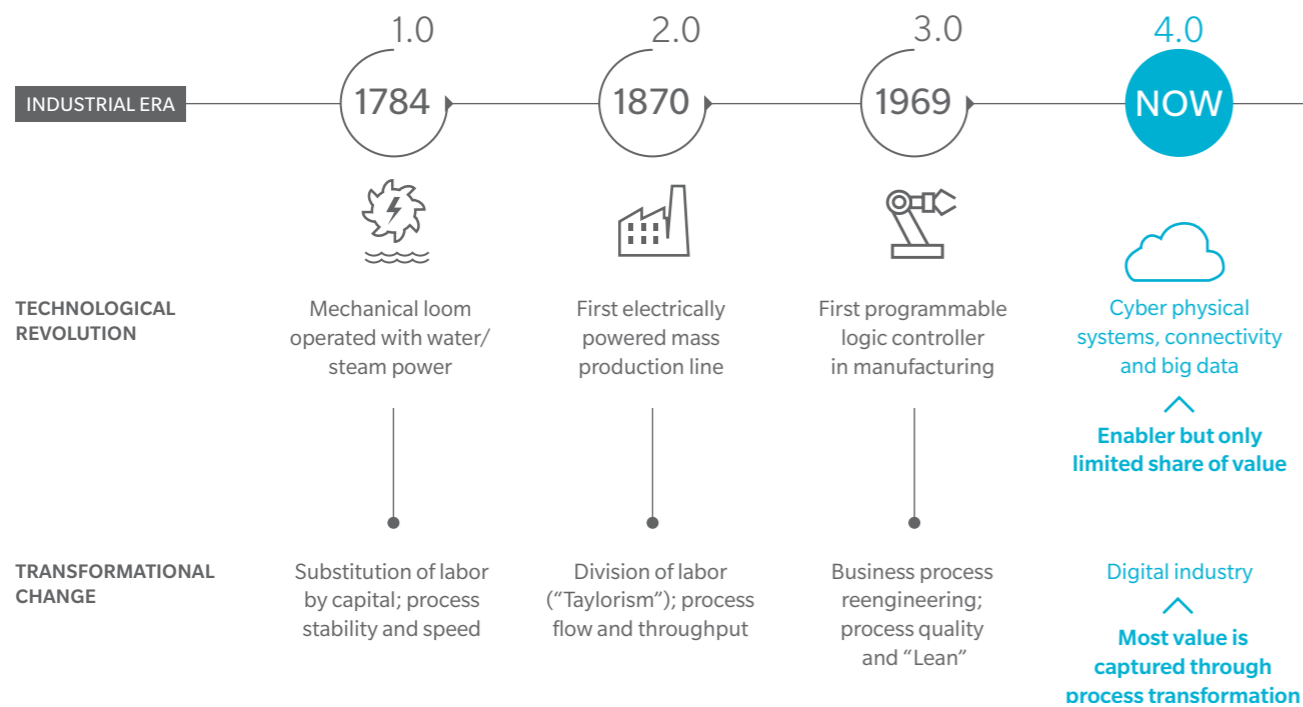


DIGITAL INDUSTRY

# THE NEXT INDUSTRIAL REVOLUTION

Contrary to common belief, “digital industry” is not about technology. Technology will be an enabler, but the true value of the next industrial revolution is that it will lead to better decisions, more efficient processes, and new business models. Digital industry will dramatically transform the way industrial companies operate, with results over the next 10-15 years comparable to the introduction of mass production at the beginning of the twentieth century and to lean and reengineering toward its end.

Exhibit 1: The evolution of industry



Source: DFKI (German Research Centre for Artificial Intelligence), Oliver Wyman

The next generation of production technology is just starting to be rolled out: big data analytics, virtual environments/simulation software, broader connectivity, collaborative robots and connected objects, machine-to-machine (M2M) communication, and new manufacturing techniques like 3D printing. This wave of innovation is all part of what is known as “digital industry.” In terms of value generation, however, a recent Oliver Wyman study projects that the hardware and software will matter less than the “application layer” – the business models, processes, analytics, and decision making that this technology will enable. This is not a new pattern: In the three prior modern industrial revolutions, novel technology triggered a fundamental change in the way industrial companies operated (Exhibit 1).

