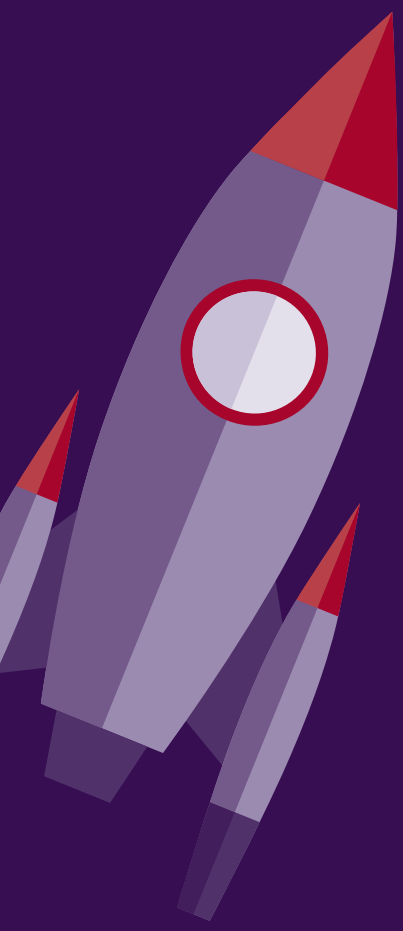
INDUSTRY 4.0

FROM THE VISION TO REALITY



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INDUSTRY 4.0

FROM THE VISION TO REALITY

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Management Summary

Industry 4.0 has become the all-dominant vision for the future of industrial production. The technologies and IT systems it is based on are already far advanced and their benefits and importance for remaining competitive are undisputed.

Now manufacturing enterprises are faced with the challenge of transforming the Industry 4.0 vision into reality – especially in their operational processes, manufacturing and IT strategies as well as company structures. And they need to define a clear path to this reality.

A typical case from the mechanical engineering industry in this study shows that the most complex change does not lie in how companies apply individual technologies, but in developing a company-wide Industry 4.0 strategy and linking together heterogeneous processes and systems, because this is the only way to fully exploit the cost and sales potential that Industry 4.0 offers. What is more, Industry 4.0 will also bring about enormous changes in the structure of staff and company, and these will have to be dealt with.

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1. Changes in operational processes resulting from Industry 4.0 2. Strategic dimensions of Industry 4.0 in the IT and production strategies 3. The road to the destination – cornerstones of the implementation roadmap

