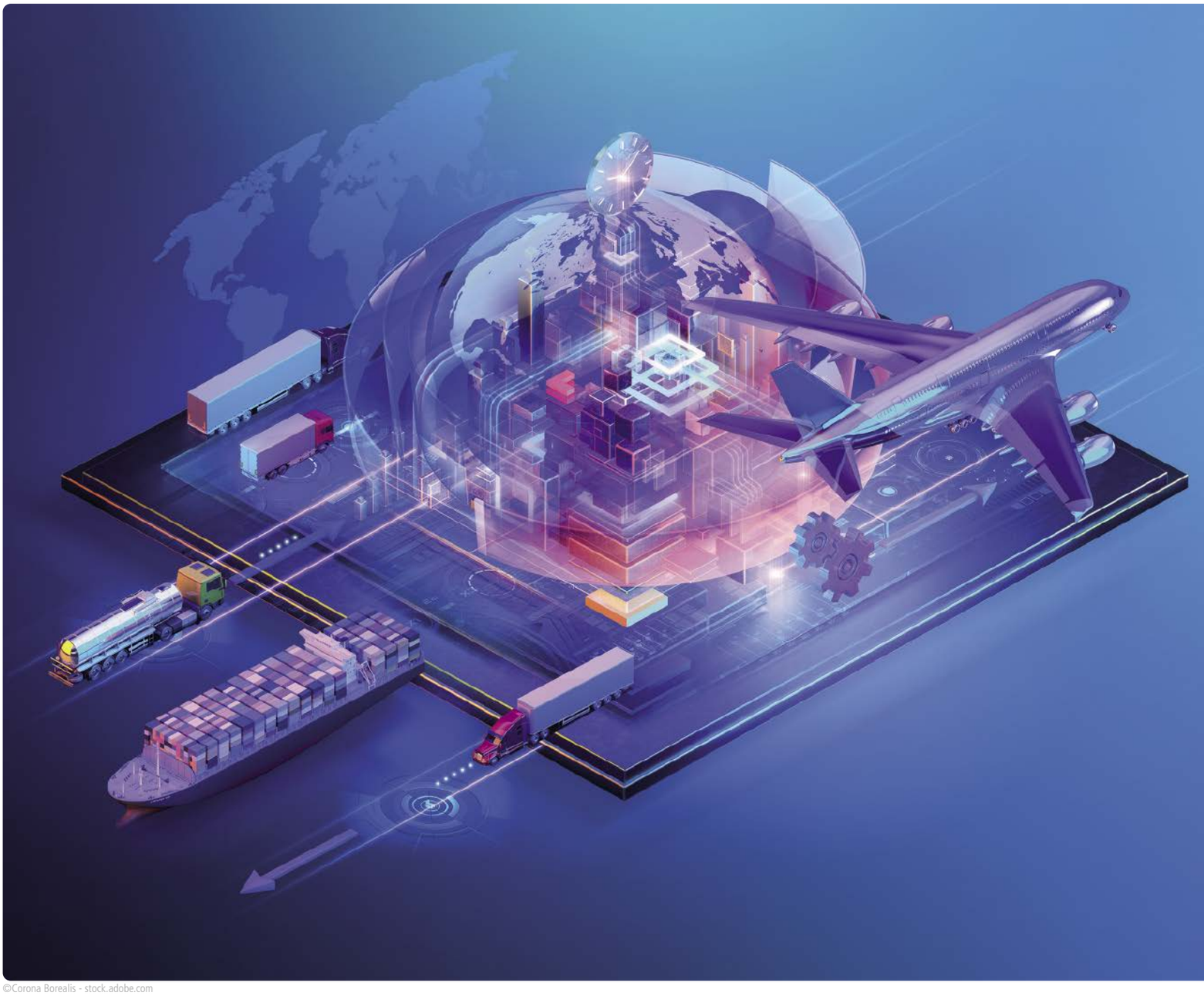
CHEManager INTERNATIONAL 2/2022



Distribution

Buy & Build Models in Chemical Distributor M&A, At the Center of Supply Chains: Prospects for the Chemical Distribution Industry, Expert Statements

Logistics

Benefits of Supply Chain Visibility, Supply Chain Resilience in Healthcare and Chemicals, Implementing Large-scale Projects in Pharma Logistics

Pharma & Biotech

Integrated Drug Development Models Offer Manufacturing Resiliency, Accelerated Drug Discovery with Machine Learning and Bioinformatics Algorithms

WILEY

Serving you better

At Brenntag your needs are our priority: *How can we serve you better?* With our two global business divisions – **Brenntag Specialties and Brenntag Essentials** – we have ensured that we can concentrate on bringing our business partners, customers, and suppliers the most advanced, innovative and effective service in the industry.

At **Brenntag Specialties** we focus on research and development, customized to the specifics of each industry to provide you with precisely tailored products and solutions. Our diverse partnerships and unique supplier base allow us to bring you the right solution, every time.

With our **Brenntag Essentials** division, the focus is on safeguarding your supply chain with a lean, fast and reliable distribution of chemical products and value-added services. We act globally and think locally, with a vast network of dedicated experts always ready to meet your needs.

Along with innovation and distribution, you can be assured that safety and sustainability are imperative to our business.

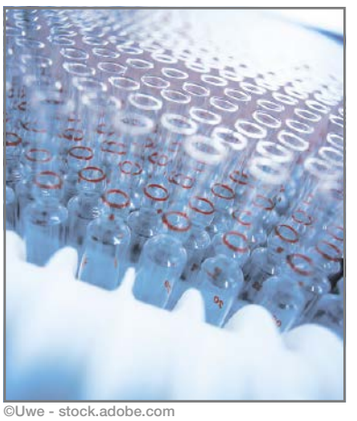
Visit brenntag.com to discover what we can do for you.

ConnectingChemistry

BRENNTAG


©markobe - stock.adobe.com


©vegefox.com - stock.adobe.com


©Uwe - stock.adobe.com


©Costello77 - stock.adobe.com

Distribution

Logistics

Pharma & Biotech

Strategy & Management

Innovation

What a Ride!

After a Record-2021, Will M&A in Chemical Distribution Keep Up the Pace?

This time last year, when looking at the M&A activity in the chemical distribution industry, we had just observed a record Q1-2021, with already more than half of the transactions that had been captured during the entire year of 2020 announced at the time. While some of these projects may have been a carryover from the previous year, it was back then not such a brave move to predict that activity for the year would quite likely return to pre-pandemic levels. And return it did.

Not only in terms of financial performance of chemical distributors, but also in terms of M&A activity, 2021 was a record-setting year. After the relative low in 2020 of just 36 transactions, which was mostly attributed to difficulties in feeding valuation models with reliable forecast data during the Covid pandemic, 2021 saw a total of 64 deals. This is an all-time high in our statistics, which goes back to the year 2009.

Typically, Q3 and Q4 of each year show the highest number of M&A announcements on average (since 2009 amounting on average to 27 and 29%, respectively, of total announcements per year). The comparatively high level of activity in Q1-2021, with 19 announced transactions (or 30% of the annual number), only 2016 came close to that with 17 deals (or 38% of the number for the whole year), would indicate that there was some carryover from 2020. We would argue that projects were brought into early 2021 for completion, in order to base valuations on full 2020 results and also have more robust forecasts than the ones available during the early part of the Covid-19 pandemic and the resulting lockdowns.

©Denys Rudyi - stock.adobe.com

Two Large Transactions Involving Private Equity

During 2021, the most significant events in terms of size and relevance were transactions by two private-equity-sponsored companies. The initial public offering (IPO) of Antwerp-based Azelis at Euronext in Brussels in September is the (temporary) endpoint to a "buy & build" model, that has its origins in Italy in the late 1990s, involving a string of financial sponsors over time. Temporary, because Azelis has made it clear they will continue to add on businesses as they did under full EQT Private Equity's ownership. With this IPO asset managers now have a range of listed chemical distributors that they can invest in.

