

Future of Operations in the digital world

Industry 4.0: CEOs' master plan for driving the race in performance excellence



Industry 4.0 and the related new technologies, such as the “Internet of Things”, “cyber-physical systems” and “additive manufacturing”, will drive radical performance improvements in terms of cost and customer excitement. CxOs in all industries are currently defining their ways to explore and exploit the benefits. The bad news is that the variety of technologies and limited number of industrialized examples make it hard to understand the complexity of the topic. The good message is that this is far more than buzzwords. The new technologies have actual game-changing potential. Savings of between 15 and 50 percent per cost line can be achieved on the operations side. Leaders need to act now. The challenge is to define a powerful operations concept that is forward looking and ensures measurable short-term benefits.

Technology opportunities drive radical performance improvement in future operations

Industry 4.0 and its related technologies offer great opportunities to accelerate and streamline all kinds of operations processes like R&D, procurement, production, logistics and customer relationship management. But the list of technologies and buzzwords is long: Industry 4.0, smart factory, cyber-physical systems, digital revolution, Internet of Things, data-driven business models, augmented reality, additive manufacturing, virtual manufacturing, Workplace 4.0, predictive analytics, cognitive analytics, analytics among others.

Understanding what is only hype, what brings value and how to transform

Few companies have organized themselves well and have systems and structures in place to manage the future of operations. CxOs are reporting that they are lost as far as understanding what is only fashion versus what brings real value and hopefully a competitive advantage to their companies. They also ask themselves how to organize a continuous transformation towards a future-of-operations target picture,

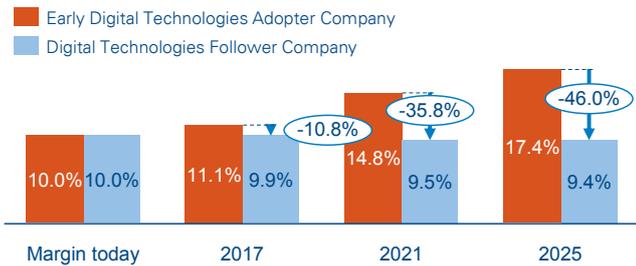
how to be reactive to technology disruptions in an agile way and, last but not least, how to gain access to required technologies.

Risks are non-competitive operational performance, stranded investments and lost profits

In these disruptive times most companies are at risk. In our current “Digital Transformation” study we have found that more than 80% of the companies have no clear target picture and transformation plan regarding Industry 4.0 and the related digital and non-digital technologies. They are designing and developing their operational performance by accident. The funding for the differentiating investments in operations redesign and technology does not come through – moreover, it is diluted.

The opportunity is to become industry leaders in EBIT margin development and operational agility.

In several operations projects we have modeled the cost advantage an early adopter could achieve over a follower. The results depend on who you are exciting or threatening. On average, an early adopter improves by 10% within two years and almost doubles EBIT margin in 10 years.



Five-step management agenda to make it happen

Defining, building and operating an enhanced operations model using new digital technologies is a significant challenge for the CxO suite: underlying technology bandwidth is beyond the available competences of almost any traditional industry player. Implementation times for global Industry 4.0 projects are beyond the horizon of technology developments, and their evaluation can be assessed. Capex and investment required for globally consistent business model changes in operations exceed typical investment budgets by far. So how can these challenges be overcome? Five steps are necessary to fully leverage technology and value-chain opportunities to become an industry leader in operational performance:

1. Understand the relevant technologies and their maturity levels
2. Identify and describe concrete applications of these technologies per operations function
3. Determine each of these applications' value and define a target picture
4. Define a transformation path and launch a portfolio of concrete implementation projects

5. Establish technology access and an innovation network

Each of these steps has its own success factors and benefits.

