Operations Strategy
How to manoeuvre in times of technology-driven disruption
1. CHANGING BUSINESS MODELS
We see transformations within Pharmaceuticals, Energy and Automotive, with a significant impact on these sectors' operations … which industry is next and how will you be affected?
Page 9

2. UP TO 20% COST SAVINGS
There is significant improvement potential through use of the latest technology, automation and digitisation along the entire value chain, especially in traditional industries.
Page 13

3. OVER 2.3 MILLION ROBOTS
Asia will have 2.7 times more industrial robots in operation than the EU by 2018.
Page 21
Operational performance. Never before has the employment of technology had such an impact.

INTRODUCTION
Over the last 300 years, new technologies and processes have paved the way for disruptive products and breakthrough innovations. What is noticeable is the way in which the pace of disruptive innovation seems to have increased over time. In the 18th and 19th centuries, there were relatively few truly disruptive technologies introduced, and the intervals between them were relatively long. In the 20th century these breakthrough innovations have become more frequent. It was, and obviously is difficult to predict the importance and impact of new products, as the selected quotations show. So have company leaders learned lessons from the past, and are they prepared for this pace of technological change, and the competitive threat it entails?

It seems that we have reached a stage around the year 2000, where technology and especially the increased performance and cost efficient supply of microprocessors, data storage and communication bandwidth allows a new dimension of change and its pace.

New technologies, shifting consumer behaviour and market entrants seeking to disrupt traditional ways of doing business are about to overturn conventional definitions of industries, firms, their products and service offerings and value chains.

The new challenge for mature businesses and traditional companies is that global technology firms or small start-ups in adjacent markets can come from nowhere to disrupt their business model and change customers’ buying patterns. The number of potential threats has never been so high.

Derived from the strategic thinking of ancient warfare, management literature and business schools especially in the US and Europe have taught "essential
HISTORICAL DEVELOPMENT

The number and variety of Disruptive Products is skyrocketing.
DRIVING FORCES OF TRANSFORMATION
New technologies, shifting consumer behaviour and market entrants overturn conventional definitions.

- FIRMS: Stronger integration of customers and suppliers in terms of better coordination and enhanced cooperation increases efficiency and drives innovation.
- PRODUCTS AND SERVICES: Solution based approach creates additional value, which can be captured by both the firm and its customers.
- PHYSICAL OFFERINGS: Use of advanced data analytic tools enables companies to offer new services, which improve efficiency and effectiveness of (manufacturing) assets.
- AUTOMATED PLANTS: Cyber-physical systems are at the heart of Digital Plants, where humans, smart robots, logistic components, products and IT systems are highly integrated.

Source: BMI White Paper – University of Cambridge, Roland Berger
These are very interesting times for Chief Executives, Chief Operations Officers and their teams. To reflect latest developments and to maintain simplicity at the same time, we would like to introduce a pragmatic, non-exhaustive model to discuss Operations Strategy and its key objectives. Operations Strategy, as an important subset of corporate strategy, has to define and implement elements in the following five dimensions.

As we can learn from history and by looking around us, the frequency and significance of change taking place is soaring. Another new development has been the scale of financial resources and the appetite of technology firms to enter new markets: nowadays technology firms or start-ups often trigger change instead of OEMs. It is therefore becoming increasingly dangerous not to acknowledge and address these developments.

KEY ELEMENTS OF OPERATIONS STRATEGY ...

Five dimensions are crucial to define a cohesive strategy.

**OPERATIONS STRATEGY**
- What is our Operations philosophy – are we "Lean", "Six Sigma", "World Class in ...", are we open or introverted – and how serious are we as managers about implementation?
- How much Capex and Opex do we need to run a profitable business, and how should we allocate it?
- What does our Operations roadmap for the next 5 and 10 years look like? Which future scenarios are likely and how do we prepare for them?

**VALUE CHAIN**
- How do we ensure customer-centricity?
- Do we follow a selective or a seamless digital strategy?
- What is the right level of automation and digitisation for our business?