Guenther Eberhard, DistriConsult

Azelis will probably need to see some further placements of stock to have a large-enough free float, so that the company is eligible for inclusion into theme funds or other investment products.

The second large acquisition was that of Caldic by Advent International and the subsequent combination with their existing investment in GTM/QuantiQ. This allowed Goldman Sachs to exit their circa three year-long investment in the Rotterdam-based distributor in November. And for Advent this will be an opportunity to put the investment in the industry on a broader, more sizeable basis by covering a much wider geographic area than the initial investment in Latin America did.

The latter shows that the financial community believes that there is space for yet a few more distribution firms with activities around the globe. Another member of this category is Barentz, part-owned by investor Cinven, who just recently have announced the acquisition of Unipex. The company has made a significant step forward with the acquisition of Maroon Group in the US at the end of 2020. This particular transaction was interesting in two ways: it enabled the establishment of a strong presence in the US in one sizeable deal and also showed that in order to get to a critical size Barentz had to go beyond its focus on life sciences (particularly food, feed and pharma) and also add "technical" application areas such as coatings, adhesives, sealants and elastomers (CASE) to the portfolio.

Listed Companies Continue Growth by Acquisition

The larger listed chemical distributors also have been quite active in

2021. Serial acquirers Brenntag and IMCD were able to buy four and eight companies, respectively. DKSH made three acquisitions (business unit Performance Materials, only). Univar made one acquisition in Latin America (Brazil). Many of these transactions can be classified as "consolidation" moves, i.e., the takeover of companies in industry/country combinations where the acquirer is already active. In some cases, this presence was built by acquisitions made prior to the Covid-19-triggered slowdown. It is also worth noting, that at times relatively small companies were acquired, as long as the individual deal served the strategic and programmatic growth targets of the buyer.

Although not directly related to acquisitions, another event in the financial sphere is worth mentioning. In September 2021, Brenntag was included into Germany's leading stock index DAX, which at the same time was also expanded from 30 to 40 companies as part of a broader reform.

"The financial community believes that there is space for yet a few more distribution firms with activities around the globe."

Such developments, even if they pertain to a specific company, help to raise the profile of the whole industry, which is regularly featuring on the watch list of the financial community by now.

Filling The Gaps

But it is not only these larger groups that make acquisitions. Quite a number of mid-sized, privately held distributors have acquired businesses and entered new geographies, as the consolidation of the industry continues. In Europe the companies that have been active here include Biesterfeld, Krahn Chemie, Lehmann & Voss, Oqema, (all Germany), Ravago Chemicals (Belgium), Giusto Faravelli (Italy), Safic-Alcan and Lavolleé Chimie (both France). Since these companies have, in recent years, enjoyed excellent profitability, ensuring a high cash generation, more activity can be expected from this type of companies in the future.

While they have nicely filled war chests at their discretion, management and owners of such companies are often a bit conservative in their approach to valuations. Also, they are typically less willing to take on financial leverage than private-equity-owned or listed companies, for whom showing the momentum of steady quarter-by-quarter growth is more of a necessity in view of equity market expectations. The mid-sized companies are mostly filling in the blank spots in their geographic coverage, which they may still have in Europe. And the more adventurous distributors may also invest outside of their home continent.

What Is Next?

In our view, it will be the macro-economic drivers that will influence developments in the coming quarters. High energy and (agricultural) commodity prices will have a signifi-

Continued Page 6 ▶

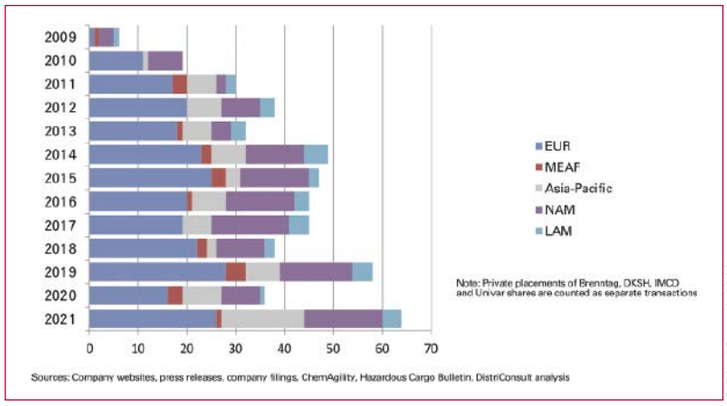


Fig. 1: Chemical distribution industry M&A transactions 2009 to 2021 by continent. M&A frequency shows a big increase from the low level in 2020 and an all-time high in 2021; Europe is still the most active geographic region.

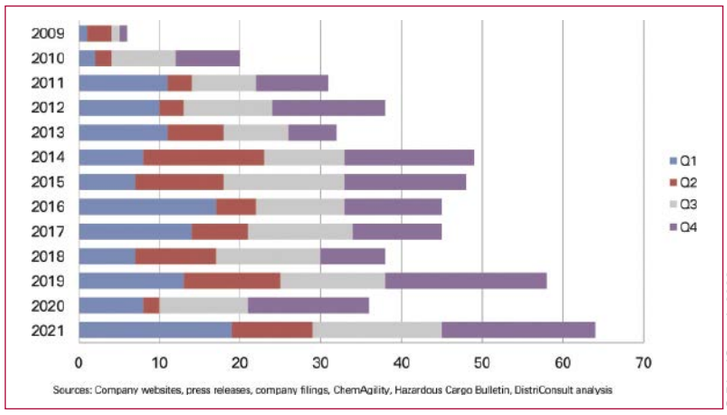


Fig. 2: Chemical distribution industry M&A transactions 2009 to 2021 by quarter. M&A activity is typically very strong in Q4 of each year with a spill over into Q1 of the following year; this is particularly obvious in 2020/21.

cant impact on the activity across industry sectors through higher input cost. Add to that the potential of further disruption in global supply chains to product availability on the supply side. But also on the demand side, when consumer sentiment changes and demand for formulated products stagnates or declines, either because price increases make them unaffordable or the purchasing power weakens through inflation as discretionary income declines. Quite likely this will leave some skid marks in the financial results of distribution companies, maybe not in Q2, but eventually later in the year. Valuations may be again a bit trickier against such a backdrop. And as M&A activity is usually related to the performance of equities in general, this may have a dampening effect on the number of deals that will conclude by the end of this year. Not so much of a rosy outlook for the pace of deals after all.

Guenther Eberhard, Managing Director DistriConsult GmbH, Waedenswil, Switzerland
- geberhard@districonsult.com
- www.districonsult.com

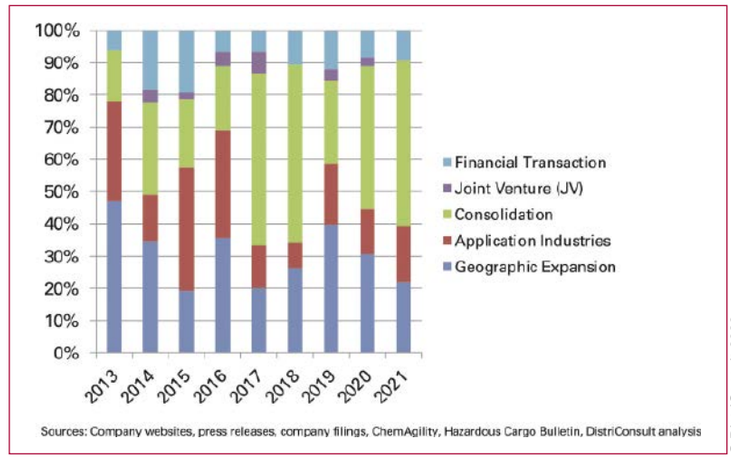


Fig. 3: Chemical distribution industry M&A transaction rationale 2013 to 2021. 2021 was even more than 2020 about consolidation, after geographic expansion as main driver during 2019.