Step 1: Anticipation and understanding of relevant technologies

Understanding technology is key to anticipating the future operating business model. Relevant technologies can be clustered into five categories:

- Data-based technologies contain applications around virtual manufacturing, simulation, augmented reality and predictive analytics.
- Connectivity-driven applications allow connection of the virtual world with the physical, such as cyber-physical systems, the Internet of Things and collaborative robots.
- Advanced equipment and machining need to be incorporated – often specific to the requirements of products and services. In addition, smart energy systems and additive manufacturing contribute to this sector of technologies.
- Value-chain networks and ecosystems change rapidly, and therefore need to be explicitly analyzed with regard to a converging ecosystem (integration with customers, suppliers and other players), centralization or de-centralization of value-add, and crowd intelligence technologies.
- Finally, solutions for enhancement of operator productivity, such as virtual workplace technologies and e-learning, need to find their way into the relevant set of technologies.

Top management needs to install intelligence for identifying and exploring relevant technologies, as well as develop information about practical application and maturity stage per technology.

Functions	R&D and innovation	Supply Chain configuration	Processing and Assembly	Logistics	Quality and maintenance	Sales and planning
Key Technology (examples)	<ul style="list-style-type: none"> ■ Big Data ■ AR ■ Simulation ■ Cyber Physical Systems(CPS) 	<ul style="list-style-type: none"> ■ CPS ■ Simulation ■ Reconfigurable machines 	<ul style="list-style-type: none"> ■ Smart Robots ■ AR ■ Big Data ■ Advanced machining 	<ul style="list-style-type: none"> ■ Internet of things ■ RFID ■ Augmented Reality (AR) 	<ul style="list-style-type: none"> ■ IoT and CPS ■ Big Data ■ Smart robots ■ AR 	<ul style="list-style-type: none"> ■ Big Data ■ Simulation ■ Internet of Things
Example applications	<ul style="list-style-type: none"> ■ 24/7 R&D ■ Virtual innovation networks ■ Innovation sourcing ■ ... 	<ul style="list-style-type: none"> ■ Virtual network optimization ■ Virtual supplier integration ■ ... 	<ul style="list-style-type: none"> ■ Agile Global performance management ■ Augmented assembly ■ Collaborative robotics ■ ... 	<ul style="list-style-type: none"> ■ Cloud based end-to-end and real time material tracking ■ Smart intra-plant material transport ■ ... 	<ul style="list-style-type: none"> ■ Inline process and quality control ■ Predictive quality analytics ■ Augmented quality control ■ ... 	<ul style="list-style-type: none"> ■ Predictive demand and supply chain planning ■ Digital show rooms ■ ...
OPEX potential	10-25%	15-25%	15-20%	35-50%	15-45%	10-40%

This capability can be installed in-house or sourced from a third party. Arthur D. Little maintains a comprehensive technology database highlighting the most relevant information to understand these technologies efficiently.

Step 2: Identification of possible technology applications to enhance the operating model

Identifying relevant applications in the company's operations is a straightforward approach: every relevant technology is analyzed for potential applications. For each function in the operations, whether it is R&D, processing, maintenance or other, a long list of applications is derived. Regardless of business-model enhancement or opportunity to drive productivity, technology, application and potential deployment date (depending on technology maturity) are listed. This step is essential, since it bridges technology intelligence and the subsequent step of operations strategy. To cover the technology bandwidth and expertise in relevant fields of operations, a team of outsourced technology experts and in-house operations specialists is required.

Step 3: Business case and target picture development

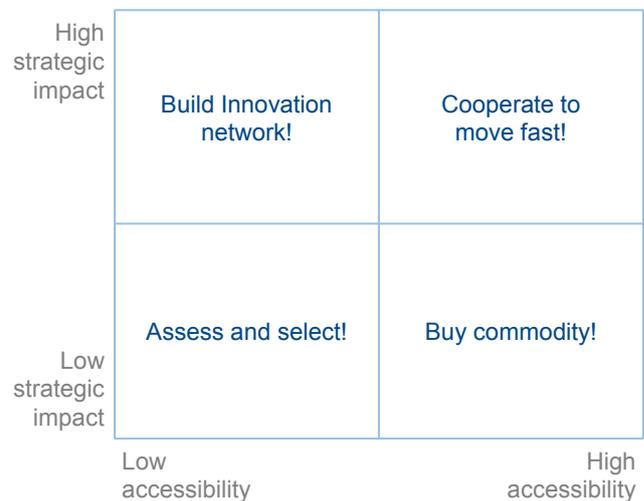
Every single technology application is evaluated regarding its contribution to monetary and qualitative benefit potentials: EBIT improvement, working capital and asset reduction, increase of operations agility, competitive position and proposition. This evaluation is done per application and operations area. If data is missing (e.g. quality or maintenance cost), a company-specific baseline model needs to be developed. Finally, the puzzle of high-benefit applications is put together and a target picture with a 5–10-year horizon is developed. Since technologies mature unpredictably, this target picture needs to be reassessed and if needed be adjusted annually.