**MANUFACTURING FOOTPRINT**
- What is the best place to produce our products and their component parts? Which capabilities do we need in every site and which functions are required locally?
- How much production capacity do we need, how flexible are our sites in terms of volume and product mix and how do we coordinate and manage our production network?
- How standardised do we want our sites to be, e.g. in terms of machinery, processes, layouts or organisational structures?

**BUSINESS MODEL**
- Which products and services do we offer for which customers and markets? Is our offering global, or does it require localisation?
- What are our core capabilities? Which capabilities should we keep in-house, and which should we outsource?
- How do we integrate suppliers?

**TALENT MANAGEMENT**
- How do we ensure the availability of a skilled workforce and skilled managers?
- How do we provide continuous development and training in the relevant areas?
- How do we manage and adapt the capacity of our people and how do we encourage global mobility for bottleneck resources?

Source: Roland Berger
Operations Strategy, an important subset of Corporate Strategy, has to define and implement these five dimensions.

- Philosophy & implementation
- Capex and Opex allocation
- OpS Roadmap 2020/25 and scenario planning

- Customer centricity
- Seamless vs. selective digital strategy
- Level of automation/digitisation

- Location
- Capacity and flexibility
- Degree of standardisation

- Customers, markets, products & services
- Core capabilities & depth of added value
- Supplier integration

- Skilled workforce
- Continuous training
- International mobility

Source: Roland Berger
A good place to start in times of high pace: focused business model, light footprint and embedded customer centricity.

BUSINESS MODEL
This article assumes key strategic decisions around products, services, customers and markets have already been made. Based on a given product-market strategy, a central question for Operations Strategy – and one directly linked to investments and the focus of R&D and production – is the question of a company’s core capabilities and the depth of value-add. Answers to those questions lead to the definition and degree of in-house and outsourced processes and activities.

Traditionally “product-heavy” companies tended to keep manufacturing in-house and have built significant assets over the years. Some of these companies struggle in times of overcapacity and market liberalisation, as we can see in the energy sector, in the steel industry and potentially in Automotive with significant investments in production capacity.

A famous example of how to avoid costs associated with manufacturing, storage, and distribution is The Coca Cola Company (TCCC). Founded in 1886, TCCC today has become one of the world’s largest beverage companies. Over the last 130 years it has evolved its business model from a sparkling beverages business to a diversified business, including still and now premium beverages.

TCCC makes its products available to global consumers through a network of Company-owned or -controlled bottling and distribution operations as well as independent bottling partners, distributors, wholesalers and retailers. This is not a modern concept; TCCC has been operating a franchised distribution system since 1889.

In this franchised distribution system, TCCC only produces the syrup concentrate which is then sold to various bottlers throughout the world who hold exclusivity over a region. The franchise model allows the company to keep Opex, Capex and inventory levels low. It also enables the company to scale its business faster.
STRATEGIC POSITIONING ALONG THE PHARMACEUTICAL VALUE CHAIN

Outsourcing is now a strategic lever for the Pharmaceutical industry. In parallel the wholesale / retail process becomes interesting for Pharmaceutical companies again.

1990

<table>
<thead>
<tr>
<th>R&amp;D</th>
<th>Trials</th>
<th>Active pharmaceutical ingredient</th>
<th>Manufacturing</th>
<th>Logistics</th>
<th>Marketing, Medical, Sales</th>
<th>Wholesale / Retail</th>
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Era of M&A and JVs

2000

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<tr>
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<th>Wholesale / Retail</th>
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Era of patent cliffs & pipeline failure

2010

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<tr>
<th>R&amp;D</th>
<th>Trials</th>
<th>Active pharmaceutical ingredient</th>
<th>Manufacturing</th>
<th>Logistics</th>
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<th>Wholesale / Retail</th>
</tr>
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Era of new business models & new economies

2020

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<thead>
<tr>
<th>R&amp;D</th>
<th>Trials</th>
<th>Active pharmaceutical ingredient</th>
<th>Manufacturing</th>
<th>Logistics</th>
<th>Marketing, Medical, Sales</th>
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TCCC’s bottling partners are responsible for meeting the customer demand through manufacturing, packaging, distributing, and merchandising the finished branded beverages to customers. The bottling partners are also responsible for customer marketing and outlet execution.