learn more:
www.infraserv-logistics.com

BOOKING NOW

NEW HAZARDOUS SUBSTANCE STORAGE

IN FRANKFURT AM MAIN

New hazardous substance storage capacity

Approx. **21,500** pallet positions

TRGS 510 storage classes,

Water hazard classes 1-3

Temperature-controlled storage

from 2–8 °C and

15–25 °C

infraserv logistics

+49 69 305-44011
info.logistics@infraserv-logistics.com

Planning for the Unexpected

Why the Chemical Distribution Industry Is Becoming an Even More Important Chemical Value Chain Partner

The chemical distribution business is a diverse industry that provides customized solutions for important sectors such as pharmaceuticals, paints & coatings, agriculture, cosmetics, food & feed, and automotive. At the center of the supply chains of these sectors, distributors are critical partners for global corporations as well as for SMEs. This role has become particularly obvious and relevant during the corona crisis. But distributors themselves also face many challenges in the aftermath of the pandemic. CHEManager asked Dorothee Arns, Director General of FECC — the voice of the chemical distribution industry in Europe — about the current challenges, market trends and her vision for the sector's future.

Dorothee Arns, FECC

CHEManager: Mrs. Arns, the Covid-19 pandemic is not yet over, but after two years of operating in a pandemic environment, what impact did the corona crisis have on the industry?

Dorothee Arns: By and large, the distribution sector navigated the pandemic rather well and – overall – succeeded in adapting quickly to the rapidly changing conditions. The picture is, of course, not homogeneous, but depends to a considerable extent on the level of segmental and regional diversification of the respective distributor and the product portfolio. On one hand, we could observe that all applications needed to contain the virus spread, for example disinfectants, pharmaceuticals, chemical building blocks for personal protective equipment, were constantly in extremely high demand. On the other hand, other segments which were significantly impacted by lockdown measures during infection peak times faced suspended demand first and afterwards huge catch-up effects when the closures of service sectors were lifted. In any case, and despite all the challenges chemical distributors proved to be a reliable, trusted partner for all their stakeholders and were able to meet all their commitments at any time. For our sector itself — as well as for the entire chemical industry — it was a good opportunity to showcase in reality how much the chemical distribution business can contribute to solving societal challenges.

©Grispb - stock.adobe.com

What, in your opinion, are the most important lessons learned from the past two years?

D. Arns: In my opinion the most important lesson learned is to constantly "plan for the unexpected", which means develop plan B options for the case that the traditional solution does not work out anymore. What we have seen starting with the pandemic, followed by a series of unprecedented supply chain disruptions triggered by different causes and now with the Russian war in Ukraine, is that our traditional ways of working and making business do not necessarily apply anymore. For decades, all industries, not only chemicals, have optimized their business models with ever shorter lead times, less inventories and increasing reliance on certain structures and processes without buffers. Relatively stable geopolitical times meant relatively stable supply chains, apart from ad-hoc emerging issues, such as sudden force majeure situations; as a consequence, supply reliability was, by default, taken for granted.

What we now see is how vulnerable our business models and processes are and that external shocks in some parts of the world — even if far away — can have massive knock-on effects on entire supply chains. Availability of products — from raw materials, semi-finished products, spare parts up to energy — is more and more becoming THE critical issue, supply chain excellence, flexibility and ample global networks are converting more and more in key factors for success.

How will the experience of global supply chain interruptions change the sourcing or operating model of the chemical distribution industry?

D. Arns: Well, not only in chemical distribution, but for all economic players world-wide the crucial task is to check and challenge their individual business models and company

processes to make them as future-proof as possible in rapidly changing geopolitical and other framework conditions.

Distributors are anyhow used to respond flexibly and agile to ever-changing market conditions and to use their extensive networks worldwide to find good solutions for their customers and principals. This is part of their DNA and the value added they bring to the supply chain.

Most likely this kind of diversification in terms of sources, segments, applications and products will be further extended, long-distance global supplies will be complemented with more regional or local supplies, and inventories — especially for critical substances — are likely to increase to buffer unexpected shortfalls. Some business models, above all those based on single-suppliers, just-in-time deliveries and a low level of diversification in general are likely to be phased out for the sake of enhancing the resilience against external shocks.

After the pandemic, what will be the most important short- and long-term challenges facing the sector?

D. Arns: Actually, the short- and long-term challenges for our sector are pretty much the same as before Corona. The pandemic has "just" further enhanced the urgency of previously existing topics, such as sustainability, and accelerated the speed of ongoing developments, such as digitalization. Additionally, as explained beforehand, the new challenge of supply chain resilience needs to be dealt with — not only short-term, but also long-term.

And if all this were not enough, the Russian war in Ukraine is now threatening Europe´s energy supplies, apart from its massive impact on global food chains. A potential embargo of Russian gas at this point in time would put the entire chemical industry under massive pressure. It would also have a domino effect on Europe´s entire industrial base, because the chemical industry is the "industry of industries", that means enabler of many downstream segments.

It goes without saying that this is a minor issue in comparison with the humanitarian situation of the Ukrainian people. However, such a step must be well thought out and prepared, which is not the case yet. Even with more lead time, this change could belong in the range of the biggest challenges ever for Europe´s chemical industry, and sustainable solutions to this issue remain unclear at the moment.

How do chemical distributors support the goal of transforming the feedstock base of as many material value chains as possible?

D. Arns: Indeed, FECC members take their environmental responsibility very seriously and are committed to deliver on the targets of the European Green Deal and the United Nations´ Sustainable Development Goals. Just, reality tells that chemical distribution per se is a relatively small sector in a sandwich position between the downstream user industries and the chemical manufacturers. This means the whole chemical supply chain can only solve the issues together in a cross-sector cooperation, and distributors are fully prepared to play their part.

This is also why the sector welcomes the many initiatives from European petrochemical producers to further diversify and transform raw material streams, for example by applying chemical or mechanical recycling or mass balance approaches. Some of the FECC members have also successfully pioneered a cross-industry pilot project in Denmark to use chemical waste as a resource, which is not only a practical implementation of the circular economy, but could also be a further step to reduce the environmental footprint in general and save emissions in particular. There is for sure more to come in this respect.

Continued Page 10 ▶

The circular economy is a crucial factor to reach carbon neutrality. Chemical distributors play an important role in the chemical/plastics value chain. How will the circularity trend, that requires closed-loop collaboration along value chains, change the way the industry operates?

D. Arns: Chemical distributors are closely monitoring the developments, which will affect all operations, as distributors are placed in the midst of all value chains. Some facets of the circular economy, for example resource efficiency, reuse of material or recycling have already been in place in our sector.

What is new in the regulatory concept is the target to fully deviate from linear business concepts towards circularity, wherever possible. Apart from the intensified cross-sector cooperation this approach will require a lot of innovation in all parts of the value chains and significant investments in new solutions and new infrastructure—on top in times of increasing uncertainty.

Where the distribution sector per se can make a big difference is when it comes to our own operations and to advising our customers on circular economy principles and how these could practically be implemented in every-day-operations. This is already happening and will be further intensified.

Do you think that carbon neutrality and circular economy are chances to enhance the role of chemical distributors in the chemical value chain? Or will distributors rather have to fear a declining importance due to these trends?

