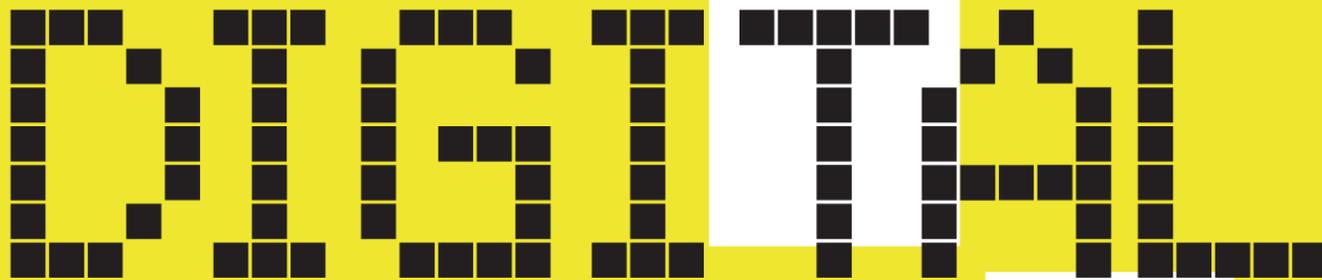


## INDUSTRY 4.0



## EVOLUTION

What companies need to be addressing now

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uturologists, economists, and entrepreneurs all agree: digitization will change the business world more rapidly and comprehensively than did the Industrial Revolution 150 years ago. Major new developments are expected to take place by 2020 that will affect the underlying structures of industry as such and extend far beyond the current circle of “digital players.”

Highly flexible newcomers—often from other sectors—are putting the dynamic developments in information technology to use in sophisticated ways and leaving established competitors behind. Until very recently, top-brand companies that make high-grade industrial hardware could still rely on sufficient demand. But by tomorrow, they may no longer hold the key to customer access. That key is now in the hands of owners of digital platforms that automatically connect demand with supply. For the “old economy,” it is now of crucial importance not to succumb to inertia but rather to see the opportunities that lie in combining their experience and tradition with the new digital possibilities.

#### SELF-CONTROLLING SYSTEMS

The changes taking place on shop floors are more of an evolution than a revolution. Sensors are already collecting masses of data on products and processes these days. However, most of this data has not yet been used. Squandering this data makes it hard or impossible to detect poor quality or inefficiency. And that in turn can lead to shortages of parts in production, for



#### CONNECTIVITY

In 2015—or **405 years** after the first mail coach started running—**320 billion** letters were sent. And last year, **44 years** after electronic mail was invented, some **205 billion** e-mails were sent as well—every single day.

example, or breakdowns in machinery. Connectivity, however, can achieve complete congruence between the digital and real worlds. Control loops can be closed and self-controlling systems created that function like the “human system” in taking available information and filtering, processing, and putting it into action. Self-controlling systems ensure that capacities are put to the best effect, materials are ordered at the right times, and problems are detected right when they start. That increases flexibility and reaction speeds.

This principle does not stop at the factory gates. Connecting everyone involved in the value-creation process eliminates gaps in the flow of information among customers and suppliers. This generates a “system of systems” in which information is automatically exchanged in real time. The automotive industry is a pioneer in this type of connectivity. Customers who order a Porsche today, for example, will immediately be given a precise date of delivery. If changes should subsequently arise, they will be registered and automatically processed in the network that connects the manufacturer, suppliers, and service providers.

#### HUMANS REMAIN INDISPENSABLE

Targeted coordination of people and machines is expected to be a major source of competitive advantage. In addition to further progress in automating physical systems, the greatest amount of potential—as yet unutilized—lies in the field of “knowledge work.” Robot assistants already help human workers perform tiring activities in production. Similarly, teachable →

systems will assist people working on monotonous tasks in indirect areas such as compiling operational data. The advantage here derives from making targeted use of the respective strengths of humans and machines. Where complexity levels exceed the capacity of the human brain, artificial calculations are needed and algorithms can render the flood of data interpretable. They can organize huge volumes of data into instructive patterns and evaluate complex interrelationships—faster and more reliably than any human can. However, humans remain unbeatable at actually interpreting these interrelationships. The experience of Porsche Consulting shows that big data approaches to analyzing company data generally yield a lot of waste, or meaningless correlations. Yet they also reveal the interrelationships



#### STORAGE CAPACITY

In 2016, the volume of traffic on the Internet will reach **1 zettabyte**. That is the amount of data that can be stored on **225 billion** DVDs. If they were piled on top of one another, the resulting stack would circle the globe **7 times**.

of interest—in about half the time previously required to find them. The consultants can put this time they save into activities that create value and find solutions.