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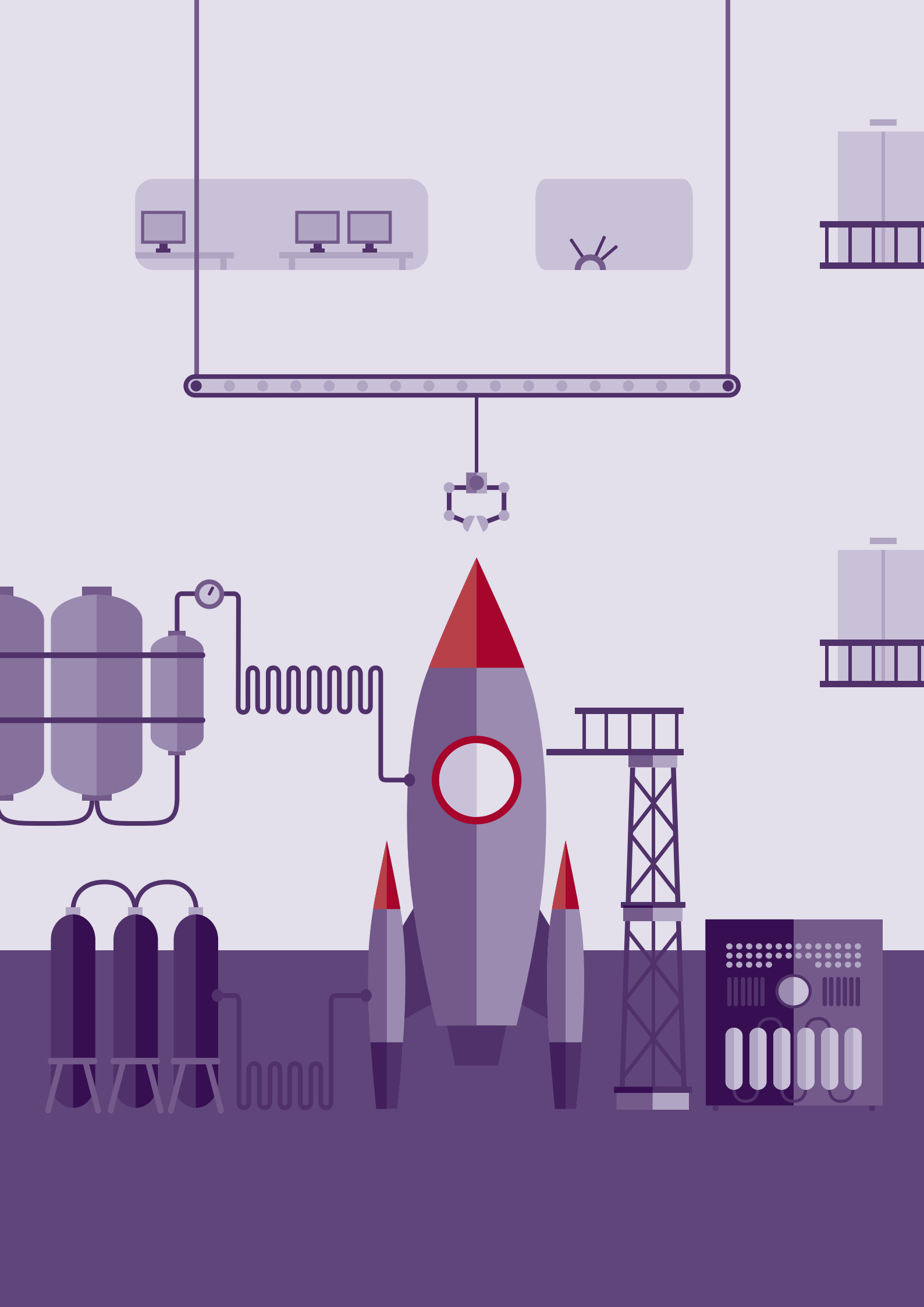

1. Changes in operational processes resulting from Industry 4.0

Increased performance across all areas

First and foremost, Industry 4.0 helps reduce product costs and throughput times. Small batch sizes, all the way down to a batch size of 1, can be produced much more quickly and cheaply, and the significance of human resources as a cost factor reduces considerably. Industry 4.0 gives enterprises more leeway in their product range, pricing and delivery times.

But it is not only the operational divisions that benefit, R&D and Product Management also profit. The data provided by Production and Sales ensures optimal transparency and significantly improves the decision-making quality in both divisions. At the same time, simulations enable fully seamless processes, thus considerably accelerating the entire development process, all the way through to the market launch.

How Industry 4.0 halves production times – a look into the future

The illustration shows where and how Industry 4.0 changes the value chain. It is based on the example of the mechanical engineering company mentioned above, which manufactures small series, special devices and by individual customer order.