D. Arns: Based on what we discussed before, there is a growing role for distributors and a lot of opportunities to tap. FECC has informed and instructed our members of the practical implications of the circular economy already at a very early stage, facilitated the best-practice exchange with concrete examples and also compiled ample circular economy guidance material for distributors in close cooperation with our colleagues from the Danish National Distributors´ Association Kemi & Life Sciences. The underlying target was to give our members as much time as possible to prepare for the new developments. Distributors significantly rely on early scouting and identifying market trends. Then their inherent agility allows them to adapt rather quickly to new conditions and develop new business models. Hence, I am confident that the role of chemical distributors will enhance rather than decline.

Another transformation that has been particularly accelerated by the pandemic is digitalization. How digitalized is the chemical distribution industry today, and which are the biggest challenges of the digitalization that still need to be tackled?

D. Arns: The pandemic has certainly accelerated digitalization, which had already been high on the agenda before. Still the level of digitalization differs individually from company to company and largely depends on the overall business strategy. Nevertheless, this development will gain more momentum, especially when more and more young talents come onboard, who are even more used to work with digital tools than their predecessors were.

Since chemical distributors are active in all chemical segments and fulfill all chemical supply chain functions, the sector regards itself as ideally placed in the midst of all value chains to pilot innovative digital solutions, and that is what we are doing, also in the competition-law-sound framework of a European association as FECC. Moreover, at FECC we have the pleasure and the benefit to count a series of well-renowned digital solution providers as our members, and these companies are demonstrating on an every-day basis how much can be achieved via digitalization.

> *"Our traditional ways of working and making business do not necessarily apply anymore."*

The top challenges—from today´s point of view and not only for small- and medium-sized enterprises—are certainly cybersecurity, the compatibility/standardization of data across sectors and industries, and the protection of confidential business intelligence. The latter is of particular but not exclusive relevance for specialty chemicals´ distributors with own recipes. Last but not least increasing digitalization goes along with the requirements for new digital skills in addition to those which are already in place.

The race for young talent will intensify in the coming years, and not just because of digitization. Will the multifaceted transformation just discussed help to attract more young people to the chemical distribution sector?

D. Arns: Possibly the transformation will play its role, too, but most likely it will be even more important for chemical distributors to showcase the solutions they are actively contributing to solve the societal mega challenges. Here the pandemic can serve as a good example. Existing production and distribution lines were switched at a fast pace to make more of the much-needed products available and FECC members donated them in vast quantities to nursery homes, hospitals, schools and kindergartens in their surroundings.

These days it is not enough to offer highly qualified, well-paid and secure jobs to attract young talents. Additionally, young people are looking more and more for a purpose and a job where they can make a meaningful difference for society and the environment. This is definitely what chemical distribution can offer. With that in mind I am sure that the chemical distribution sector has many compelling stories to tell.

Weighing the risks and the chances of the topics just discussed, what is your vision of the future of the chemical distribution sector?

D. Arns: The vision of the future is for the chemical distribution sector to continue playing a vital, vibrant role in the chemical supply chain by offering value-adding, sustainable solutions to our business partners and acting as a reliable, trustworthy, constructive dialogue partner for all stakeholders.

■ www.fecc.org

Prospects for the Chemical Distribution Industry

Becoming an Even More Important Partner in the Chemical Value Chains

The chemical distribution business is a diverse industry that provides customized solutions for important sectors such as pharmaceuticals, paints & coatings, agriculture, cosmetics, food & feed, and automotive. At the center of the supply chains of these sectors, distributors are critical partners for global corporations as well as for SMEs. This role has become particularly obvious and relevant during the corona crisis. But distributors also face many challenges in the aftermath of the pandemic and the current political and economic environment.

CHEManager asked executives and industry experts to share their views on the prospects for the chemical distribution sector. We proposed to discuss the following aspects:

- What, in your opinion, are the most important lessons learned after two years of operating in a pandemic environment?
- What will be the most important short- and long-term challenges facing the sector?
- How do chemical distributors support the chemical industry on its path toward carbon neutrality?

Read the insightful answers of the experts here.

©industrieblick - stock.adobe.com

Keeping Supply Chain Costs as Low as Possible

Thorsten Harke, President, Harke Group

"The chemical distribution industry has proven its important role in the supply chain."

Over the past two years, in an environment marked by a pandemic and more recently increasing geopolitical tensions and conflicts, the chemical distribution industry has proven its important role in the supply chain by buffering and evening out supply chain disruptions, thus helping its partners avoid the most catastrophic outcomes.

We achieved this through early order planning, safety stocks, early booking of logistics capacities, and our broad, international network, through which we were regularly able to help out our customers with emergency quantities that were "squeezed out" from our long-standing international partners.

In addition to digitalization and online distribution, which we are meeting with a sophisticated IT infrastructure and our newly launched and completely reworked online shop and marketplace harke.com, one of the major challenges facing chemical distribution is the ever-increasing amount, complexity and cost of regulations. These range from further expanding REACh regulations, over the Green New Deal with among others upcoming CO_2 tariffs up to new supply chain laws. We assigned highly qualified and trained personnel to these topics in order to keep up to date with and duly execute the vast amounts of ever-changing regulations.

As chemical distributor and hence as "transaction cost specialist," we nevertheless achieve keeping costs for the supply chain as low as possible, also for sales and logistics costs. By combining a large range of products from different suppliers in an intelligent and optimized way, our efforts do not only translate in cost savings, but also in considerable savings of CO_2-emissions for the chemical industry.

By being able to open markets worldwide quickly for innovative leaders through our established networks, we furthermore contribute to the faster introduction of innovative, sustainable "green" products with lower carbon footprint to our customers, another important contribution to lower CO_2 emissions.

Distributors Are More than a Mere Logistic Agent

Christian Kohlpaintner, CEO, Brenntag

"These challenging times have highlighted the large and crucial role the chemical distribution sector plays in maintaining business continuity."

In the past two years, and today, we have faced global challenges of a severity unlike anything I have ever seen in my career of almost 30 years in the chemical industry. Many cumulating factors contributed to these challenges, disrupting supply chains and logistics processes globally and persistently.

But these challenging times have highlighted the large and crucial role the chemical distribution sector plays in maintaining business continuity, more than the chemical industry realized before. Brenntag quickly learned how to deal with the diverse disruptions, leveraging our size and global network and especially through the expertise and strong dedication of our employees worldwide who came up with solutions for our customers and suppliers and going the extra mile to be the trusted partner.

Distributors with a global footprint like Brenntag have become key service providers, and reliable partner in problem solving, much more than a mere logistic agent.

This role will continue to expand as the focus on sustainability in the chemical industry will lead to drastic and fundamental changes, and the pressure to change and develop is immense. Global distributors like Brenntag have the network and overview to overcome local challenges, and work with suppliers and customers to develop sustainable ideas, drive product innovations and to learn from best practices in other regions or industries.

The huge innovation potential and know-how of our sector and our experts is not yet fully recognized and used by our industry partners. The sustainable transformation needs to include and learn from the expertise in the chemical distribution sector to scale effects, and to find benefits for all parties involved. Chemical distributors like Brenntag can serve as integration and connectivity platform and stimulate the ESG agenda of the industry. Carbon neutrality and global sustainability in our industry will not be achieved in isolation – but only by a joint effort and shared know-how.

Every Challenge Presents Opportunities

Hans-Joachim Müller, Group CEO, Azelis

"Our digital strategy has allowed us to keep a closer connection with customers and principals during the pandemic."

The pandemic pressed us all to adopt new ways of working and living that involved changes that were somewhat uncomfortable, but also changes we all found to be great advantages. This is the case of working from home and becoming more digital than ever before. The implementation and adoption of collaboration tools and other technology — all in the cloud – showed us that we are less dependent of our physical offices than we thought. Our local for local approach has proven to be equally successful in a more virtual environment.