#### CONCIERGE FOR CUSTOMERS

In addition to improving efficiency, digital technologies are also triggering truly revolutionary developments. One example would be the fact that the value creation process no longer stops with the sale of a product or service. Contact with customers shifts from the transaction as such to an ongoing interaction. When companies and their customers remain connected, and when companies have data on how customers use their products, they can further develop their products and services in targeted and faster ways. This trove of

information puts them in a position to act like a good concierge at a hotel: they can understand customer needs and behavioral changes and respond right away. OTA (over-the-air) connections in cars, for example, enable manufacturers to analyze vehicle usage data and install software updates or other options based on customer desires. In industry, parameter trends for machines and systems yield precision forecasts for breakdowns and necessary maintenance work. Predictive maintenance and similar service models also allow replacement parts to be ordered on an automatic basis.

#### PLATFORMS AS COORDINATORS

In addition, platforms are increasingly taking the lead when it comes to connecting supply and demand in the best possible ways. The Uber



#### COMPUTATIONAL POWER

In 1969, the Apollo 11 mission sent a Saturn V rocket to the moon. The power of the computer that navigated the rocket back then is **1/200 millionth** of that in a single iPhone 6s.

transportation service would be a good early example of this. Without possessing a single car, it has taken large parts of the market from traditional taxi companies. It functions as a coordinating service that smooths asymmetries in information. Its platform connects customers who want to be driven with available drivers—and the company earns a fee from this coordination service. By providing available vehicles with higher levels of use and shorter waiting times, it increases the efficiency of the overall “vehicle use” system.

Comparable platforms such as Mator are currently on the rise in the mechanical engineering sector. This online marketplace makes machines from the DMG Mori company available around the world in a flexible manner for →

## TRENDS IN INDUSTRY 4.0

### REVOLUTION

**NEXT-SHORING:** There is an ever greater demand for individual products. At the same time, costs are being lowered due to greater levels of automation and new technologies such as 3D printing. This is bringing production back from low-wage countries to sales markets in proximity to their customers. This trend is combining technical and local knowledge, and its shorter paths are increasing speeds and causing less damage to the environment.

**CO-CREATION AND THE CONCIERGE PRINCIPLE:** Companies can connect with their customers over the entire life cycle of their products. This lets them understand their customers’ needs better and address them via a “concierge principle.” For example, customers participate in product creation processes (co-creation) or individualize their products by means of co-customizing options. During the ownership phase, customer usage data gives companies valuable information on how to offer additional services in targeted ways. As a result, today’s transactions between companies and customers are turning into ongoing interactions—which benefit both sides.

**CAPACITY EXCHANGES:** Digital marketplaces are enabling every company to locate suppliers for individual jobs, to relieve their peak capacity periods, and to offer their own capacities during low periods. An approach known as “farming,” for example, gives industry a new business model for decentralizing production and letting its machinery work on a flexible basis for different clients. Other services such as design and logistics can also be booked when a company’s own resources are exhausted.

### EVOLUTION

**INTELLIGENT ORDER PROCESSING:** Digital orders automatically arrange for their own fulfillment in an interconnected system of manufacturers, suppliers, and service providers. While customers are still configuring their orders, the system compares all relevant internal and external resources for design, supply, production, and assembly, and immediately provides a delivery date. Each order “pulls” the requisite designer, the right storage space, and the available machine tools, and also books its own transportation to the customer’s location.

**AUTONOMOUS CONTROL LOOPS:** Data alone does not improve the products and processes at industrial companies. But it can produce quantum leaps in quality and enhance costs and reliability if the many sensors and meters feed their product-, process-, and plant-specific information into company-wide systems. Processes can thereby be seamlessly monitored, and controlled and improved in targeted ways, which significantly raises efficiency and quality. Defects and corrections at one aluminum casting company were recently reduced by 80 percent. For maximum speed, closed control loops need to run systems autonomously and initiate fully automatic actions.