Step 4: Transformation approach determines how the wheel keeps turning

To implement successfully, momentum and continuity are key. Pilots with significant and short-term measurable financial impact based on available technology are defined and conducted first, with the respective projects rolled out globally. Speed is key – amortization should be less than two years. Savings are reinvested to launch the next series of pilots and projects. Therefore, the level of initial investment determines the transformation schedule. Depending on the progress of projects rolled out and the organizational capability, further pilots and projects are kicked off subsequently. By doing so, transformation towards "Industry 4.0" is overseen as a portfolio of dedicated projects with respective multi-project management – and therefore manageable with well-known tools.

Step 5: Building capabilities and establishing technology access

Careful decisions need to be made about whether competence for single technologies should be built in-house. Should a company invest in a predictive data analytics center? Is it required to keep product data modeling along value chains as a core competence? The make-or-buy decision for each technology determines the future operating model. For technological competence to be built up, careful selection of the acquisition strategy is on top management's agenda: cooperation, acquisition (of players) and partnering strategies are the key dimensions. Central capability needs to be built up regarding the set-up and management of multilateral innovation networks – initiatives without dedicated partner management approaches typically require more time or fail.



Conclusion

The (digital) technologies now becoming fully available for industrial companies are going to re-intensify the efficiency race that is already taking place in all manufacturing industries. Because of the game-changing potential these technologies can bring, each company will have to manage them sooner or later.

By being proactive today, companies ensure that they will stay ahead, at least in this race, which will enable them to match their competitors on cost. At the same time, they have the best chance to identify new business models and unique selling propositions enabled by technologies in their industries. Through this, companies can build truly sustainable advantage outside the efficiency race.

The best way to be proactive on this is to start the transformation in a targeted way. The target is to focus on key long-term technologies and, at the same time, on specific pilot implementation projects. This enables companies to build practical experience and expertise with these technologies and reinvest the savings from these projects into technologies for the next wave of projects.

Case Example

A leading Tier-1 automotive supplier with several hundred manufacturing sites decided to take a proactive approach to incorporating modern technologies into its manufacturing and supply-chain operations. A key challenge for the supplier was to organize such an endeavor effectively across divisions. The divisions of the supplier serve products that are technologically different to those of their OEM customers. Due to this, the operations are historically organized at division level, with limited standardization and centralized control.

Together with Arthur D. Little, the supplier organized a cross-divisional project to identify and assess the key technologies for optimizing its own operations in the coming decade, and to implement an organization to launch and manage the transformation associated with implementing these technologies.

The joint project assessed 20 different technology areas and ranked their potential for the different parts of the operations based on current technological maturity, savings potential and required implementation effort. Based on this assessment, the key technologies for the supplier were selected, and a new organization was established at group level to drive these technologies into the operations.

This organization is responsible for realizing the estimated 1.2 bn. EUR of savings enabled by these technologies until 2025 by developing expertise, building networks with technology providers and other early adopters, and maintaining an ambitious portfolio of pilot and implementation projects. The first round of 20 implementation projects, launched during the project with Arthur D. Little, is already scheduled to bring savings of 70–100 m EUR within three years.

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Arthur D. Little

Arthur D. Little has been at the forefront of innovation since 1886. We are an acknowledged thought leader in linking strategy, innovation and transformation in technology-intensive and converging industries. We navigate our clients through changing business ecosystems to uncover new growth opportunities. We enable our clients to build innovation capabilities and transform their organizations.

Our consultants have strong practical industry experience combined with excellent knowledge of key trends and dynamics. Arthur D. Little is present in the most important business centers around the world. We are proud to serve most of the Fortune 1000 companies, in addition to other leading firms and public sector organizations

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