It was thanks to our initial decision to put digital first — even before Covid — that enabled Azelis to roll out its customer experience platform globally, currently covering seven strategic market segments in APAC, EMEA, and the Americas, with new countries launching every month. Covid also accelerated the desire of our customers to get digital access to product information, our formulation expertise, and trends driving the market. To address these needs, our customer portals play an increasingly important role. In a nutshell: our digital strategy has allowed us to keep a closer, real-time connection with customers and principals during the pandemic and will remain to do so.

At Azelis, we believe every challenge presents opportunities; let's talk about the latter.

Thanks to this digital acceleration, we can now combine both physical and digital, thus creating formidable synergies for our customers: sharing knowledge more effectively, more efficiently, and building valuable customer relationships. The key is finding the perfect combination between digital and physical, intelligent connections between physical assets, the human touch together with digitalization, that will drive innovation through formulation.

Azelis is proud to play a key role in the supply chain, finding ourselves in a privileged position: between our suppliers and our customers. Our sustainability strategy, Action 2025, is crucial to our corporate identity and business model and has the ultimate goal to reduce CO_2 emissions (carbon neutrality) within the supply chain and provide sustainable formulations that help customers become more energy-efficient and increase the recyclability of the products we support them bringing to market, thus fostering circular economy.

Manifold Challenges for the Sector

Robert Späth, Managing Partner, CSC Jäklechemie

"In such uncertain times, chemical distribution will play an increasing role in supplying our industry."

The pandemic has shown how the global economy has become interdependent over the last decade. Lock downs of harbors in China or elsewhere had severe consequences for the supply of Germany, for example. For the chemical distributors, this brought the chance to emphasize their importance for the stabilization of the supply chains. That was a big challenge not only for purchasing and sales but also for our own pandemic precautions at our sites. New supply routes, flexibility and digitalization brought us forward and finally the recognition as supply-critical infrastructure also helped. I think we learned a lot from the Corona crisis.

Just when the pandemic appeared to be largely over, the Ukraine crisis caught us off guard. A new iron curtain is now cutting through supply chains to the east. The associated energy crisis with unprecedented price increases is forcing some sectors into struggle for existence. Therefore, we might soon experience disruptive structural changes and a lot will depend on whether an accelerated energy transition in Germany succeeds. The priorities however shift the longer the conflict progresses and yet the challenges of the Green Deal remain in place too. In such uncertain times, chemical distribution will play an increasing role in supplying our industry. The challenges for the sector are manifold. Making us attractive to good junior staff, strengthening our networks with customers and suppliers, expanding our own logistic capacities are obvious. In addition, we face new risks like cybercrime and, finally increasing legal requirements remain our constant companions. Additionally, we work hard to meet the sustainability requirements of most of our business partners, for example by participating in initiatives like TfS. Sustainability will also play an important role in the further development of the Responsible Care program. We definitely won't run out of work.

Enabling Climate Neutrality and a Circular Economy

Felix Thalmann, CEO, Büfa Group

"We see ourselves as an important link between the producer and our customers, enabling them to make environmentally conscious purchasing decisions."

In order to achieve the goals of climate neutrality and the transformation to a circular economy, Büfa has already evaluated many of its products with the Product Carbon Footprint. This allows us to measure a product's contribution to climate change along its entire life cycle and creates transparency about the associated greenhouse gas emissions. We see ourselves as an important link between the producer and our customers, enabling them to make environmentally conscious purchasing decisions.

In addition, we look at the issue of energy from three perspectives. First, we save energy, for example by optimizing logistics routes, avoiding business trips by using video conferencing, or by offering mobile working.

Second, we are increasing our energy efficiency by installing new equipment and modern building engineering in our operations or by consistently converting our entire vehicle fleet to electric cars. And thirdly, we are making growing use of renewable energies by supplying all our sites with electricity from regenerative sources or installing photovoltaic systems at our sites ourselves.

The Vulnerability of Supply Chains

Neville Prior, Group Chairman, Cornelius Group

"Covid has been a wakeup call to how fragile our lives and our luxuries are."

Learning is essential to life and the Covid pandemic taught us several lessons. In what became one of the biggest human experiments in history, we learnt, almost overnight, that we can work in new ways. Office based staff went from the gregarious environment of an office, to working from home, alone. Technology was mobilized swiftly, and we all experienced the frequent delights of video conferencing. Very quickly we adapted to being "on camera", whilst managers had to work harder to keep productivity up and spirits high. Companies learnt that not all travel was necessary, but that employee mental health was of huge importance. Today companies still grapple with the question of how to keep the company culture in such different circumstances. We will not remain in this splendid isolation, but for sure the world of work has changed forever. I think the other great learning was just how fragile supply chains had become. When China closed down, we all shivered from the cold winds of lack of supply. We must ensure that supply chains are made more rigorous, that sources of supply are made secure for the future, and that as suppliers we take the necessary steps in partnership with principals, suppliers and customers. The world will slowly change, we may see more regional scale manufacturing replacing world-scale plants, and the concept of on-shoring will grow.

Covid has been a wakeup call to how fragile our lives and our luxuries are. There is work to be done!

Partnership and Collaboration Are Key

Christopher Erbslöh, Managing Director, C.H. Erbslöh

"The past two and a half years have demonstrated how valuable distributors are in linking supply and demand."

Removing a link from any structure will make it more unstable and the past two and a half years have very vividly demonstrated to the entire chemical sector how valuable distributors are in linking supply and demand. This is why we collectively need to understand that partnership and collaboration work better than individuality, and that this will create a more stable and profitable future for all of us in the long run. Distributors like C.H. Erbslöh and the LEL Alliance can offer more than technical innovation on the one side and a better price on the other. We can find solutions, offering technical answers to tackle issues ranging from local marketing needs to global climate change and carbon neutrality, while maintaining a transparent and robust supply-chain, allowing both manufacturers and customers to react to short-term volatility.

Chemical Distributors Face Major Challenges

Thomas Dassler, Managing Director, Häffner

"To succeed in the environment of an increasingly demanding market, distributors need to strengthen their competitive position."

After what we have experienced in the last two years, it is more difficult than ever to make sound predictions. The pandemic and the war in Ukraine have taught us how quickly things can change, and this will also have a significant impact on the way of doing business in the future.
The worldwide shortage and price increases of raw materials, the excessive rise in international transport cost and geopolitical uncertainties pose major challenges to chemical distributors in maintaining their ability to supply.
Against the backdrop of recent events, we at Häffner have once again intensified our risk management. We always strive to ensure delivery reliability for our customers, even in difficult times.
Additional challenges for our industry arise from the planned revisions of the REACh and CLP regulation and the Supply Chain Act.
To succeed in the environment of an increasingly demanding market, distributors need to strengthen their competitive position by delivering customers highly specialized solutions and value-added services instead of exchangeable chemical products. Haffner's customers benefit through our comprehensive services ("Häffner Smart Chemicals") offering solutions to increase the supply chain's transparency (via digital twins for IBCs) and manage several standardized processes for the customers like e.g., automated organization of empty container collection, vendor-managed-inventory concepts or even pay-per-use billing-formats. Furthermore, we keep extending the number of Electronic Data Interchange (EDI) connections with our customers and suppliers. The combination of both automation and process visibility along the global supply chain contributes to more sustainability by more efficient transport planning and better utilization of (plastic) containers. At the same time, we see noticeable cost advantages for all sides. Nevertheless, especially among our SME customers, we still have to do a lot of persuasion.

Flexibility and Robust Supply Chains Are Key

Patrick Barthels, CSO, Oqema (left)
Hartmut Kunz, CFO, Oqema (right)

"As distributors, we want to offer our customers security of supply as well as competitive prices."

