term business objectives and future operating model.

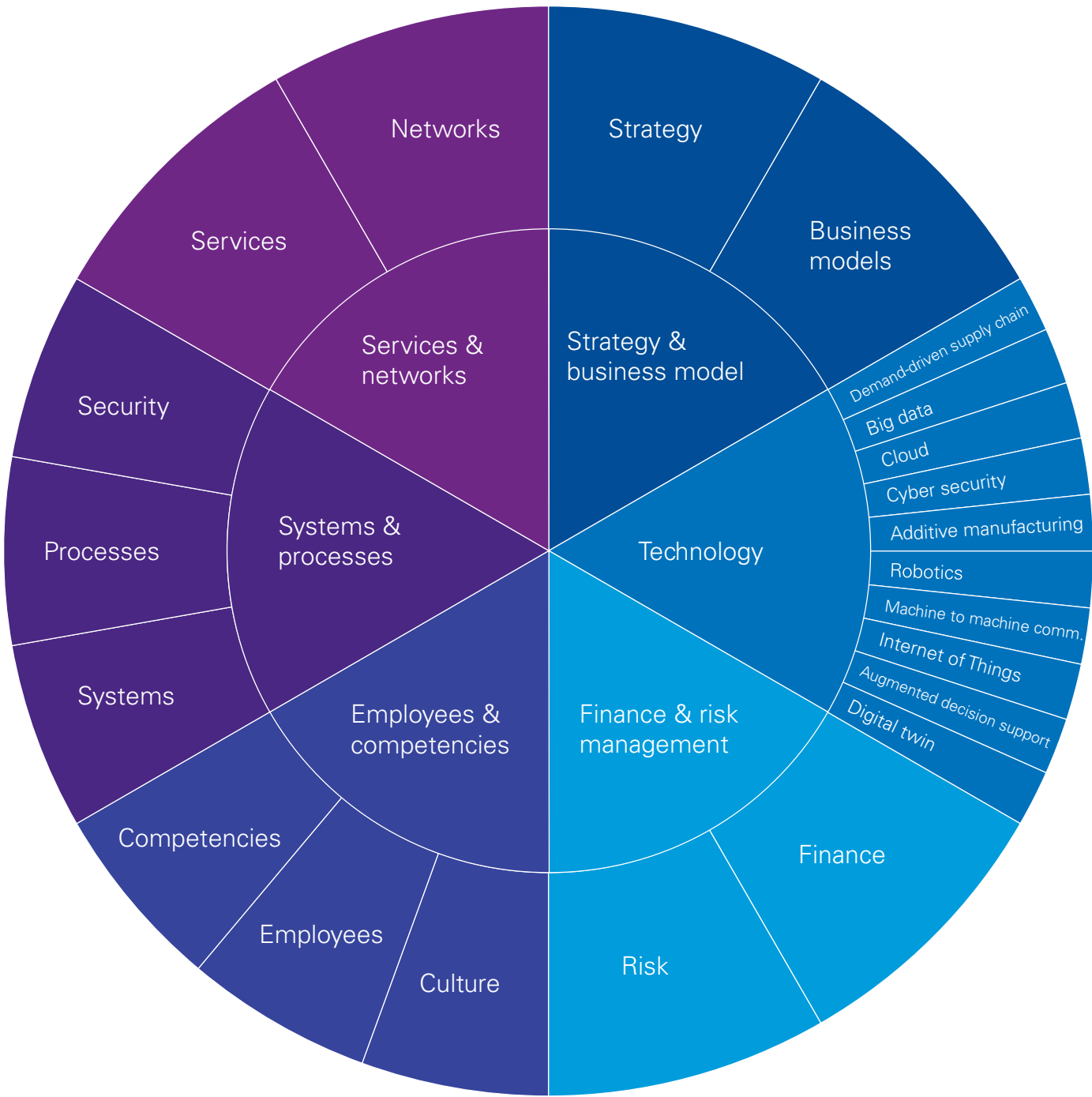
In our benchmarking discussions, we identified a number of areas where manufacturers could be taking a more integrated and strategic approach to i4.0 adoption. We assessed their current state of maturity against their peers. And, in each area, we focused on what the leaders are doing to drive adoption and create value.

We took a holistic approach to assessing maturity; broadening our view beyond pure technology capabilities to also explore areas such as strategy and business models, systems and processes, services and networks, employees and competencies, as well as finance and risk management.

What we were looking for was evidence of a holistic enterprise strategy and activity related to i4.0. What we found was a significant gap between executive ambition and transformative action.