Most of the value of digital industry will be realized outside of the production area. Production will of course be enhanced, but more importantly, digital industry will give rise to a second generation of “lean” over the next 10-15 years and impact processes like planning, pricing, maintenance, research and development (R&D), and product launch. Oliver Wyman predicts that the global annual margin impact of digital industry across

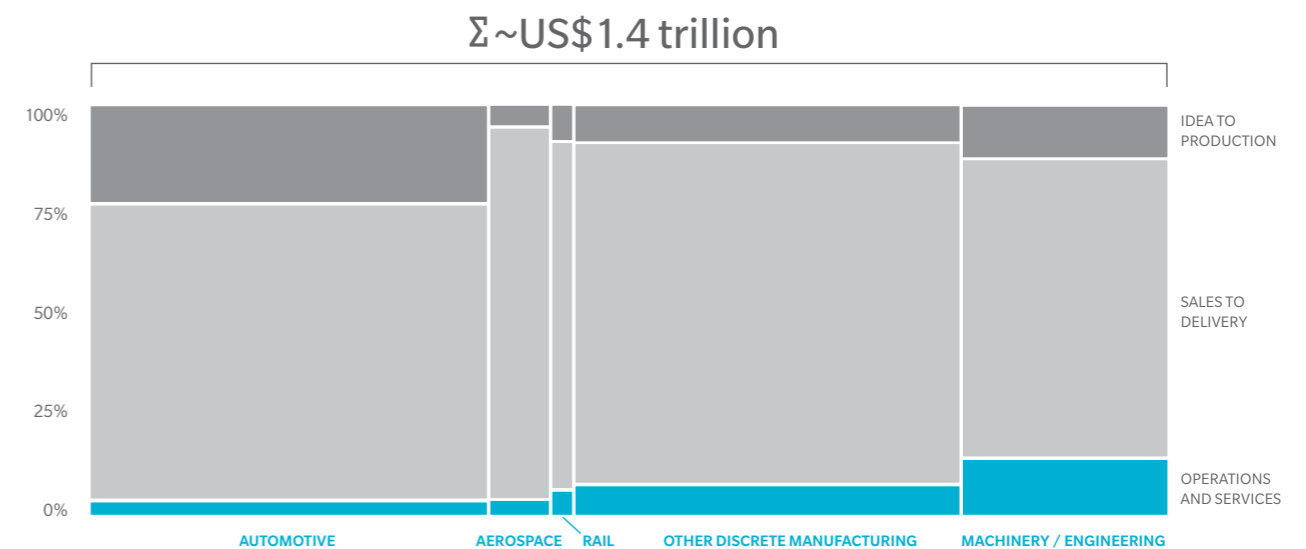
discrete manufacturing in 2030 could be an estimated US\$1.4 trillion (Exhibit 2). The automotive sector could see the highest absolute value impact, while aerospace and rail rolling stock manufacturers could see the largest relative change.

## DIGITAL INDUSTRY PROCESS LEVERS

As shown in Exhibit 3, this cumulative value will be unlocked by the wide range of levers that are becoming available to manufacturers as a result of digital industry. Demand forecasting and intelligent pricing is the largest lever, representing margin impact of up to US\$600 billion

