PRESS INFORMATION
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Study by Deloitte and VCI
Chemistry 4.0: Innovation for a Changing World

- Linking the chemical industry with digital services leads to new business models and more sustainability
- Sector has the solutions to drive the circular economy
- The chemical-pharmaceutical industry wants to invest more than 1 billion Euro into digitalisation

The chemical-pharmaceutical industry in Germany is heading for new shores. Chemistry 4.0 marks the fourth stage of development in the 150-year-old sector, a stage which will be shaped throughout the next decade by digitalisation, a circular economy and sustainability. For this purpose, the study "Chemistry 4.0 - Growth through Innovation in a Changing World" was conducted by the German Chemical Industry Association (VCI), with support from Deloitte. "Through the use of digital mass data in the future, our sector can extend its role in the value chain and develop new business models. Furthermore, we have created future-oriented solutions to drive the circular economy," says VCI President Kurt Bock regarding the potential of Chemistry 4.0 in developing the businesses. This is why the companies are planning to invest over 1 billion Euro in digitalisation projects and new digital business models during the next three to five years.

Digitalisation is not exactly new to the German chemical industry. Many companies have already automated their systems and use digital processes at management level. However, the use of digital mass data, according to the study, facilitates not only increased efficiency in production, for example through anticipatory maintenance using sensors, but it also leads to more innovation, such as virtual reality and advanced simulations for research and product development. "Connecting digital services with products from the chemical and pharmaceutical industries is the key to additional value creation," the VCI President emphasises.

- This is why, for example, the sector is working on precision farming ("Digital Farming"). The chemical industry no longer only provides support to farmers in the form of fertilisers and pesticides; rather, apps should help to identify diseases and pests in fields and to find the optimal dosage to treat crops. Further modules - for example to analyse soil condition and the weather forecast - supplement the data-
based model, which the farmer can use to control his farm. This will improve the factors influencing the environment and the business's economy.

- From a medical technology perspective, there are new 3D printed products, which will perhaps even be 4D printed in the future, for which the materials have been developed and supplied by the chemical industry. Materials printed in 4D have an extra "dimension", a shape memory, which can be activated at certain times. Therefore, medical implants can be manufactured in a shape that is easy to work with, which then assume their saved shape when inserted into the correct place in the body.

**Circular economy: Chemical options for more resource efficiency**

Closed cycles of materials are becoming more important in Europe. Despite recycling measures, in the EU only 13 per cent\(^1\) of all used materials are currently fed back into the cycle. In Germany this is significantly better: just less than half (46 per cent) of 5.9 million tonnes of waste plastic\(^2\) is used again as materials through recycling, 53 per cent is converted to energy. Different industrial collection systems have been established in the market by the chemical or related industries, for recycling window profiles, agricultural films and chemical pallets, for example. The recovery of energy from plastic contributes to generating energy and warmth from waste.

As the concept of a circular economy goes beyond the concept of classic raw material recycling and includes all methods that increase resource efficiency, the concept will influence the product portfolios and business models of the chemical-pharmaceutical industry. Here, the sector has a series of strategic options for the future: high-performance materials to reduce the customer's resource consumption, increased use of renewable raw materials and biodegradable products, production of base chemicals in biorefineries, use of waste as a material ("Waste to Chemicals") and using electricity surpluses to manufacture chemicals ("Power to X"), as well as using CO\(_2\) as a material. While the technology and processes are reaching market maturity, the market still has a long way to go, due to higher costs in comparison to conventional methods. According to Bock, "The path to a comprehensive circular economy requires perseverance from companies. Although they have already developed pilot systems for such solutions, very few of these systems can be operated economically at the moment."

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\(^1\) Study Fraunhofer UMSICHT for the VCI Regional Association of NRW, March 2017  
\(^2\) Consultic Study on Plastic Material Flow, October 2016
As a rule, business models in the circular economy will comprise of networks of partners from different sectors, Deloitte states in the study. Digitalisation will make cooperation across businesses in such economic networks easier. Companies, who want to be successful in this environment, will need to combine technical skills with networking skills. VCI President Bock sees good opportunities for chemical companies to take on a central role as "orchestrators" in these networks, thanks to their experience with complex production processes.

**Medium-sized companies have good opportunities**

The analysis conducted by Deloitte was supplemented by a survey of medium-sized chemical-pharmaceutical companies. In total, 124 medium-sized companies from all sectors of the chemical-pharmaceutical industry took part. Henrik Follmann, Chairman of the Committee for Independent Entrepreneurs in VCI reports that, "The companies in the survey are convinced that digitalisation and the circular economy are already opening up new opportunities for medium-sized companies."

Medium-sized companies want to use these opportunities primarily to innovate. Two thirds of the companies in the survey have developed a digitalisation strategy or are currently working on one. The survey also brought up particular obstacles in the area of digitalisation. "It is especially necessary to promote the expansion of quick broadband in rural areas. Furthermore, digital education for all age groups must be improved," according to Follmann.

**Transformation needs industrial policy momentum**

The transition to Chemistry 4.0 presents a multitude of challenges for the sector, but the paradigm shift also needs support through industrial policy measures. "The transition will work best in a political and regulatory environment, which promotes new products and investments. The industrial policy of the next federal government must be one thing above all else: good innovation policy," the VCI President explains.

In order to further develop digitalisation, the study lays down three policy priorities: the public sector has to expand technical infrastructure and promote digital education, as well as improve data security and review data protection regulations. A target of 2025, at the latest, has been declared for the necessary quick broadband infrastructure for telecommunication to be established. At the same time, the development of a high-performance security network in Germany and Europe between authorities, companies and research must be set up. The scale for
regulatory framework in terms of data protection orients itself around empowered citizens.

According to the recommendations in the study, to make progress in the circular economy, future policies should undergo an innovation check, so that they do not obstruct new business models. To stimulate more investment, state-financed start-up funding for innovative projects and the simplification of access to venture capital, as well as funding of private-public partnerships in the form of pilot projects, are recommended. Policy should also promote society's fundamental understanding of a circular economy. This includes, for example, creating transparency on targets and costs.

**Note:** The Deloitte/VCI Study "Chemistry 4.0 – Growth through Innovation in a Changing World" can be found here, both abridged and unabridged (only in German language):
[www.vci.de/chemie40](www.vci.de/chemie40)

The VCI represents the politico-economic interests of around 1,700 German chemical companies and German subsidiaries of foreign businesses. For this purpose, the VCI is in contact with politicians, public authorities, other industries, science and media. The VCI stands for more than 90 percent of the chemical industry in Germany. In 2016 the German chemical industry realised sales of ca. 185 billion euros and employed over 447,000 staff.

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