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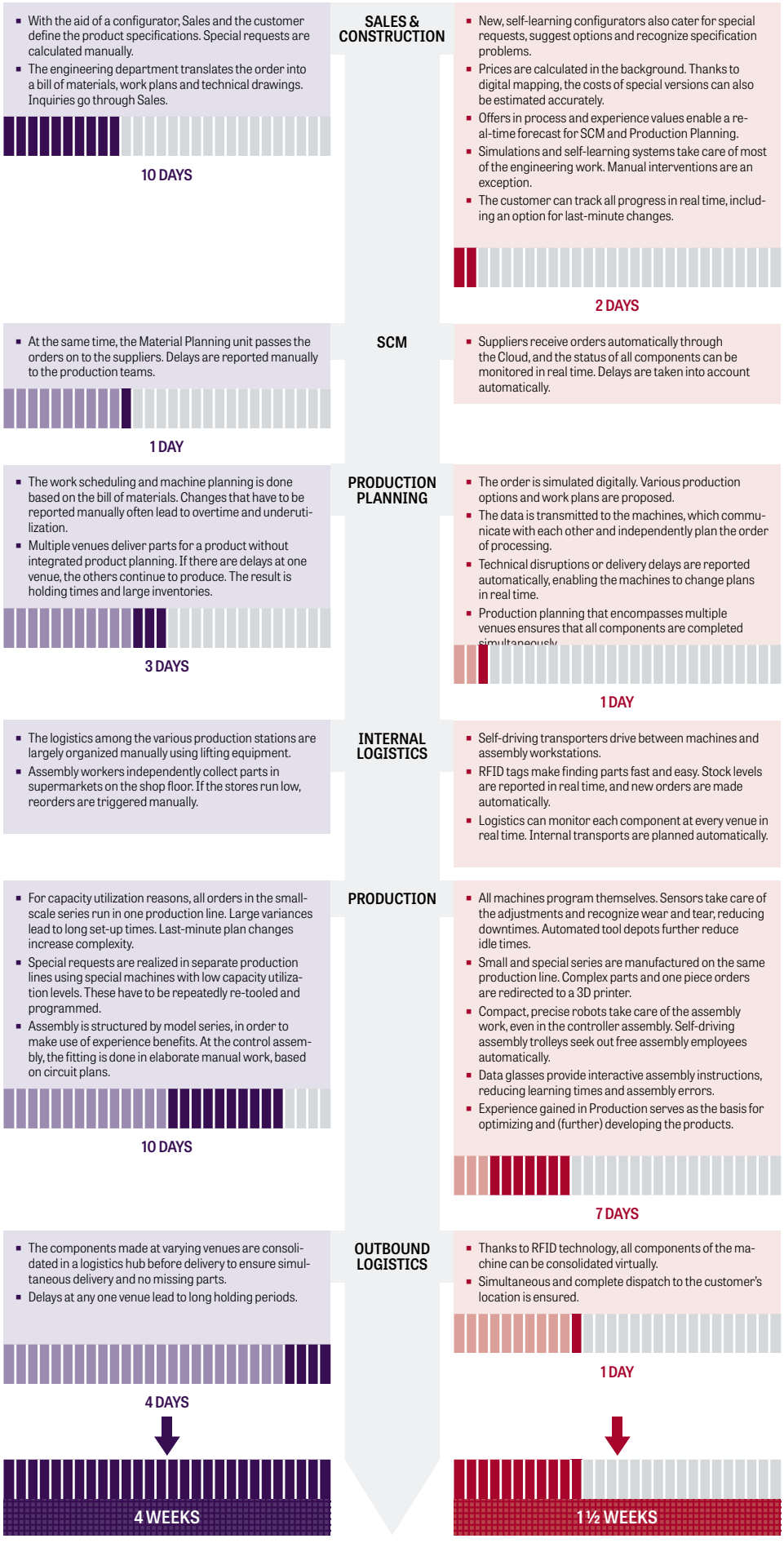
FIG. 1: REDUCTION OF PRODUCTION TIMES ALONG THE VALUE CHAIN WITH INDUSTRY 4.0



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2. Strategic dimensions of the realization of Industry 4.0

The rigorous implementation of Industry 4.0 is a long-term strategic challenge for the entire company. Large parts of the manufacturing strategy and production footprint, the IT and HR strategies have to be rethought.

Manufacturing strategy and production footprint

At the global production network level and at individual venues, the manufacturing strategy and production footprint are changing in the following ways:

- Profiles of the sites and production divisions: The borders between (small) series and one-off production are blurring; sites and production lines with a mixture of series and special production are becoming the rule.

- Product portfolio: More sales potential is arising in the "long tail". The falling batch numbers that are required to break even make a broader range of products and numerous product versions possible.

- Technology portfolio: Numerous new and upcoming production technologies are part of the design of future production lines. The focus lies on technologies such as 3D printing and more robotics in the assembly phase.