As you can see in our next example, many Pharmaceutical companies have changed their view on “what is core” significantly over the last 25 years. After an era of scale through Mergers and Acquisitions and Joint Ventures, followed by an era of patent cliffs and pipeline failure resulting in enormous cost pressure, we now see an era of new business models with the creation of specialised new players and the renaissance of “connect with your customer” after a long period of outsourced wholesale and retail processes.

When it comes to defining strategic positioning in the value chain and to making it work two attributes become ever more important. Firstly, a clear perception of shifts in relevant profit pools, what is happening in your company’s ecosystem and in adjacent markets. Secondly, flexibility and the will to change, as well as to integrate external suppliers.

While the described business model changes in Pharma were mainly driven by financial pressure and risk mitigation, the rise of digital technologies has started to transform entire industries based on the availability of affordable high-tech concepts like intel-
mentally friendly car, but as a high-end vehicle that competes with cars like the Audi A7, Mercedes CLS or BMW 5 Series. By placing the battery packs at the bottom of the car, which provided superior rigidity and handling, Tesla became the only car to provide an all-glass panoramic roof. The software allows the Tesla car to update itself wirelessly and provides the ability for the driver to fully customise the car’s behaviour – steering and suspension.

Such a high level of technology integration was considered a gold standard by other car manufacturers. By continuously investing into R&D, Tesla became an innovative electric car producer, which now also designs and sells powertrains for other car manufacturers. As a next step, Tesla is aiming to be not only an innovative automotive manufacturer, but also an “energy innovation company”. Tesla’s energy division is focused on two segments – Powerwall, home-size rechargeable batteries and Powertrain, modular storage systems for businesses and utility companies that can be ramped up to 10 MWh battery blocks.

If we look at some of the described industries and companies from a shareholder value perspective, e-commerce firms provide more value to their shareholders on each dollar in sales compared to traditional manufacturers like car producers. Pharma firms are close to e-commerce companies and have even improved their performance over the last years. It might be true that performance varies across industries and that the price-to-sales ratio always used to be lower for car manufacturers. However, Tesla as a recent disruptor in the automotive industry, shows that innovative companies can outperform their peer group significantly and can achieve a price-to-sales ratio of 8 – in terms of market capitalisation to generated revenues – compared to “below 1” for the top ten car producers.

There is obviously no “one size fits all” business model, but some interesting patterns to consider and learn from.
SHARE PRICE TO REVENUE RATIOS FOR SELECTED INDUSTRIES [TOP 5 IN EACH INDUSTRY]

Traditional manufacturing like Automotive delivers less value per Dollar in sales than E-commerce companies...

PRICE-TO-SALES RATIOS IN THE AUTOMOTIVE INDUSTRY, 2015

...but disruptor Tesla outperforms its automotive peer group by a factor of 10 and more.

<table>
<thead>
<tr>
<th>REVENUES [USD BN]</th>
<th>MARKET CAP [USD BN]</th>
<th>PRICE TO SALES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toyota</td>
<td>249</td>
<td>220</td>
</tr>
<tr>
<td>Volkswagen</td>
<td>247</td>
<td>70</td>
</tr>
<tr>
<td>Daimler</td>
<td>166</td>
<td>90</td>
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<tr>
<td>General Motors</td>
<td>152</td>
<td>51</td>
</tr>
<tr>
<td>Ford</td>
<td>150</td>
<td>56</td>
</tr>
<tr>
<td>Fiat Chrysler</td>
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<td>Honda</td>
<td>116</td>
<td>59</td>
</tr>
<tr>
<td>Nissan</td>
<td>104</td>
<td>43</td>
</tr>
<tr>
<td>BMW</td>
<td>102</td>
<td>70</td>
</tr>
<tr>
<td>Hyundai</td>
<td>81</td>
<td>26</td>
</tr>
<tr>
<td><strong>Tesla</strong></td>
<td><strong>4</strong></td>
<td><strong>32</strong></td>
</tr>
</tbody>
</table>

Source: Bloomberg, Roland Berger
Construction of a unique value chain. Automation and digital enablers are becoming more affordable and ready for use.