Over the coming chapters, we will explore where the leaders are narrowing the gap and how they are developing and applying their capabilities to drive long-term value.

6 dimensions build the basis of i4.0's principles



Source: KPMG International, i4.0 framework 2017



KPMG insight: Being 'bolder'

It's difficult to make big, bold moves when dealing with an evolving and rapidly-maturing technology. Make the wrong bet and you risk operational disturbances, financial loss, and possible shareholder and customer backlash. Make the right bet and you can be the disrupting force in the industry, leapfrogging your competitors and capturing new markets.

But, being bold does not necessarily mean investing more money or making big bets. More often, it is about changing the way of thinking within the organization.

For some, being bolder means seeing the bigger picture, thinking about how i4.0 technologies could disrupt their traditional end-to-end value chain and building a plan of action to respond. For others, being bolder will mean using actionable insights to drive a new rate of development progress to create the next generation of product or service.

In most cases, the key is to think about how i4.0 capabilities and technologies could be used to cut across traditional industry value chain roles and internal functional lines, simplify processes and improve productivity. And then be bold in securing those improvements.

After all, if i4.0 is the key to unlocking something radically new that challenges conventional wisdom (and many signs suggest that it is), it is not something you want to confine or constrain.

Not big bets. But more bold thinking.

Key chapter takeaways

1. Take bold steps towards integration.
2. Think holistically not functionally.
3. Assess your current i4.0 maturity across multiple lenses.
4. Develop and execute against an enterprise roadmap.
5. Understand the long-term value and secure the short-term benefits.

Strategy: Focusing on performance

i4.0 technologies are being adopted across the manufacturing sector. And many are beginning to achieve notable cost and productivity improvements from their investments. The bigger benefits, however, will come when manufacturers start to focus their i4.0 capabilities on improving their overall organizational performance.

Let's face it: the challenges facing today's manufacturers are not confined within a single function, geography or business model. They are deep and fundamental: changing customer preferences, cost and capital pressures, shorter product lifecycles, new sources of disruptive competition and an incessantly quickening pace of business and demand are forcing manufacturers to rethink and transform their operating and business models.

It is easy to see i4.0 individual technologies as the panacea to many of the current pain points that manufacturers are feeling. Investments into robotics and machine-to-machine communication do help improve operational pace and productivity. Better analytics can enable improved insights into customer preferences and product usage. Digital twinning can assess and simulate systems to improve design and performance.

But our conversations and benchmarking exercise reinforce the view that the greatest value of i4.0 comes from the improvements that can be achieved when these technologies and capabilities are integrated together at a product lifecycle and value chain level.

The problem is that too few organizations have yet to achieve this type of scale or cross value chain scope with their i4.0 programs. Our benchmarking showed that some discrete work streams may be demonstrating favorable returns. But

achieving the full benefits of i4.0 will take a holistic enterprise approach. It will also require much bolder leadership and action.

What are the leaders doing?

- **They are developing business-aligned strategies and roadmaps.** Our conversations with industry manufacturing executives indicates that the leaders are more likely to view i4.0 as a strategic advantage and an opportunity for competitive differentiation. They have a clear understanding of the impact i4.0 will have on their financial and business models. And they are working to create stronger alignment between their i4.0 investments and their corporate strategy.
- **They are assessing their 'time to value' on i4.0.** Some we talked to indicated that their investments should deliver payback within 2 years. But the industry

KPMG insight: Measuring performance

Until recently, organizational performance was always particularly difficult to assess. Individuals reported up to sub-functions; sub-functions reported up to functions; functions reported to executives. Different key performance indicators (KPIs) were measured and captured, data from disparate systems were smashed together (often manually into an Excel sheet) and managers looked for ways to 'improve' their numbers. It's no wonder few executives had a realistic view of their organizational performance.

With i4.0, however, executives can achieve unprecedented confidence (and timeliness) in their organizational performance measurement. The difference is that, with i4.0, relevant data based on the performance outcome being targeted is captured directly through sensors, combined, analyzed and communicated with helpful visualizations to the executive suite in near real time.

In doing so, executives are uncovering insights and predicting potential future impacts on their KPIs (much like a GPS

device can predict arrival times based on real-time traffic flows), thereby augmenting them to make high-stakes, complex decisions. They are also helping to remove much of the human bias that can often influence performance reporting and decision making.

i4.0 doesn't just improve performance measurement. It potentially improves the overall quality of decision making, allowing executives to make more complex trade-offs, thereby optimizing performance.

leaders also understand that the 'time to value' on performance improvements may be at odds with management, shareholder and customer expectations. The leaders are therefore also focusing on implementing concrete short-term measures to realize value from i4.0, including reductions in their cost of goods, their order lead times and their inventory levels.