**LOGISTICS ROBOTS:** Models in which humans and robots work side by side without the safety barriers of the past are changing approaches to logistics. People will no longer be the ones fetching the materials to ship to production sites. Instead, robots will bring the items to the dispatchers, or even deliver them directly to the assembly locations. Amazon has already reversed the “people go to products” principle. Its warehouses now have shelving units that move automatically to the employees, who then just have to remove the products they need for packaging.

individual jobs. Another new development in industry has to do with the fact that closed systems no longer necessarily represent a competitive advantage. Open platforms like Axoom started by the Trumpf company enable not only the initiator but also other mechanical engineering companies to offer their services on a modular basis along the entire job processing chain. Customers select the services they need and compile their own modular packages for their jobs. This example illustrates how those who stick to themselves and decline to connect with partners and competitors run the risk of excluding themselves from the virtual marketplaces of the future.

**FOCUS ON CUSTOMER BENEFIT**

Everything that can be digitized will be digitized—at an increasingly rapid rate. Developments in technology often do not show a linear progression. Instead they might start slowly and then rapidly pick up speed. In order to distinguish real opportunities from technical fads that do not create value, it helps to concentrate on benefits. In contrast to the vast range of dynamic technical possibilities, basic human needs remain largely constant. They can serve as lodestones for technical innovations. One example would be assistance systems for work processes, which help meet safety needs and provide instruction or guidance in the workplace. The usual forms of assistance today, which include everything from informational posters and manuals to PCs and tablets, will give way to data glasses and digital contact lenses that superimpose instructions onto the viewer’s field of vision. Augmented reality systems will promote safety and efficiency, and can be adapted in extremely flexible ways to new situations. A focus on benefits, therefore, can channel further development for an entire range of technical possibilities in meaningful ways.



**SPEED**

The WhatsApp instant messaging service had

**1 billion** active users in February 2016.

That is an average gain of four users per second since its release in 2009.

To reach the same number of users, the landline phone system took

**116 years**—or 14 times as long.

**THE KEY QUESTIONS**

Industry 4.0 is a topic that is attracting a fair amount of hype these days, and a good deal of discussion in the media, among researchers, and within companies themselves. But no one can say for sure how it will develop in the future. Reliable prognostications are rare. And technological developments have often been incorrectly assessed in the past. As late as 1995, Microsoft founder Bill Gates is said to have called the success of the Internet a “passing fad.” And in fact many dot-com companies failed around the turn of the millennium. But subsequent developments speak for themselves. Today, too, there is a great risk of misjudging current developments and succumbing to inertia. At the same time, many companies in the “old economy” are hardly aware of the sheer scope of these developments. In addition, they often lack a sense of urgency and the flexibility needed to develop in smart and courageous ways in order to safeguard their access to customers in the future. To provide clarity in this situation, Porsche Consulting poses the most important questions in each of the three main fields of action. →

# HOW TO MAKE THE CHANGE

What companies need to be doing now



## SET A DIGITAL AGENDA

Under the influence of digitization, business models are already changing—and with them the companies themselves. Setting a digital agenda is the best way to determine the right course to take. It provides orientation for the overarching company strategy, as well as for individual segments such as production 4.0 or virtual development. Here are some important questions:

- What changes are affecting our industry?
- What digital business models do we need (e.g. leasing instead of sales)?
- Will our current services continue to attract customers in the future?
- What changes should our company make to enjoy digital growth?
- Are we making full use of Big Data or wasting valuable information-related opportunities?
- What processes can be made more efficient in digital form?



## PROMOTE A PIONEER SPIRIT

As shown by the companies in Silicon Valley, a high rate of implementation promotes competitive advantage in the digital world. Investments there are not based on return as such but rather on degree of product maturity. New ideas are quickly tested in the form of “minimum viable products” and then rolled out if successful. German companies in particular will need to change their culture in order to achieve this type of agility. They will need to place less emphasis on perfectionism and more on risk and the courage to make mistakes. Here are the key questions needed to actively shape a digital learning curve:

- Where will digitization bring added benefits for our customers?
- How fully developed do prototypes really have to be?
- How can we involve our customers as early as possible in new developments?
- How do we create more space for creativity?
- How do we become more daring?



## ORGANIZE CHANGE

The biggest obstacles in digital transformation are not a matter of technological limits but of willingness on the part of people and companies to embrace change. The digital world demands creativity and nimble structures. Here are some important questions for companies that wish to become more agile:

- Do our existing functions and structures still make sense?
- Do we need to redefine the way we work together and communicate?
- How can we accelerate the pace of digitization?
- How can we identify and train employees from within our own company?
- Do we launch our own start-up or should we hire outside expertise?
- What partners are a good fit for us, and bring value to both sides?