The clearest implications arise for the international production footprint. The share of personnel costs in the product costs is declining, and with it the importance of wage arbitrage as a location criterion. The question of whether a local presence is strategically necessary in growing markets is becoming more central.
Because, from the supply-chain perspective, a highly flexible, cost-effective site in Europe can have a much larger delivery radius, while at the same time still enabling competitive delivery times for customers in other parts of the world.
These factors will change the approach to optimize global manufacturing networks significantly.

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IT strategy and IT governance

The core of Industry 4.0, the networking and automating across the value chain, makes IT governance and an all-encompassing IT strategy imperative. These require the following four key measures:

- Selecting a lead system and a standardized IT protocol.
- Creating a company-wide target vision for the system landscape, which includes all new and existing systems, the cloud solution and external interfaces.
- Compiling a data management concept with aspects such as data lakes as a central collection instance, standard analyses in operational divisions and controlling, all supported by big data.
- Building up a center of excellence for IT security. Extensive networking and the central storage of data considerably increase the damage that can be caused by attacks. Demands on components, systems and access rights have to be defined centrally.

HR strategy

The work environment after the implementation of Industry 4.0 has much different demands on flexibility and qualification. The increased product variance and shortened time between receiving an order and starting production on it render shift plans that are predetermined for weeks in advance and a rigid assignment of individual staff members to certain workplaces obsolete.

Planning and management tasks in line with rule-based decisions and activities like the traditional “machine operator” disappear to a great extent. In engineering and production management, staff will be used in future when creativity is needed in the event of resource conflicts or a lack of experience.

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In this kind of environment, highly flexible specialists are required: flexible in order to be able to fulfill a wide range of roles along the value chain; specialized with a view to IT systems and production technologies. New roles become more important, like "data scientists", who develop analysis algorithms, and administrators, who program entire production lines.
An HR strategy contains the following key aspects for addressing these changes:

- Translating changed requirements into concrete function and qualification profiles and a target qualification structure.
- Sketching the main transformation steps on the way to the new staff structure. These include not only training, but also extensive requalification.
- Agreements with the employee representatives regulate the execution of the transformation steps and the required flexibility of working hours and assignments.

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3. The road to the destination – cornerstones of the implementation roadmap

The journey to the full application of the Industry 4.0 philosophy takes place in stages. This reduces the complexity and risks of the implementation. It also enables the latest technological developments to be included, and facilitates intermediate steps in the HR realization and the change management.

Creating strong foundations:

The first step is ensuring standardized governance for the execution of the Industry 4.0 philosophy. Part of this is establishing an "Industry 4.0 compatibility test" as part of organizational and investment decisions.

An analysis of the potential along the entire value chain reveals cost and revenue potential that arises as a result of technological restrictions and a lack of interconnection. This analysis also forms the basis for a business case.

Building upon this, fundamental decisions are made regarding the production footprint and the IT and HR strategies.

Quick wins and the first implementation steps:

The IT system landscape is restructured by phasing out or harmonizing overlapping systems and preparing the data migration.

In production and logistics, technology updates such as automated transportation solutions, data glasses, interconnected manufacturing centers and 3D printers lead to quick wins in the existing structure. Parallel to this, long-term investments are initiated in machinery and infrastructure.

Within the HR strategy, changes for the staff members are elaborated and translated into new job profiles. Consequences and opportunities for the employees are communicated early on and qualification measures introduced.

Interconnection and harmonization:

The use of RFID tags considerably simplifies planning and steering, and enables the flow of parts and components to be traced in real time.

The restructuring of the IT landscape is completed with the go-live of a lead system and the harmonization of all systems, e.g. the product configurators.

In addition, all systems, including the interfaces to suppliers, are interconnected. All data is migrated to data lakes and a cloud solution.

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Self-learning systems and exploiting the full potential:

Self-learning systems and simulations are launched in Sales, Engineering and Production and connected up to the central data sources.

The supply chain is fully automated, from the customer's order to the suppliers and production and on through to the delivery. The new production lines go into operation.

Core processes, organization and staff structure in all operational divisions are adjusted to the target status.

Relevant data from Sales and Production is automatically passed on to Research, Development and Product Management.