- **They are supporting their decisions with the right measurement, monitoring and reporting.** The leaders told us they were looking at new data sources and KPIs in order to visualize the cross-enterprise benefits from the more holistic rollout of their i4.0 investments. Rather than focusing on pure ROI, they are also assessing a broader basket of potential value drivers — such as performance outcomes, impact on innovation and improved collaboration — that influence their organizational performance.

Start with performance

The exciting thing about i4.0 isn't the technological change it will bring. It's the step-change in business performance it has the potential to unlock. Indeed, our research and conversations reinforce the view that i4.0 is more about enabling business performance than it is about the technology itself.

What that means, however, is that executives cannot simply 'buy' i4.0 maturity. In fact, the hardest (yet also the most valuable) part of i4.0 adoption lies in the planning — aligning the strategies, creating the roadmap, communicating the vision, building the support and allaying the fears about

cyber security and employee layoffs, to name but a few.

Executives will also need to consider how their investments influence performance within and across their value chains. A well-executed i4.0 strategy could, for example, greatly improve an organization's speed-to-market for products and services, and add new value to the product lifecycle by uncovering valuable insights, creating different processes and achieving improved visibility across the value chain. Or it could be used to improve working capital and drive down operational expenses in order to enhance price competitiveness and/or improve overall profitability.

Our interviews suggest that the leaders are those that recognize that technology is not a silver bullet. They are the ones that align their transformational ambitions with a clear understanding of their performance challenges and opportunities and their capabilities to achieve bold outcomes in their chosen markets.



Key chapter takeaways

1. Remember that i4.0 is about performance, not technology.
2. Create alignment between your corporate strategy and your i4.0 roadmap.
3. Cut across functional silos to identify new opportunities for value creation.
4. Be prepared to make big and bold decisions.
5. Think about whether you are measuring the right things.



Value: Scaling up

Discrete technology investments and initiatives are certainly helping manufacturers build i4.0 capability and experience. But many are facing significant challenges scaling up those projects and capabilities to drive enterprise-level value.

If the true value of i4.0 comes from the transformative performance improvement it unlocks, then manufacturers will need to start focusing on scaling up their initiatives to achieve enterprise scale.

To be clear, we are not suggesting that all humans be replaced by robots or artificial intelligence (AI). Nor are we (necessarily) advocating for massive investment into new technologies. Rather, we believe that organizations need to drive their i4.0 strategy at an enterprise scale — cutting across divisional lines and bringing together people, processes and capabilities from across the organization to achieve transformational change.

Easier said than done. Our research and benchmarking exercise suggests that most, if not all, organizations are facing significant challenges as they

strive to move from small isolated projects to enterprise scale.

In part, our research suggests that manufacturers are being held back by legacy IT challenges. Many interviewees noted that their ambition to improve data sharing and visibility is being hampered by deeply ingrained functional silos and proprietary platforms. Others are being impacted by bottom-up investment models and approaches that do not account for enterprise-wide value of a holistic i4.0 strategy.

However, our discussions also suggest that some manufacturers may be holding back, waiting for further evidence or additional data to help make their decision easier. The leaders, however, are not waiting.

What are the leaders doing?

— **They are focusing on breaking down silos.** Our benchmarking exercise indicates that the leaders are working across research and development (R&D), purchasing, operations, sales and marketing to identify opportunities for collaboration and mutual value generation. They are more likely to be engaged in cross-border work aimed at creating an integrated i4.0 landscape. And

they are more likely to be working to integrate the customer perspective into their core processes.

— **They are improving the agility of their IT infrastructure and processes.** The leaders told us that they were focusing on improving the agility of their IT infrastructure in order to facilitate the integration of i4.0 processes. They are also more likely to have considered the potential process impacts that the adoption of i4.0 may create across the wider organization. However, it must be noted that few organizations have managed to successfully use i4.0 to optimize their key operations processes.

— **They are thinking holistically about the interdependencies.** In our discussions, the leaders were often the ones that took a more strategic view of the related impacts and potential consequences of their i4.0 initiatives. They think strategically about developing the necessary competencies across the enterprise and within the value chain. And they are more likely to have considered the possible impacts of their i4.0 initiatives on their financial and business models.

KPMG insight: Viva la revolution!