VALUE CHAIN
The end-to-end, cross-functional definition and continuous improvement of a company’s value chain is key to ensure the most competitive way of providing products or services. It is surprising therefore, that there are still companies which don’t have a process model and which don’t think about their value chain in an holistic way – their culture and operations are still very “silo”-driven rather than process oriented.

CUSTOMER-CENTRICITY
A big portion of the tech-companies’ and start-ups’ success comes from the philosophy of customer-centricity. Customer-centricity is not just another word for customer orientation, it means that the entire business and its processes are designed around the customers’ needs and expectations. New technology is a trigger and tool at the same time to make this transformation happen – many digital enablers and tools are already available for each step of the value chain, many more will follow. →

Driven by firms like Uber, Blablacar and others, General Motors has launched a car sharing service called Maven, which allows customers to use cars for just over GBP 4 per hour. Moreover, Ford recently created a new enterprise – Ford Smart Mobility, which will be an incubator for future opportunities, such as ridesharing and fractional ownership. By using apps customers can choose the type of the car and book it seamlessly. This represents a huge shift in the value chain of an OEM, as
### DIGITAL ENABLERS AND POTENTIAL BENEFITS ALONG THE VALUE CHAIN

An holistic deployment can reduce overall costs by up to 20%.

<table>
<thead>
<tr>
<th><strong>SALES &amp; MARKETING</strong></th>
<th><strong>R&amp;D AND ENGINEERING</strong></th>
<th><strong>PROCUREMENT</strong></th>
<th><strong>PRODUCTION</strong></th>
<th><strong>DISTRIBUTION / INSTALLATION</strong></th>
<th><strong>AFTERSALES SERVICES</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Predictive analytics</td>
<td>Virtual factories</td>
<td>Demand driven</td>
<td>Customer triggered one lot customized production</td>
<td>Smart storage</td>
<td>e-care sharing platforms</td>
</tr>
<tr>
<td>Social network</td>
<td>Cloud services</td>
<td>real-time supply management</td>
<td>Automatic delivery</td>
<td>&gt; Full wireless connection to products for software upgrades and maintenance</td>
<td>&gt; 3D printing of spare parts</td>
</tr>
<tr>
<td>communities</td>
<td>for complex computing and planning</td>
<td>Participation of suppliers in product development</td>
<td>Predictive maintenance</td>
<td>&gt; Modular adaptive manufacturing</td>
<td>&gt; Digital collaboration</td>
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<tr>
<td>Tracking technologies</td>
<td>Rapid prototyping</td>
<td>Electronic drawings</td>
<td>Interactive robotics</td>
<td>&gt; Smart products</td>
<td>&gt; Mobile device machine control</td>
</tr>
<tr>
<td>Online product</td>
<td>3D printing</td>
<td>E-auctions</td>
<td>Modular adaptive manufacturing</td>
<td>&gt; 3D products</td>
<td>&gt; e-care sharing platforms</td>
</tr>
<tr>
<td>configuration</td>
<td>CAD (Computer-Aided Design)</td>
<td>EDI (Electronic Data Interface)</td>
<td>&gt; Interactive robotics</td>
<td>&gt; Smart products</td>
<td>&gt; Full wireless connection to products for software upgrades and maintenance</td>
</tr>
<tr>
<td>Individualized goods</td>
<td>Simulation tools</td>
<td>&gt; Modular adaptive manufacturing</td>
<td>&gt; Storage robotics</td>
<td>&gt; Mobile device machine control</td>
<td>&gt; 3D printing of spare parts</td>
</tr>
<tr>
<td>Digital collaboration</td>
<td>Digital mock-up</td>
<td>&gt; Design and development time reduced by more than 50%</td>
<td>&gt; Predictive main-</td>
<td>&gt; Maintenance profits can go up by 10-20%</td>
<td></td>
</tr>
</tbody>
</table>

→ **SALES & MARKETING**
- Sales per employee are up by 40%

→ **R&D AND ENGINEERING**
- Design and development time reduced by more than 50%
- Inventories reduced by 30-50%

→ **PROCUREMENT**
- Manufacturing costs reduced by 10-20%

→ **PRODUCTION**
- Logistics costs reduced by 10-20%

→ **DISTRIBUTION / INSTALLATION**
- Maintenance profits can go up by 10-20%

Source: Fraunhofer Institute for Manufacturing Engineering and Automation (IPA), Roland Berger
it starts to move from a traditional car manufacturer to an additional service provider, covering all steps of the value chain through end-to-end digitisation.