First of all, we enjoy meeting people in person and if we stay calm and keep going, we can manage a lot of uncertainties. Also, the past two years of the pandemic have led to high volatility in volumes and prices. This underlines the importance of flexibility and the increasing need for robust supply chains — now and in the future. For us, expanding partnerships with suppliers and customers, digitalization and decentralization are the key building blocks to be resilient and responsive. Expanding partnerships is a way to strengthen supply chains, decentralization enables us to respond to challenges quickly, appropriately and with local differentiation, and digitalization supports fast and balanced data-driven decisions. Our strong growth over the last 10 years confirms that we are on a good path, and we will continue to drive it forward.
The volatility of raw material availability and the increasing supply disruptions of recent years pose a particular challenge, as we expect them to continue and, as distributors, we want to offer our customers security of supply as well as competitive prices. Security of supply requirements remain a major challenge, as supplier partnerships usually require a single sourcing approach, which contrasts with secure multiple sources.
The most important contribution is the shift to more sustainable products, which we not only want to offer but also actively establish in the market — our goal is to become the market leader in some of these products. We are investing in more sustainable processes, for example, by switching to climate-neutral warehouses (as we have just opened one in Austria), with the aim of reducing our overall carbon footprint. Another important pillar is the circular economy — we have our own recycling plant, which we will continue to expand. True to the motto: we want to do things right or not at all.

Continued Success During the Pandemic

Gerd Bergmann, Chairman of the Managing Board, Nordmann

"The climate crisis remains one of the most important global challenges."

The pandemic has shown just how vulnerable and interconnected global supply chains are – and how carefully we have to manage our resources. At Nordmann, our response to the extreme situation has been to communicate openly and coordinate efforts with all those affected by it (i.e., employees, suppliers and customers). Having a diversified product portfolio, supply chain excellence, a good level of agility and — above all — good long-standing relationships with our business partners have proven to be the most important factors for our continued success during this time. Crises like these can only be overcome together! Colleagues in China, for example, have helped very much with assessing the current reinforced lockdown situation in the country and its effects on our supply chain.
Even if the pandemic and the terrible war now being fought in Ukraine have made many other issues seem less important nowadays, for us the climate crisis remains one of the most important global challenges. New mobility concepts affecting material choices and our company's portfolio are additional topics we have to tackle, as well as the use of renewable raw materials, the circular economy and CO_2-neutrality. As an energy- and CO_2-intensive sector, the chemical industry can play a pioneering role here – and in many respects, it is already doing more than the public tends to realize. Nordmann is a sustainable player that strives day by day to get better.
Serving as a distribution company and central link between manufacturers, Nordmann has been doing a lot to support sustainable and transparent value chains with the aim of mapping out entire cycles from raw material extraction to recycling so they can be easily understood. This includes now being ISCC-certified and having been involved in sustainability initiatives such as Together for Sustainability and Responsible Care for many years already. Where our product portfolio is concerned, we have also been marketing products from sustainable or renewable sources for some time now, especially for plastics and cosmetics – partly in response to the significant increase in demand for these types of products. We will continue to use our product and application knowledge in order to help customers select raw materials and additives, as well as to provide advice on recycling and product shelf life.

Challenges Are not Getting Smaller

Andreas Woschek, Executive Vice President Chemicals, Helm

"The Covid pandemic confronted us with the biggest challenge since the financial crisis a decade ago, yet we managed well."

The Covid pandemic confronted us with the biggest challenge since the financial crisis a decade ago, yet we managed well: transferring the entire organization to work from home within days and continuing to operate the business with no major interruptions was unthinkable for many in the industry. By now, everybody is a professional in using video conferences to interact with business partners so the toolbox for interaction has been widened. As the peak of the pandemic is behind us, we are highly welcoming that face-to-face meetings are possible again.
Global and regional supply chain constraints result in increased transportation costs and reduced reliability for deliveries. We see customers building larger inventories, as just-in-time (JIT) deliveries are not as given as they used to be. Severely increased raw material costs are raising product prices to record levels. All this creates a perfect storm for the chemical industry short- and mid-term. In the long-term, the challenges will not get smaller as we will have to offer crisp and decisive actions to minimize the effects of climate change — in light of increased social urgency, agreeing and coordinating these activities internationally will be even more challenging than in the past.
The path towards carbon neutrality is an enormous challenge for our energy intensive industry which is mainly based on fossil raw materials. Distributors will have to contribute their share to ensure that sustainable initiatives overcome the obstacles of lack of scale and remote locations close to the bio-based feedstocks. A long-term plan combined with tangible short and midterm actions will create new business opportunities which will compensate for businesses which need to be halted as they will become too costly and environmentally unbearable. Our industry needs to define these actions, yet the support of a realistic governmental frame is required as well.

How to Make Supply Chains Resilient

McKinsey Survey: What Companies Planned and Actually Did to Cope with Covid-19 Supply Chain Shocks

When the pandemic was pounding at their doors, many industries were rattled. Healthcare and chemicals were adapting rather successfully to the new normal, as a McKinsey & Company survey reveals. Even though, in some cases they fell behind their initial plans. Supply chain leaders in these sectors managed to avoid a complete breakdown. But the predicament caused issues both around planning processes, the fulfillment including delays and cost increases.

The Covid-19 pandemic has delivered the biggest and broadest value chain shock in recent memory. But it is only the latest in a series of disruptions. Statistically, supply chain disruptions lasting a month or longer occur every 3.7 years, on average. Changes in the environment and in the global economy are increasing the frequency and magnitude of shocks. Forty weather events in 2019 caused damages exceeding $1 billion each. McKinsey research shows that at least one month of disruption can eliminate 45% of one year's EBITDA over a decade.

Regional Approach instead of Increased Inventories

Consequently, it is imperative for companies to prepare for events that may affect their supply chains tomorrow. In 2020, according to the McKinsey survey, 93% of the respondents across industries and regions intended to make their supply chains far more flexible, agile, and resilient. But in the 2021 survey, many companies had yet to execute their original plans.

Healthcare and chemicals performed, on the whole, better than many other industries. Healthcare applied the broadest range of measures, 60% of the respondents saying they had regionalized their supply chains and 33% having moved production closer to end markets. In chemicals, it was 20% and 5% respectively. By contrast, only 22% of automotive, aerospace, and defence players had regionalized production, even though more than three-quarters of them prioritized this approach in their answers to the 2020 survey by McKinsey.

Healthcare was also the only industry not increasing inventories more than planned, and the only one which did much more than planned broadening their options for action by regionalization. This was likely driven by multiple developments, as the massive increase in demand globally for many products, resulting in the need to an overall ramp up of production and supply chain.

In 2021, all managers in healthcare and 80% in chemicals believed regionalization still to be relevant or at least partially relevant in the next three years (fig. 1). And they´re right to continue investing: Even in value chains that are more geographically diversified, production of certain key products may be disproportionately concentrated. Many low-value or basic ingredients in pharmaceuticals for instance are predominantly produced in China and India. In total, we find 180 products across value chains for which one country accounts for 70% or more of exports, creating the potential for bottlenecks. The chemicals value chain has a particularly large number of such highly concentrated products.

Restore Transparency

Analysis of Covid-19 crisis management, demonstrates the weaknesses as if observed under a magnifying glass. The chemical industry, specifically further upstream, has limits when making changes in their assets, in a short timeframe and, also, making them or ensuring they are economically reasonable. To give an example, it would take a company 10 to 20 years to recoup the investment required to move an ethylene production plant from Europe to China. And these plants are not set up within a few months.

© McKinsey

Anna Littmann, McKinsey

So, it was inevitable to subject the operating processes to an audit. But it turned out that some companies had planning processes, which were not built to deal with the high number of constraints, were also facing sudden requirements to accommodate or to replan. For instance, they had to cope with incredible fluctuations in delivery of raw materials, but also—specifically in healthcare—unpreceded demand increases.

Particularly in the early phase of crisis management, this led to a total loss of transparency. No one knew any longer when a certain product could be produced and be delivered to the customer. Or maybe it had already been delivered? In most cases, this could be addressed by setting up a supply chain control tower within a few weeks, while systems were step by step adapted and new tools introduced.