The first industrial revolution spanned more than a century. It took time for new technologies to be adopted, old technologies to be retired and new ways of working to be created. Don't expect to solve this industrial revolution in a single fiscal year or 5-year strategy.

The likes of Uber, Facebook or Amazon suggest that some

revolutions can occur in a very short period of time. But manufacturing is quite different: massive capital investments, complex legacy infrastructure and large physical footprints generally mean that revolutions are slower to take hold.

So, while some executives may be loath to make big and transformative

moves today, the reality is that the market is continuously moving. The pressure to adapt (and the proven ROI) may seem limited today, but the reality is that — over the coming years — the revolution will start to take a much clearer shape.

But by then, it may be too late to catch up. The revolution continues.

Scale for success

We believe that current deployments of i4.0 technology and capabilities are not yet at the right scale to deliver enterprise value. Achieving that scale will take careful planning and significant integration.

To start, organizations will need to overcome the lack of one version of 'the truth' as a consequence of multiple legacy IT estates and siloed functional data systems. Recent improvements in 'middleware' is breaking down the silos. Advances in product data management within product lifecycle

management as well as digital twinning are also knitting the enterprise together. But manufacturers will still need to be wary — especially as data is communicated automatically from machine-to-machine and throughout the wider value chain — that the data must agree and align to be effective.

At the same time, our interviews suggest that most technology decisions are currently too disconnected from the business model to drive the greatest potential value. The leaders are those that are working to embed

their transformative i4.0 technology investments into their wider operations and corporate strategies as well as performance objectives.

The bottom line is that — while isolated projects may build capabilities and experience — the greatest value comes when they are enhancing the business strategy and performance in a wider, more integrated fashion. Manufacturers will need to assess whether their i4.0 capabilities are helping to drive value within the organization, and then scale as appropriate.



Key chapter takeaways

1. Pilots and discrete projects will not deliver sustainable performance improvement.
2. Focus on improving the enablers of enterprise i4.0 — culture, technology, processes, etc.
3. Break down functional and geographic silos to drive enterprise value.
4. Understand and assess the interdependencies.
5. Consider how to respond to a 'two speed' IT dilemma.

Change: Managing the impacts

The adoption of i4.0 at the enterprise scale will represent a massive change for traditional manufacturers and their employees. Developing the right capabilities, controls and culture will be key to driving i4.0 success.

KPMG insight: Transforming at scale

Trialing a new technology on the shop floor and driving an enterprise scale i4.0 strategy are two very different things. Lean methodologies can be brilliant at driving rapid innovation and development in small projects and discrete initiatives. But they will not be enough to move an organization through the type of strategic change that i4.0 requires.

That does not mean that executives should simply abandon everything they have learned to date. Those using continuous improvement frameworks to drive productivity will find much about lean can be applied to larger programs. Other key concepts — failing fast, integrated teams and scrums — remain strong concepts for organizations in transformation.

However, to achieve more transformative results, the change agenda must be owned at the executive level, bringing together the entire executive committee to shape the roadmap and align their business strategy to the talent strategy.

Revolutions, by their very nature, demand significant change. The fourth Industrial Revolution is no different: new ways of working, new skills and capabilities, new operating models, new processes and new roles and responsibilities will be required. Change is inevitable.

For manufacturing leaders, the challenges are manifold. Most will need to adjust their talent strategy to develop and retain the new skills and capabilities required to operate in an i4.0 environment. Change programs will need to be created to facilitate the transition and improve adoption. New governance frameworks and controls will be required to manage the new ‘digital employees’ of the organization. New cultures will also be required, both to attract new digital talent and to encourage greater innovation, collaboration and (within parameters) risk taking.

This, however, will involve the engagement and support of employees. And our benchmarking exercise suggests that there may be a significant gap between executive support for i4.0 and employee awareness. Our assessment indicates that the majority of executives tend to enjoy an average to above-average understanding of the significance of i4.0 (even if the picture of their future operating model and talent profile is not yet clear). Individual employees, on the other hand, are thought to have a below-average understanding of i4.0 and awareness of their individual contribution to the success of the organization.

While some may see disruption in i4.0, others see opportunity for rejuvenation. Indeed, some manufacturers and observers suggest that i4.0 may be the answer to the sector’s looming talent gap as manufacturing becomes less

about grease and gears and more about data and digitization. A few are already leveraging their i4.0 capabilities to draw next-generation talent and millennials into the workforce.

What are the leaders doing?