Other car companies have announced similar strategy moves: Jaguar Land Rover, for example, has just launched its “InMotion” car-sharing division. As well, Dr. Dieter Zetsche – Chairman of the Board of Management of Daimler AG and Head of Mercedes-Benz Cars informs us that “This digital transformation is in full swing at Mercedes-Benz. We are transitioning from car manufacturer to networked mobility provider, whereby the focus is always on the individual – as customer and employee. This is how we will continue to develop the company and thereby ensure our future competitiveness.”

Differences between traditional versus customer-centric approaches also become apparent in the design phase: When customer-centric technology firms design a car they build everything around the driver first, by starting from the user-interface, seat design and everything that the passenger interacts with, saying that engine and powertrain is the last thing they would think of. At the same time, traditional OEMs normally start their design process from the other end. Transformation is happening with a shifting focus from products to customer experience. Customers expect products that are easy to interact with, intuitive and connected.

SEAMLESS VS. SELECTIVE DIGITAL STRATEGY
Many companies have embarked on their journey to improved online customer interaction and better visibility of their products on the internet, reduced lead time for product design through CAD systems and simulation tools and investments in automated manufacturing.

However, often these solutions mirror the silos within the organisation and are focused on functional improvements – sales & service, R&D, procurement or production. Real end-to-end process design which cuts through the entire organisation and which offers a seamless experience for customers and suppliers is still a rarity, especially in traditional organisations which have been built and shaped in the pre-digital era. Despite the value from a customer perspective, lead times can be further reduced significantly and total cost savings of up to 20% are feasible. →

Aiming for a “big bang” and trying to implement a digitised end-to-end process in one go may be too costly and carries a lot of risks as well. Perhaps a better way forward is to map out the “whole picture” and to connect the dots one by one, from one “digital island” to the next, until the process is as integrated as possible with available and affordable technology.

If managers decide to move towards a seamless digital strategy, they should consider that major changes are necessary in terms of organisation structures, the way management and employees think and work, and interaction with third parties, e.g. stronger supplier integration. This will most likely require a new level of openness and trust.

Due to the degree of required change, some companies decide to start with a blank sheet and launch a new company with the specific business model and scope, instead of going through the long, complex and expensive change process with a lot of internal resistance and a high likelihood of failure. Once the new company is successfully established in the market and stable, the two companies can be merged, leveraging the experience of the old, with the business model of the new in order to achieve accelerated transformation.

"You would make a ship sail against the winds and currents by lighting a bonfire under her deck ... I have no time for such nonsense."

NAPOLEON
LEVEL OF AUTOMATION AND DIGITISATION
Not every company requires or is yet in a position to start a transformation towards end-to-end digitisation and full automation. The degree of change and the best way to implement this change will depend greatly on the industry sector, the product range, the competitive environment and the availability of experienced teams to initiate and guide the transformation process.

Nor is it true that manufacturers are alone in the vanguard of digitisation. Financial Services have a long track record and Construction, similarly, is well on its way to a less concrete-centric future, with BIM, GIS and off-site manufacture revolutionising the industry in stages.

As we have described before, technical enablers and automated solutions have become more affordable and flexible, so that investments and their financial payback, which have been unattractive and unthinkable in previous years, now become sensible and attractive.

Management should develop, alongside their teams, an up-to-date overview of the potential investments for automation and digitisation and their benefits along the value chain, and form a common understanding of what it would take to get to an integrated end-to-end process. In developing business cases for the different process steps and the entire value chain, falling into one of two extremes should be avoided:

1. “That will not work” attitude from self-appointed experts and technology sceptics. Find a balanced approach between experience / realism and innovative spirit.

2. “Over-Engineering” and insisting on solutions that are too expensive, and don’t have a sensible payback.