Analytics and Digital Tools Are Key

What did successful companies do better than others? Their planning process was strongly linked to its use of modern digital tools, especially advanced analytics. They were 2.5 times more often to report they had pre-existing advanced-analytics capabilities. That was the case for 20% in the chemical industry, where another 53% already had analytics to a certain degree and were planning to implement more. In healthcare, the level of preparation and planning was less, with 7% and 33% respectively (fig. 2).

The healthcare industry traditionally tends to have high margins and high service levels, and to invest into high inventories, modern systems and tools as well as in talent. However,

© Travel mania - stock.adobe.com

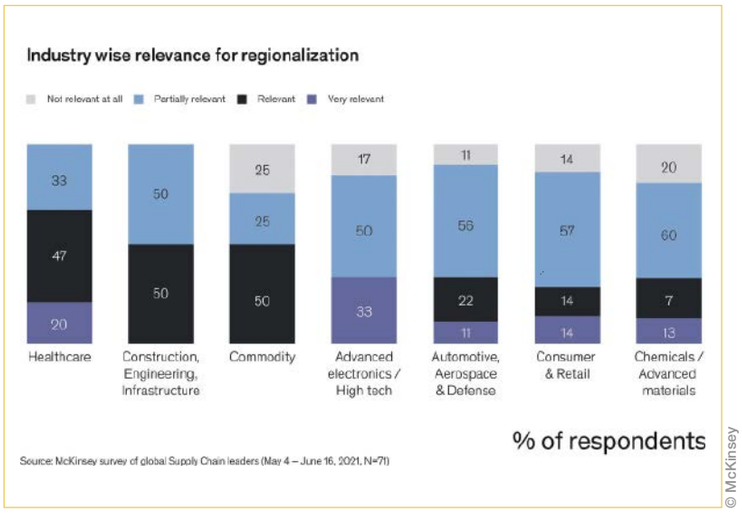


Fig. 1: Regionalization is relevant in the next 3 years, especially for healthcare.

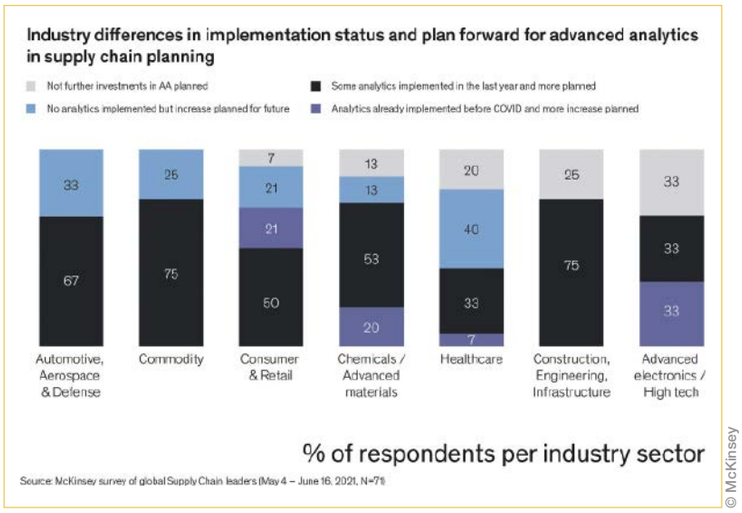


Fig. 2: All industries have invested in advanced analytics during Covid-19 pandemic.

many companies have still a lot of room for improvement regarding the use of digital and advanced analytics—across functions, not only supply chain but also commercial or manufacturing.

To make progress in the digital journey, companies that successfully implement digital start with a strong vision and aspiration. Key questions to ask in the early stages include: How can tools advance the strategic goals? How can analytics help transform core processes or generate new business opportunities? And what is the value and feasibility of each of these solutions? As a next step, they assess their capabilities concerning data, technology, and culture as well as the support or partnerships needed. Based on this, companies can create a roadmap and business plan for the next one to three years.

Talent Gap Threatening Supply Chains

Any implementation of digital technologies requires skilled talent to use the tools. However, the skills gap that existed before the pandemic, only widened during it. While 80% of supply chain leaders surveyed invested in supply-chain technologies in 2021, only 1% report having sufficient talent in-house to support their increased digitization, down from 10% in 2020. The skills gap is being delt across industries: in 2021, 71% in chemicals and 40% in healthcare reported to be affected, as the McKinsey survey shows. Companies have tried to gain ground by reskilling and hiring.

Although higher wages reached up to three times the level of pre-Covid times in some areas, the increases still have not led to filling of positions, as the shortage has been driven by fundamental shifts in the labor supply and demand curves. There are several underlying factors for this imbalance, and many of them are not Covid related, such as school closures and health concerns, and hence will remain.

Build upon the Momentum — for the next Big Challenge

The one-billion-dollar question for supply chain managers is what kind of challenge they need to prepare for next. What might a future pandemic or other dilemma look like? The most severe effects we currently see come from the energy price wave affecting specifically the European process industry at a magnitude never seen before, with future monthly prices at energy levels that are five times higher than the average in 2021, resulting in significant production cost increases for energy intense industries such as the chemical industry.

The main challenges of decarbonization lie indeed within the supply chain: For most chemical companies, 60 to 80% of the emissions stem from suppliers and need to be addressed, in healthcare about 90%.

The coming months could turn out to be critical. Some companies may slip back, reverting to old ways of working that leave them struggling to compete with their more agile competitors on cost or service, and still vulnerable to shocks and disruptions. Others will build on the momentum they gained during the pandemic, with decisive action to adapt their supply chain footprint, modernize their technologies, and increase their capabilities. There is no doubt, the latter will be better prepared for the next big challenge ahead.

Anna Littmann, Partner, McKinsey & Company, Frankfurt, Germany

- anna_littmann@mckinsey.com
- www.mckinsey.de/operations

Solving the Riddle of Supply Chain Visibility

Which Benefits Result of More Visibility? The Views Greatly Differ

Supply chain visibility (SCV) seems to be on everyone's agenda right now. However, when talking to companies, it quickly becomes clear that everyone has a different picture of visibility. Basically, visibility is about knowing more than you knew before, and this is what most companies still agree on. When it comes to what this additional knowledge consists of, what the resulting benefits are or how to implement it, the views greatly differ. This disparate understanding results from the fact that the added value of visibility does not lie in itself, but in what is gained from it.

© Camelot Management Consultants

Constantin Reuter, Camelot Management Consultants

Nina Eckenbach, Camelot Management Consultants

The question is: What can a pharmaceutical wholesaler gain out of the temperature information of active ingredients on the way from the contract manufacturing organization (CMO) to the product producer? Or what does a pharmaceutical producer require an ETA (estimated time of arrival) of last-mile deliveries for? SCV has a different meaning for everyone, and the benefits depend on the use case.

Diverse Use Cases, Diverse Benefits

Even within the pharmaceutical industry, visibility can have different manifestations depending on the stakeholder, process stage or field of application. The distinction lies in the challenges and how SCV helps to manage those. Here, visibility can support many aspects from general processes, like sourcing, production, or distribution, up to specialized procedures, like the transport of living cells for cell & gene therapies.

A common challenge in the pharmaceutical industry, for example, is temperature management. Monitoring and tracking of temperature today are still mostly done with data loggers. They are read out at check points without having temperature visibility between the check points. Obtaining temperature visibility itself is not an added value. The actual benefit is rather provided by an alert indicating a critical point in a product's stability budget, a resulting recommendation for a cooling system on the next transportation mode, and the provision of handling instructions to the receiving party.