- **They are thinking carefully about their future capability requirements.** A handful of leaders in our research have begun to consider which competencies would be necessary to support their future i4.0 solutions and have started embedding these considerations into their strategic roadmap. Some plan to update their talent strategies and partner with outside organizations to diversify their recruitment pool.
- **They are driving the change agenda.** Our benchmarking research



indicates that some leaders are creating robust change management plans and thinking carefully about the people, governance and cultural impacts of their decisions. They are proactively communicating with employees to raise awareness, engagement and confidence. And they are articulating and executing on a clear vision for the future.

- **They are focusing on value, not costs.** Rather than approaching i4.0 as a cost and headcount reduction initiative, the leaders see i4.0 as an opportunity to improve value and performance (albeit one they are struggling to quantify). Where resources are released, some leaders are redeploying them to new tasks to varying levels of success. Where additional value can be generated,

they are investing in training and development. The leaders are enjoying growth without adding headcount and, in some cases, shifting their resources to more value-adding tasks.

Engage your employees

Manufacturing organizations are no strangers to change. And most boast fairly mature operational change management capabilities. But shifting an organization towards an i4.0 environment is a significant undertaking that will require a much deeper level of planning, communication and action.

Employee engagement is critical. In some cases, key processes or methodologies may exist only in an individual employee's head; best practices will need to be documented,

standardized and understood before they can be automated. In other cases, employees may need to be upskilled or retrained in order to fulfill more value-adding tasks; this too, will require engagement and encouragement.

The key is to articulate a clear vision for how i4.0 enables change to deliver performance. Help employees understand and envision their role in the roadmap to i4.0 success. Encourage employees to embrace the value of i4.0 and actively participate in its adoption. And build a culture of innovation and performance improvement that extends from the factory floor to the front and back office.

Some might suggest that increased automation will reduce the need for change management capabilities. Our research would suggest otherwise.



Key chapter takeaways

1. Focus on creating the right culture and securing the right capabilities for future i4.0 success.
2. Seek out opportunities to improve employee value not just cost reduction.
3. Support adoption with a robust change management program.
4. Integrate future talent and capability requirements into your i4.0 strategic roadmap.
5. Be creative in order to win the war for talent.

Products: Smart products and smart processes

While most manufacturers may be adopting i4.0 within their production operations, few have yet to fully leverage their capabilities to drive stronger integration between smarter products and smarter processes. And for companies where the business case for smart products is highly applicable, value is being forfeited.

i4.0 is not just about driving operational efficiency and performance. It's also about delivering better value to the customer. Indeed, when smart products are tied together with smart processes, unprecedented value can be created for customers, manufacturers and their suppliers.

Right now, however, few manufacturers seem prepared to fully integrate the opportunities

presented by i4.0 into their product lifecycle. In fact, there seems to be a significant disconnect between those implementing i4.0 within operations and those designing and developing smarter products. Create stronger links between the two, and tremendous value could be unlocked.

Consider, for example, the cycle of continuous feedback and improvement that could be achieved by smart products supported by remote updates. Or the performance improvements that could be won when component manufacturers achieve line of sight to customer usage patterns. Or, perhaps more alluring, the services that could be created using the data that is streaming from smarter products.

Important questions will arise. Who will own the customer data? How will customer data feed into the design process to improve future products? How can data be analyzed to drive new aftermarket service models? How

will data security be assured across the value chain? Will the sharing of customer data within the value chain disintermediate or erode the dominant players' current value drivers? Ultimately, those creating the value today (i.e. those that currently control the customer relationship and own the product usage data) may not be the ones creating the value tomorrow.

Our research suggests that a handful of market leaders are now starting to bridge the gap between their smart products and their smart processes. And, in doing so, they are uncovering new opportunities to drive customer value and improved performance.

What are the leaders doing?

— **They are using product data to improve end-to-end value.** The leaders in our benchmarking exercise are starting to use customer data and field data from their products to improve the way their products are designed, developed and

KPMG insight: The commercial considerations

Developing smart products and integrating into smart processes requires manufacturers to create a smart commercial approach. Indeed, when creating a smart product that is able to feedback to the component designer or MRO team directly, the more fundamental questions are about how the traditional company silos along the industry value chain will be impacted.

The reality is that customer and usage data have traditionally been

the preserve of OEM retail or service departments. Control of this data has conferred power. With the advent of i4.0, this traditional positioning is challenged. And while in many industries the sharing of data for product or business model innovation is encouraged, in others the controlling entities impede the ability to connect parties along the value chain, often to the detriment of the end user.