Mercedes decided to fully implement their end-to-end digitisation concept. They claim that “the increase in speed and efficiency through digitalisation is impressively demonstrated in figures” during the design of their Concept IAA (Concept Intelligent Aerodynamic Automobile). Mercedes states that “design and development, which alone would previously have taken up to two years, was achieved in less than eleven months”.

"The horse is here to stay but the automobile is only a novelty – a fad."
PRESIDENT OF THE MICHIGAN SAVINGS, 1903

"I think there is a world market for maybe five computers."
THOMAS WATSON - CHAIRMAN OF IBM, 1943
UK VS. GERMANY PRODUCTIVITY GAP

The current gap of 36% is the largest since comparable estimates began in 1991.

Source: Office for National Statistics, Roland Berger
Growing productivity gap. The UK is currently 36% lower than best practice.

**UK PRODUCTIVITY**
Latest data released by the ONS (Office for National Statistics) show that UK’s productivity has fallen even further compared to its peers in the G7 countries. One key figure for productivity, “GDP per hour worked” was 18% lower in 2014 than in the rest of the group, which represents a 1% increase in the productivity gap compared to the previous year.

Moreover, UK’s productivity, measured in “GDP per hour worked”, was 36% lower than in best practice country Germany, a 5% decline compared to 2013. It is the largest productivity gap for the UK since comparable estimates begun in 1991. More than 2.6 million people work in UK manufacturing, which accounts for nearly 10% of national GDP and which contributes to 44% of UK exports. Manufacturing is important for the UK economy in terms of impact on productivity and competitiveness.

So what are the main reasons for this gap and what should UK manufacturing companies do differently to catch up again?

There are three main reasons for the UK productivity gap:
- Reduced investments in R&D and new equipment,
- Shortage of skilled workforce and
- Implementation deficit of lean manufacturing concepts

**INVESTMENTS**
Businesses in the UK have significantly reduced investment in manufacturing as a percent of all business investments, from 23% in 1997 to 15% in 2014. It still seems that a significant proportion of UK managers is primarily concerned with short term financial performance, by limiting capital expenditure. This move may provide better short term financial ratios, however, it negatively affects long-term growth and competitiveness.

As a result of reduced investment in equipment, workers have to work on outdated, less efficient machines, with increased efforts for maintenance and tool change, and they have to perform mechanical jobs that can be automated.

Robotic density is an important indication of competitiveness among countries: The UK, with 66 robots per 10,000 employees in the manufacturing industry, is exactly on global average and far behind best practice. The Global leader is South Korea with nearly 500 robots per 10,000 employees, followed by Japan and Germany, 310 and 290 respectively.

**SKILLED WORKFORCE**
Ageing population and poor supply of specialised workforces are other reasons explaining the productivity gap. There is a shortage of more than 80,000 workers with engineering skills in the UK. The Royal Acad-
emy of Engineering forecasted a demand for more than 100,000 engineers a year until 2020. In the next 20 years it is expected that 69% of engineers will reach retirement age, meaning there is a serious risk of a drain to the talent pool in the foreseeable future.

Another success factor for high manufacturing productivity is a modern apprenticeship system. When compared to the German ‘gold standard’ in apprenticeship training, employment outcomes for UK apprentices have improved over recent years. The ‘gap’ between UK and German apprenticeship training has narrowed significantly in terms of participation and completion rates, but has not been eliminated.

**LEAN MANUFACTURING**

Large and international manufacturing companies in the UK have implemented and improved lean production concepts for many years. However, there is still a significant number of firms that do not apply these techniques. The Advanced Institute of Management Research found that on average manufacturing companies in the UK are far behind international competitors such as Japan and Germany in adapting best practices. Lean concepts and their effective implementation have to be seen as the mandatory base for high productivity, world-class quality and continuous improvement.

The challenge in catching up is that other countries and companies will continue on their journey and not stop – the UK will have to improve faster than the competition. Without a much more comprehensive implementation of lean manufacturing, disproportionate investments in the development of management skills, engineering skills and modern apprenticeship training as well as investments in state-of-the-art equipment and infrastructure, the productivity gap will remain the same or even grow.
Talent management remains decisive. The centre of automated manufacturing shifts to Asia.