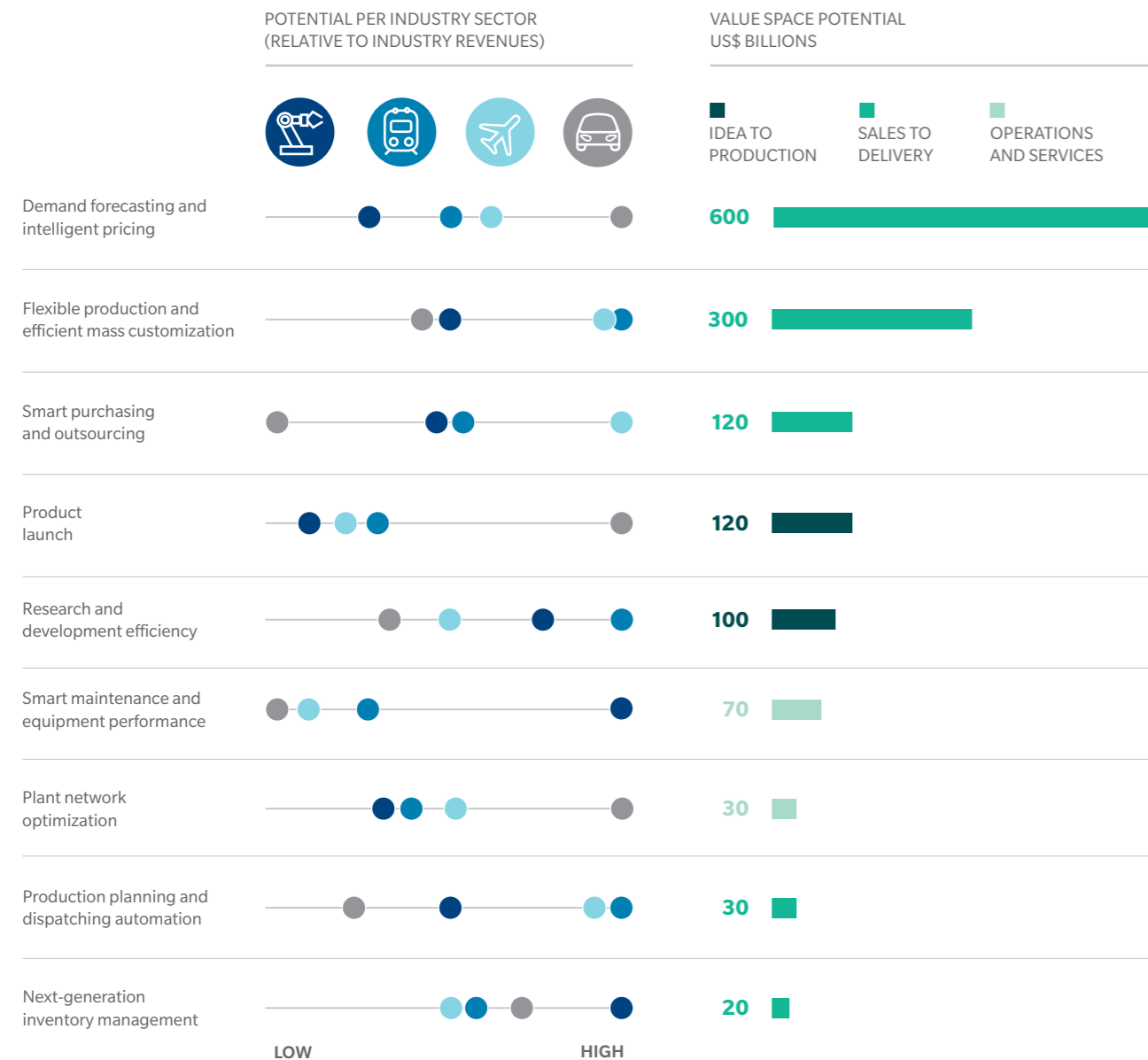
As an example of how this lever could impact industry in a few years, automotive original equipment manufacturers (OEMs) will be able to forecast future demand in real time by analyzing a wide swath of data: online configurations by customers, current and past orders, customer interactions, discussions in online forums and social media, etc. As a consequence, market research, sales planning, production planning, and scheduling will need to be redesigned, with many tasks becoming obsolete. Built-to-stock vehicles will be

Exhibit 2: Potential for digital industry in 2030 (additional annual margin)



Source: Oliver Wyman analysis, OECD, World Bank, United Nations

Exhibit 3: Potential for digital industry in 2030



Source: Oliver Wyman

configured based on real-time data and analytics, not on estimates by individual dealers. OEMs will be able to run yield management based on real-time data, bringing up plant utilization for underutilized plants significantly. A more differentiated pricing model also could be run using real-time data to optimize margin and utilization.

Not surprisingly, more flexible production and mass customization also could deliver some US\$300 billion

in margin impact. In machine engineering, for example, small or individual lot sizes will be handled just like regular series production, based on 3D models, simulation, flexible systems, and fully integrated end-to-end data flows. Integrated rework of non-quality parts within the regular production flow will be enabled based on M2M-communication and embedded product and machining information (e.g., quality and rework data).

In addition, real-time simulation and feedback loops between shop floor and engineering will ensure a seamless production flow and avoid slack.

Improvements in product launch and R&D efficiency could contribute US\$220 billion in margin impact. As an example, in the rail industry, development of product functionality (in terms of mechanical, electrical, and software components) is often a “siloeed” process. Paper-based drawings are still somewhat common and physical prototyping requirements for new tools and products are significant. Digital industry will result in a more effective R&D process, such as structured analysis of train operating data and concurrent mechatronic engineering between manufacturers and suppliers leveraging digital models. Less physical prototyping will need to be performed due to digital modeling and the availability of virtual tooling and testing environments.

## IMPACT ON MECHANICAL AND PLANT ENGINEERING COMPANIES

Digital industry also will enable machinery and engineering firms to evolve their business models. In our study, we identified four concrete value spaces around internal processes, after sales, customer value proposition, and optimization software.