Sales potential can be fully exploited by optimizing and expanding the product portfolio, through a larger number of variants and through shortened times to delivery.

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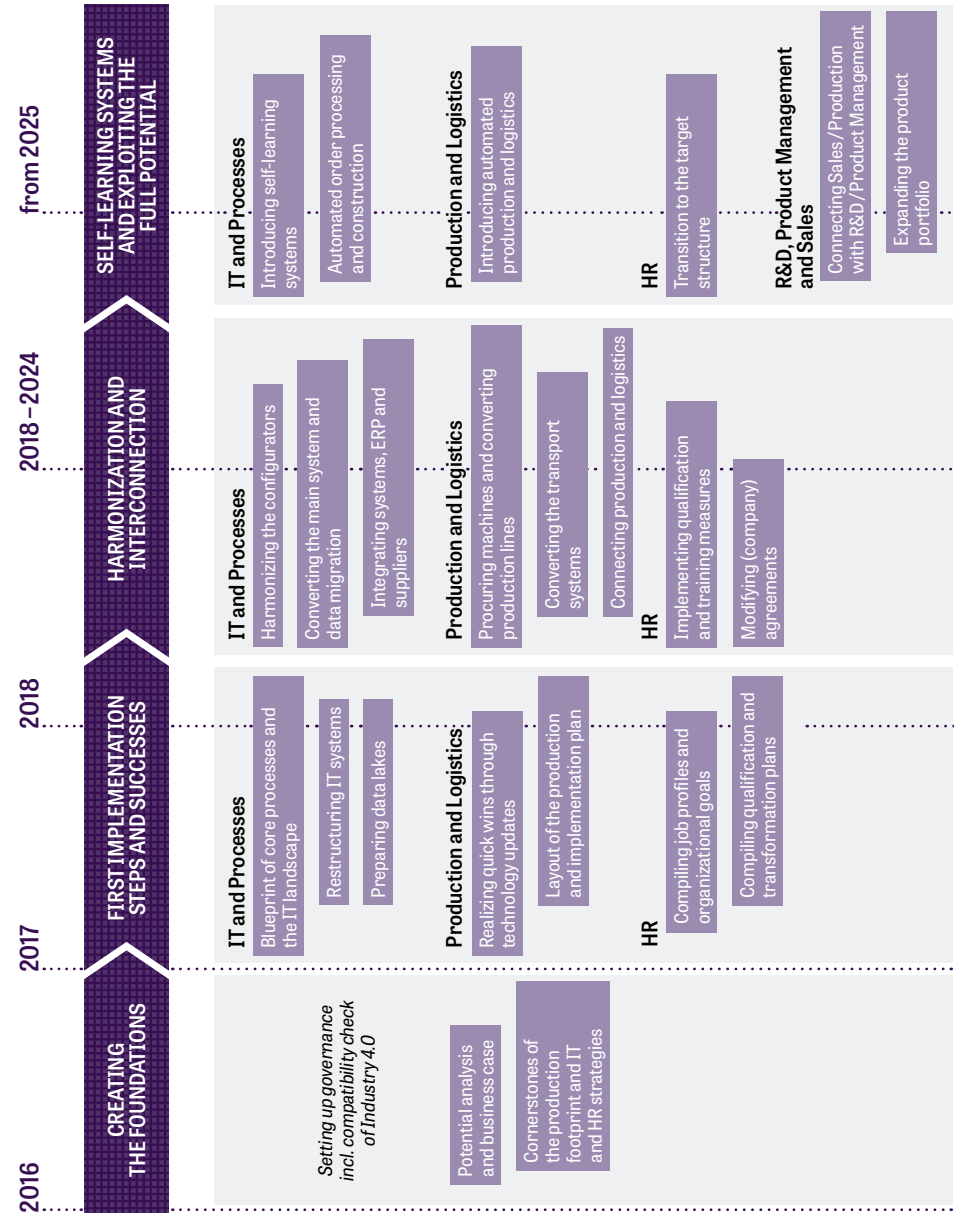
FIG. 2: ROADMAP FOR IMPLEMENTING THE INDUSTRY 4.0 PHILOSOPHY



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