Manufacturers will need to grapple with key commercial questions

related to data (who owns it, how it might be used and who will get the benefits of the insights generated), to customers (who will own the relationship, how they will be engaged and will their information be secured) and to value chain relationships (how revenue uplift will be shared, how information will be shared and how cost savings will be shared).

These are commercial, not technology, questions. Answering them will require a smart i4.0 roadmap.

manufactured. They are focusing on improving and prioritizing the reliability and relevance of their customer data sources. And they are formalizing data ownership frameworks and security.

- **They are improving integration between customers and products.** The leaders are looking to use their smarter products to drive stronger relationships with customers. They see i4.0 as a basic requirement for improved customer communication. And, where it makes sense, they are connecting their customers to their suppliers and product development function through the cloud.
- **They are moving from products to services.** Our discussions suggest that the leaders are the ones that understand the significance of data and analytics and see the potential to leverage product and customer data to create services that drive additional

revenue. The most advanced leaders are moving into predictive solutions, using their analytics capabilities and deep product knowledge to provide additional insights to customers.

Smart strategy, smart profits

At KPMG, we believe that the ability to connect both dimensions — smart products and improved processes — is the key to unlocking the real underlying value of i4.0.

To be clear, this isn't just about putting smart things into existing products. It's about using smart technologies and models to create value — for the organization, the end user and the value chain. And then it's about having the wherewithal and capabilities to harness and maintain that value.

There is no value in putting sensors into your plant machines or your products if your design teams can't translate the data into insights and real product improvements; or if plant

operations cannot use machine data to increase plant utilization and improve changeover speeds; or if capturing product performance and maintenance data does not lead to new revenue-generating service models.

In this environment, manufacturers need to start thinking about how their smart products integrate into their smart operations. They need to carefully consider their current capabilities and operating model, their IT assets and their competitive environment and be prudent about what they can achieve and by when. They need to synchronize their product lifecycles and product data with their long-term strategy to achieve measurable advances.



Key chapter takeaways

1. Integrate your product lifecycle into your i4.0 strategy.
2. Understand how customer data creates value across the enterprise.
3. Improve the flow of customer data across the extended enterprise.
4. Understand the potential for disintermediation as a result of smarter products.
5. Look for ways to improve coordination with customers.

Supply chain: Enhancing i4.0 value

Integrating i4.0 across the enterprise will create significant value. More will be achieved when suppliers and value chain players are also brought into the i4.0 environment. Unprecedented visibility, responsiveness and operating capital flexibility awaits.

After years of struggling to improve integration and coordination across the value chain, many manufacturers clearly see i4.0 as a potential solution to some of their more persistent supply chain challenges.

Indeed, a fully integrated i4.0 environment could help manufacturers to remove significant friction from their increasingly complex supply chains. It could unlock improved visibility across the network and down into lower tier suppliers to better reduce risk and improve flexibility. It could enhance coordination and innovation through better access to customer and product usage data. And it could deliver improved working capital flexibility by helping to lower inventory levels and sharpen forecasting.

The benefits of integration can be significant. But the real value will come when the value chain becomes a value network — where data is shared fluidly between various nodes in the chain, decisions and demand signals are shared in real time across the network and data sources are integrated across systems. That will allow new opportunities to be

uncovered and new performance improvements to be achieved.

The participants in our benchmarking exercise demonstrated room for improvement in demand-driven supply chain maturity. However, a few of the leaders are already moving to work (in deep collaboration) with their suppliers and customers to embed value chain considerations into their roadmaps.

What are the leaders doing?

- **They are focusing on integration.** Our discussions suggest that a few leaders are moving quickly to integrate their suppliers and customers into a demand-driven supply chain. They believe that an interconnected network is the key to future competitive advantage. And they are connecting to their suppliers and to the external environment through the cloud.
- **They are creating the right environment.** The leaders are assessing both the opportunities and the risks of greater value chain integration. They are using sensors to predict various supply chain scenarios. And they are improving their controls to reflect the potential for increased cyber security and data privacy risks.
- **They are looking for new opportunities to drive performance.** The leaders are beginning to rethink their traditional supply chains and networks to eliminate unnecessary processes and remove waste. Depending on the industry, some are working collaboratively with

their suppliers to identify new ways of working and to streamline existing processes.

Collaboration for integration

We believe that significant value can be unlocked by driving integration across the extended value chain and network. This will require not only technological integration — of systems, platforms and data — but



also closer integration around controls, governance and cyber security.