**Internal processes:** Similar to process levers, internal processes can be digitized. While some will argue that this is a more evolutionary process and in line with increasing automation and IT support over the past few decades, the potential to fundamentally redesign processes should not be underestimated. Integrating formerly disjointed processes will be key, rather than optimizing existing processes. In the long run, this will lead to a fundamental transformation of how engineering firms operate.

**After sales:** Mechanical and plant engineering firms can give a boost to their after sales business models. Many firms currently add product features and services based on their current model of a strong focus on remote service and preventive maintenance. But in the future, failures will be more predictable and avoidable, thanks to full connectivity, real-time condition monitoring, and superior analytics. Technicians will know in advance what needs to be done and can arrive with the right spare parts (possibly 3D printed). And parts can be priced based on real-time price elasticity and market data. Nor will the after

# >90%

OF INDUSTRY SENIOR EXECUTIVES CONSIDER DIGITAL INDUSTRY AS AN IMPORTANT STRATEGIC TOPIC; 40 PERCENT SEE IT AS A “TOP THREE” TOPIC ON THEIR STRATEGIC AGENDA.

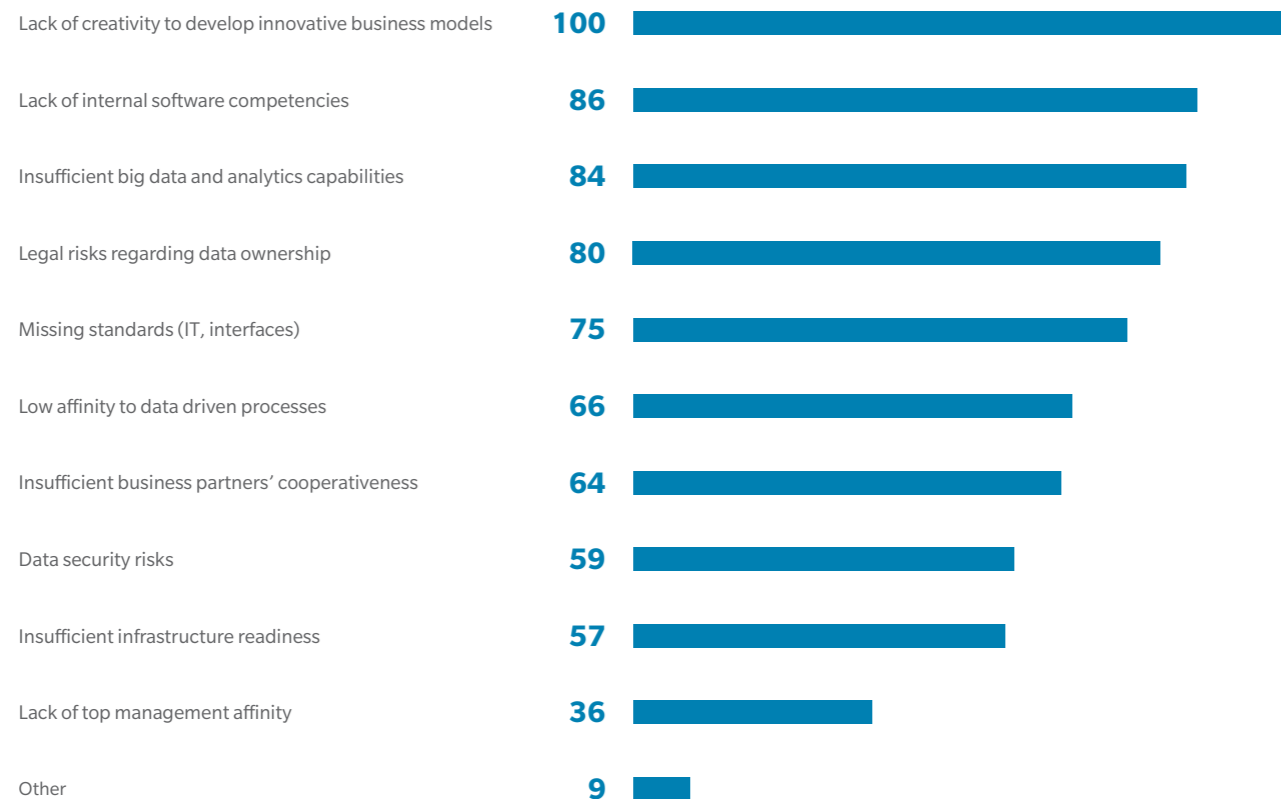


sales business model be constrained to just traditional maintenance, repair, and spare parts. Increasingly, the threshold to actually optimizing how machines are being operated by the customer will be crossed using operational data. This will open the door to new commercial agreements involving uptime/performance guarantees.