PRODUCTION FOOTPRINT
In the past, US and Western European companies invested in Asia, South America or Eastern Europe because of lower labour rates, and to create a market. The first factories were built mainly for manual labour and for relatively simple products. Nowadays we can see two different, often parallel developments:

1. Global companies and local players invest in highly automated, state-of-the-art factories in developing countries because the market growth happens here.

2. Companies invest again in their industrialised home countries and build highly automated production systems which can compete with lower labour rates and costs in other regions.

It seems like new technologies and automation have the potential to bring manufacturing back to the US and Western Europe.

LOCATION
Footprint-related decisions are still mainly driven by proximity to customers or key suppliers, low labour rates, minimum Opex or tax rates. Additional selection criteria are subsidies, local content terms, availability of skilled workforce and political stability in the region. All these decision criteria remain relevant, but factories will start to look and function differently in the near future.

In factories of the future, we expect to find 'smart working areas' with joint activity by humans and industrial robots. This will require a shift in qualification profiles, away from simple manual labour and supervision of staff to people who can programme machine tools and robots, understand logistics and material flow, are able to design and build flexible production cells and who can communicate with employees and drive change initiatives as well. It is crucial to make sure that those required capabilities are locally available. Many companies run into trouble after they have successfully ramped-up a new factory with experienced...
expats and hand it over to a local team without the skills necessary to run and maintain the factory.

CAPACITY AND FLEXIBILITY
Once the decision about the location is made, and the products and parts to be produced there, the next question is: how much space and how much capacity is really needed?

Sales people and their forecasts are often rather optimistic, and engineers and factory planners are normally generous when it comes to space and layouts: so often new factories are too big and allow a lot of space for expansion. In actual fact, factories should be as small as possible, to minimise waste in terms of transportation, motion and energy, and to allow visual management as much as possible. To stay flexible, factory layouts, material flow and production processes should be designed in a modular way, so that the buildings, infrastructure and capacity can grow or shrink in line with medium- and long-term market demand.

While the size of production plants and the number of machines is predominantly related to volume flexibility, the challenge of product-mix flexibility requires different solutions. In the past, manual labour was often the answer. Additional support regarding product-mix flexibility comes with new technical developments, such as adaptive robots. They offer a wide range of possibilities to be flexible and to meet current demand efficiently. This type of robot can easily be reconfigured, or upgraded without large additional investment, to produce new products in the event of low or changed demand.

Robots will be a very important driver of industrial growth for years to come. More than 2.3 million industrial robots will be put into operation by 2018. Annual sales of robots has increased by 17% on average from 2010 to 2014, with Asia being the biggest robotics region, where sales grew by 41% in 2014 compared to 2013. It is estimated that by 2018 there will be more than 1.4 million industrial robots in operation in the Asian / Australian market, which represents a 16% annual growth. → K

TALENT MANAGEMENT
The more high technology is in place, processes are automated and robots and machines work hand in hand with humans, the more highly qualified people play the decisive role when it comes to market leadership and competition. Skilled workmen, precision mechanics, IT and cyber experts, cloud computing specialists, big data analysts, technical sales people, software/machine tool and robot programmers, material scientists, production system engineers, quality managers, design engineers, application engineers, IP (intellectual property) sourcing professionals or technical controllers, to give examples. These job profiles will be in very high demand on the global job market.

In addition to the threats of aging population, retiring experienced workforces in industrialised countries, and the shift in required skills and capabilities in modern factories, there is additional pressure from a new phenomenon: High-tech companies, entering "traditional engineering markets", attract top engineering and IT talent by offering good money, creative space, flat organisation structures, "start-up culture" and the perspective of developing front end technologies and products, e.g. transport drones or high performance robots.

DEGREE OF STANDARDISATION
One helpful element – if not a prerequisite – of modular sites and manufacturing processes is standardisation. Standardisation on the shop floor in terms of layout guidelines, used machinery and tools, work instructions, visual management, material flow and logistics also helps to develop and implement a global set of best practices. It makes maintenance and spare part management easier and more cost effective, reduces complexity and creates comparable key performance indicators between locations and organisational units.

In terms of workflows and organisation structure it helps to develop the most efficient way to process things, from a customer request to writing an offer or to paying an invoice. It also helps with internal and external interfaces due to clear and unified job titles and role descriptions.