This level of integration will require full cooperation and collaboration between manufacturers, their suppliers and (possibly) their suppliers' suppliers. Not only to improve the success of the partnership, but also to uncover any additional sources of value. Adding the customer into

the mix — in a truly interconnected network — will further improve the returns and benefits.

The question then becomes one of control. We are starting to see early indications that leading-edge manufacturers are adopting a 'control center' approach to managing their supply chain, bringing analytics, automation, augmented decision support, modeling and other

capabilities together as a centralized function.

To start, manufacturers may want to focus their attention on improving integration with a few select (top tier) suppliers. Once standards have been set, governance and controls have been defined and protocols have been created, these tools can then be used to drive further integration deeper down into the supply chain.



Key chapter takeaways

1. Use i4.0 capabilities to drive greater integration across the value chain.
2. Focus on creating an interconnected network across the value chain.
3. Look for opportunities to unlock further performance improvements from the value chain.
4. Create the right cyber controls and governance to reduce risk while encouraging the sharing of data.
5. Consider who 'owns' the customer data and who has access to it.

5 key takeaways for manufacturers

1

Be bold. The i4.0 leaders are closing the gap between their i4.0 ambition and their activity.

2

Think big. Driving enterprise value from i4.0 requires scale and cross-functional integration through lifecycle integration.

3

Start and end with performance. Profound value is available from i4.0-driven performance improvements.

4

Plan ahead. You can't buy excellence in i4.0; it takes work and a smart strategic roadmap.

5

Assess yourself. Understand where you stand versus your competitors.

Overview of benchmarking exercise

Report creation process and demographics

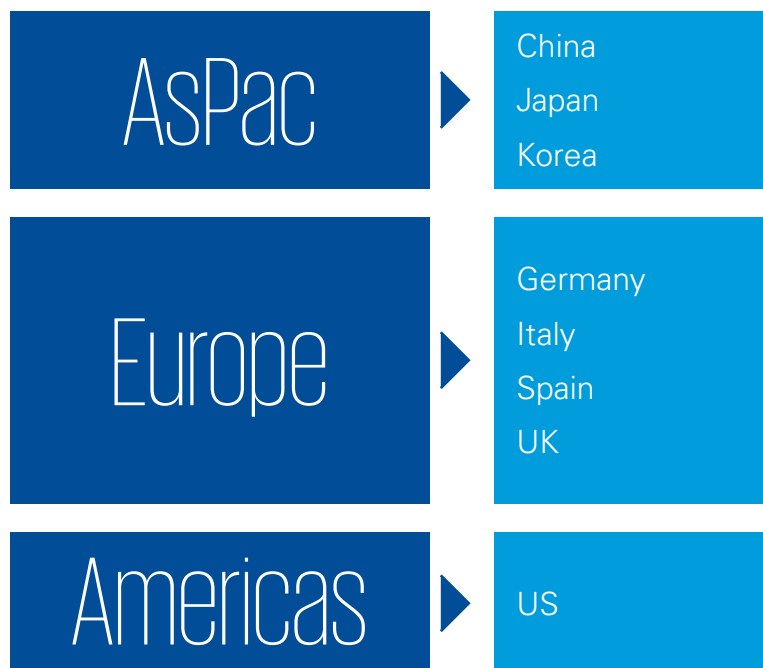
Between December 2016 and April 2017, KPMG embarked on a deep-dive benchmarking exercise for Industrial Manufacturers in eight countries spanning three regions around the globe (see below). The in-person interviews were conducted by a small group of KPMG i4.0 specialists with senior individuals/teams who had a strong insight into the status of i4.0 in their respective organization. They followed a structured set of questions, benchmarking six dimensions related to i4.0 maturity. The interviews also included factory walk-throughs to provide additional perspective to the topics discussed.

To achieve the depth required, KPMG focused on a subset of Industrials that would represent a cross-section of

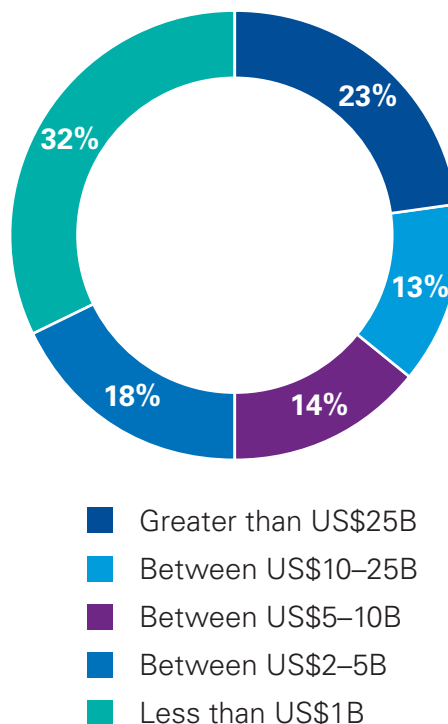
demographic elements such as size, geography, operating models, segment within Industrials, etc. In total, the 26 companies benchmarked provided sufficient quality and depth for comparison as opposed to a broad-brush, larger survey procured through third parties or online vehicles. KPMG's specialists feel strongly that the emergent nature of i4.0 warrants a more high-touch, detailed approach at this time.