**Value proposition:** Some companies will be able to introduce more comprehensive value propositions to their customers, by leveraging their superior application knowledge to offer a complete “process in a box,” including not only production equipment but also the overlying control system and best-in-class optimization algorithms. This opportunity is particularly large for engineering firms with smaller, less sophisticated customers or customers with many operational facilities. Early examples of this can be observed in the areas of automated mining pits and automated farming.

Another example is a manufacturer of woodworking machinery, which now provides digital industry solutions to its customers in kitchen and furniture manufacturing. The solution’s front end includes a 3D model that a customer and sales representative can use to design a custom kitchen. The order data is then automatically transferred to a “lot size one” production line that manufactures all of the components for the kitchen according to the customer’s specifications.

Exhibit 4: Potential obstacles to digital industry evolution (index)



Source: Oliver Wyman survey of leading German manufacturing companies

Quality control is automated as well, with defective parts repaired or remade. Finally, all parts are automatically packaged and scheduling is automated to optimize delivery costs.

**Optimization software:** Finally, there is an opportunity for some companies with superior knowledge and data regarding their customer industries to engage in the development of optimization software for customer operations – even independent of and beyond the processes traditionally covered by their machines. Creating such software would of course mean moving into a new role and developing new skills. Thus we anticipate this move will typically involve the acquisition of existing or start-up firms with software experience.

## AND THE WINNER IS?

As the above examples demonstrate – contrary to what is often portrayed in the press – incumbent machinery and engineering firms and established software players in product life cycle management (PLM), enterprise resource planning (ERP), and automation are likely to be among the winners as the digital industry evolution takes hold. Industrial applications are too small and fragmented to be relevant to mass consumer market-driven e-commerce/online giants. And so just as Microsoft did not win in “open automation” in the 2000s, Amazon and Google are unlikely to win in the digital industry B2B environment in the 2020s.

To what extent however established mechanical and plant engineering companies can access critical value spaces will depend on many factors. In general, we expect all companies to participate in some way in the first two

value spaces – digitizing internal processes and boosting after sales business models. But the concrete levers to maximize the value realized from these spaces will differ from case to case and depend on factors such as customer structure, product complexity, volume of production, market position, etc. Component manufacturers will have different priorities than machinery companies, which will again have different needs than plant engineering companies.

The third and fourth value spaces – “process-in-a-box” and optimization software – likely will be accessible only in specific circumstances. But where these spaces can be leveraged, they could be game changers for a company’s business model and growth prospects. Of course, exploiting such value spaces requires strategic vision and the readiness to take on substantial risk.

In all cases, definition of a digital industry business strategy will require a deep understanding of the processes and strategic priorities of the customer industries that a mechanical or plant engineering company serves and of the company’s own position, business model, capabilities, and ambitions.

## ORGANIZATIONAL IMPACTS AND OBSTACLES

Digital industry will usher in a second wave of leaning out key business processes, likely making entire departments redundant in their current form. Analytics will become more centralized as well as globally transparent (e.g., real-time demand forecasts instead of sales planning), while insight deployment will become more decentralized (e.g., pricing and sales promotion decisions based on centrally run analytics).

The impact on people and jobs will be tremendous. A significant number of planning, analytic, coordination, and managerial jobs will disappear due to leaner, more direct processes that require less planning and coordination. Desired skills and workforce needs will shift toward more analytical capabilities and flexibility; managerial profiles will require more digital affinity and

~US\$1.4 trillion

IN ANNUAL MARGIN IMPACT  
COULD BE UNLOCKED GLOBALLY  
BY DIGITAL INDUSTRY BY 2030.



openness to transparent, data-based decision making. It is worth noting that the pace of implementation is still somewhat unclear – there are a number of obstacles that still must be resolved. These include an installed base of hardware and software infrastructure that is not fully ready for digital industry, as well as products that might be upgradable but will continue to require “traditional” approaches until they are replaced based on their respective industry’s investment cycle. The need for employees with relevant qualifications and change management as well as unresolved data security and legal issues could also limit the speed of change. Finally, companies will need to consider if they face internal constraints in terms of creativity and out-of-the-box thinking if they are to reinvent their business models for the age of digital industry.

In summary, the impact of digital industry on individual companies and manufacturing industry sectors will be immense. Indeed, this next industrial revolution is already underway. Manufacturers would do well to consider their current situation and begin charting a course in terms of relevant digital industry levers if they hope to unlock the value and opportunities this revolution will bring.

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