Against this background it is interesting to see that companies still allow a great variance of internal procedures, organisational structures and job titles, equipment and shop floor designs in their international manufacturing sites. If they were to measure the cost of complexity that comes with it, they would probably encourage more standardisation.
Hence, a clear talent management strategy is required:

> Which qualifications do we currently have on board?
> What is the future demand in terms of qualification profile, numbers and location?
> How do we manage the knowledge transfer from retiring people to younger staff?
> How can we close the gap and where can we find a skilled workforce?
> How do we attract the best talent, how do we motivate them to stay?
> If we can’t find the people on the job market, how can we train them?
> How will we manage the shift from our existing capability pool to the new one?

In the same way as continuous improvement is non-negotiable in a manufacturing environment, continuous and life-long learning is a mandatory aspect of talent management. It has to be seen as investment into the crucial human resource. In the competition for best talent, it is also an important tool to keep talented people in the company. In times of squeezed margins, training is often first on the list of possible areas of cost reduction. This approach can cause significant damage to the organisation.

As firms grow internationally and resources become more scarce, staff mobility becomes more important. Ramping-up and running new factories, training people in newly acquired companies or green-field operations in sales, procurement, engineering, manufacturing, finance & controlling or HR procedures can make it necessary to send experienced people around the world. International mobility becomes a condition.

While many young hires embrace or even expect international job rotation, experienced people often resist due to their family situation. This of course makes mobility expensive. Another challenge is finding the senior hire an appropriate position in the organisation at home after the secondment. If not managed professionally, this can lead to frustration or even the departure of top talent.

Clear advantages of international mobility are the opportunity to implement standards and best practices around the world, building a “global culture” and network between the employees and giving the employees an exciting work experience and growth opportunity – professionally and personally.
Even in our simplified model with five key elements of Operations Strategy, there are many dots to be connected, there are many moving parts and many uncertainties. But there are also huge opportunities for those who move early, utilise the advantages of latest technology and who implement an integrated, coherent Operations Strategy. To summarise the vital points of this article, the following statements and questions might be helpful:

1. Challenge your existing business model. What is your differentiating capability in your ecosystem and who are the players you should reach out to now to be potential partners in 2 years?

2. Think “out of silo” and design a customer centric, digitised value chain. Where can available technology create competitive advantage today and what is your plan for 2020?

3. Design a flexible, standardised and modular production footprint – think also about capacity sharing, franchising and outsourcing. How many adaptive robots will you have in 2 years compared to today?

4. Highly qualified people will play the decisive role in modern, highly automated factories. Do you have a clear talent management strategy with tangible answers?

5. Develop an integrated approach which answers those and additional relevant questions in a coherent way. What does your Operations Strategy roadmap 2020/25 look like?

"There’s no chance that the iPhone is going to get any significant market share."

STEVE BALLMER - MICROSOFT CEO, 2007

We wish you the best of luck as you manoeuvre through these times of technology-driven disruption.
ABOUT US

Roland Berger, founded in 1967, is the only leading global consultancy of German heritage and European origin. With 2,400 employees working from 36 countries, we have successful operations in all major international markets. Our 50 offices are located in the key global business hubs. The consultancy is an independent partnership owned exclusively by 220 Partners.

FURTHER READING

THE INDUSTRIE 4.0 TRANSITION QUANTIFIED

There is more to Industrie 4.0 than its technical dimension. Technologies like factory virtualization, smart and intelligent machines, the IoT, the cyber production system, 3D technology, cobots determine the debate. Many are available already or emerging. Companies have launched pilot projects in which they try to embed these technologies in their current manufacturing process. Few, however, have genuinely exploited their potential to the full and implemented new models.

AUTOMOTIVE SECTOR IN TRANSITION

The automotive sector faces a sea change. Though more than 70 percent of all the miles driven on our roads are currently driven in privately owned vehicles, carsharing and ridesharing models are set to account for an ever-greater share of overall mobility in the next decade. After that, autonomous taxis, dubbed robocabs, will likely see their own slice of the market rise to almost 30 percent by 2030. By that point in time only 45 percent of miles will be driven by people in private cars.

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