Given the strategic importance of the i4.0 initiatives in each of the organizations interviewed, KPMG has treated these results with high confidentiality and complied with non-disclosure agreements (NDAs) where applicable. Within those constraints, the data was normalized and presented in this report in a way that allows insights to be drawn but does not reveal by name any commercially sensitive information.

Geographies covered



Company revenue bands

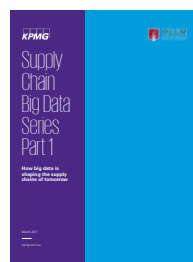


Related Industrial Manufacturing publications and articles



Industry 4.0: Scaling up to success

Manufacturers are aware of the value that Industry 4.0 could deliver to their business. Unfortunately, few have a reliable roadmap for turning their pilots into performance when scaled and fully embedded in the operating model.



Big data analytics enhancing the performance of supply chains

How big data is shaping the supply chains of tomorrow.



Industry 4.0: Smart products, smart processes, smart profits

Manufacturers are getting better at integrating Industry 4.0 into their processes. Now they need to also start focusing on their products.



Demand-driven supply chain 2.0: a direct link to profitability

Can a better demand-driven supply chain positively impact the bottom line?



Industry 4.0: It's all about the people

The adoption of i4.0 will have a profound impact on the manufacturing workforce. Organizations should start planning the transition today.



The Factory of the Future

The KPMG's Factory of the Future guide offers information and concrete support in order to successfully meet the challenge of Industry 4.0.



Future-proof your reverse logistics Did your supply chain meet the challenge of post-Christmas returns?

This report discusses the value potential of reverse logistics as a practical source of not only cost-cutting, but enhancing both profitability and brand reputation.



IIoT future state development

In this article, the KPMG Cyber Security Services practice provides an overview of what's unfolding in the world of the Industrial Internet of Things, including insights on how businesses should be approaching the revolutionary changes — and new risks — that are emerging around them.



KPMG International's 2016 Global Manufacturing Outlook

Find out what leading manufacturers are doing to drive growth.

KPMG: Helping you make the most of your i4.0 transformation

At KPMG, we understand the challenges and opportunities facing manufacturers. Every day, our people work shoulder to shoulder with the world's most innovative manufacturing leaders. And our experience and our research offer our teams insight into the reality surrounding i4.0.

This report confirms our belief that — to maximize value and competitive advantage — manufacturing leaders must take a strategy-and-business-performance-led approach to i4.0. They must prioritize integration across the enterprise. They must take a holistic approach to key issues such as talent, innovation and productivity. They must think inside and outside of their organization. And they must be able to measure and demonstrate the value of their i4.0 investments.

No matter where you are on your i4.0 journey, KPMG professionals are available to help you find and secure value, across the technology maturity cycle and the product lifecycle.

Leading manufacturers select KPMG because our teams take a technology-

agnostic approach that allows clients to receive truly independent advice and help make sensible choices for their specific organization and situation. They choose us because they know our teams won't create pie-in-the-sky strategies. Instead, the focus is on helping clients see the when, where and how of their business decisions. Our teams understand how to develop business propositions that resonate with the C-suite and board.

With strong leadership in key areas such as data and analytics, cyber security, digital labor, change management, risk management and operational performance improvement, our teams can help you on your i4.0 journey from strategy to transformation to technology implementation.

For more details about the i4.0 maturity assessment or to discuss participating in our benchmarking exercise, we encourage you to reach out to any of the i4.0 specialists listed in this publication, or your local KPMG member firm.

We can help your organization to:

- create your unique i4.0 strategy and vision, aligned to your business objectives.
- quantify the business case and develop the roadmap to support investment.
- define, improve and support proof of concept initiatives and use cases, and help you appropriately scale to achieve value.
- take a holistic approach to managing the financial, change and risk management requirements of i4.0 adoption.

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