Another example: Information about the shortage of a certain product in the warehouse is already too late for the pharma retailer, because at this point, no intervention is possible anymore. Once incidents on regular sourcing routes occur, the purpose of visibility is to inform about this, give alerts for directly affected objects, indicate indirectly or upcoming affected objects and provide alternatives, like re-routing or prioritization options.

What all stakeholders in these examples have in common is that they have to focus on high product quality under the tight restrictions and regulations of the pharma industry. So even though the appearance of SCV is distinct, it supports the essential goals in all scenarios.

Creating a Visibility Vision

Before starting a visibility project, it is important to create a clear vision. Although this advice is widely known, it is all too often not heeded. A visibility vision defines concrete goals which will act as a framework for the future supply chain, whereas these goals can describe visibility benefits in an isolated process section, such as physical shipments, or the supporting role in cross-enterprise processes, such as order-to-cash. The following guidelines can be helpful when creating a visibility vision:

- Visibility should help me to manage my supply chain better.
- I can only manage what I can see.
- Therefore, I have to define what I want to control and what I need to see for that.

A vision should be created independently of constraints or technical solutions and focus solely on the achievement of benefits. Specific use cases as well as the description of possible intervention options are particularly suitable to identify and describe those.

©lassedesignen - stock.adobe.com

Asking the Right Questions

When developing a visibility vision, it is critical to ask the right questions and to question the right things. Referring to the suggested guiding principles, it is therefore necessary to shed light on "What" is to be managed by SCV, and "How" this can be done. However, the most important question, the "Why", must be asked first. Often the trigger for more visibility is not the direct desire for more information, but challenges like recurring delays, states of constant firefighting or dissatisfied customers.

Based on the answers to the why, how and what, the decisive factors

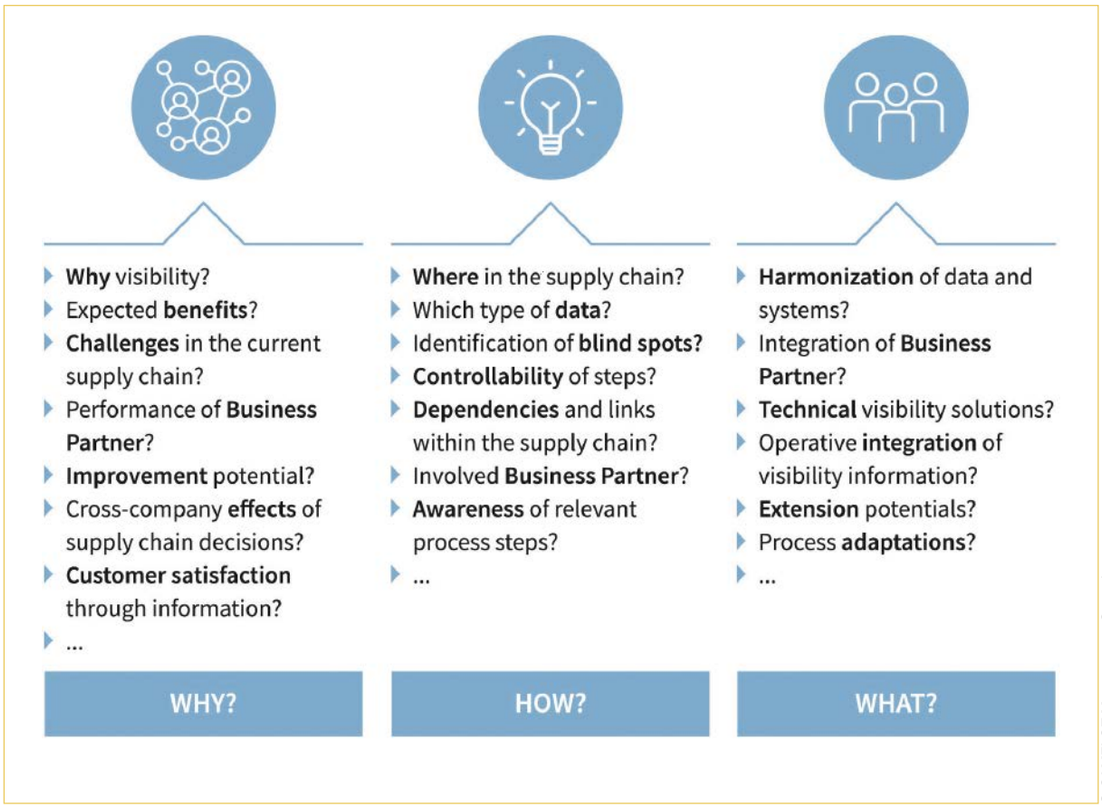


Fig. 1: Asking the right questions is key to establishing a visibility vision.

for visibility in a supply chain can be distinguished. These may include areas such as system landscapes and architectures, data structures, business partners and internal stakeholders, fields of application or process sections and their objects as well as their linkage with other process sections or objects. Putting together the different elaborated visibility requirements will result in the future end-to-end supply chain visibility vision.

A Use Case

The following use case will illustrate this: A pharmaceutical producer procures a major part of the raw materials and active ingredients via the port of Rotterdam, from where they are transported by truck to the production facility. Currently, the port informs the producer when the goods are ready for pick up whereupon he informs his road forwarders to pick up the goods at the port. With its high focus on the port of Rotterdam, the producer aims for more SCV in this process section.

"Why" Does He Require more Visibility?

One reason for gaining more visibility is that the producer aims to execute the inbound transport from the port to the production site less manually. This results in more cost-efficient processes and less susceptibility to errors. A different focus is on increased production planning reliability, whereby a reduced safety stock still goes along with a resilient supply chain.

So "How" Can these Goals Be Achieved?

First, by using a direct information access, through which the freight forwarder will be informed about arrived goods without any detour. By a timeslot booking the forwarder informs the producer about the planned arrival date at the plant. Second, during the sea transport, planned and actual events (e.g., calling different ports) are matched or an ETA is calculated. Alerts about significant discrepancies will be given early enough to identify alternative sourcing options.

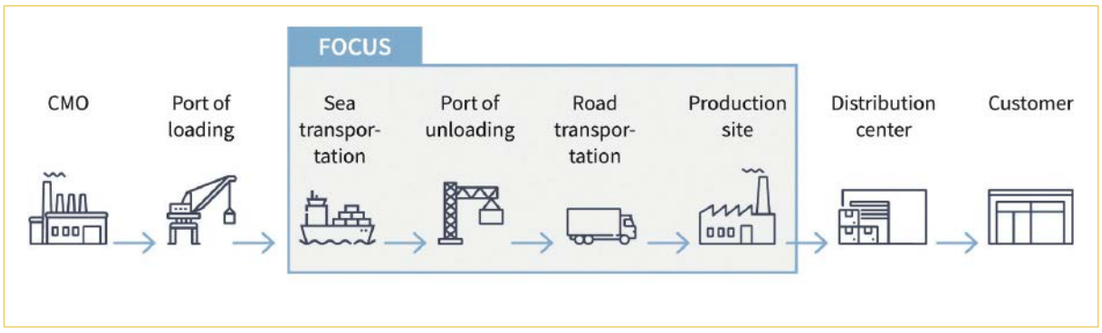


Fig. 2: Supply chain visibility focus of a pharmaceutical producer.

"What" Value Creates each Type of Visibility?

In the first case, vessels are tracked via an integrated visibility provider with direct distribution of the information to the carriers via a collaboration platform. Further integration of information at the producer is not necessary. In the second case, a dashboard provides a status overview of all orders on vessels. The provision of an ETA by a visibility provider is an option here, but it is even more important to draw conclusions about affected orders from the vessel data to integrate this information into further planning. This way the producer can see the effects of delays directly in relation to his production forecasts.

The example clearly shows that answering the "why" is the driving force in implementing the right solution for visibility.

From Strategy to Implementation

Creating a detailed vision allows to define clear goals, but also to involve and convince other stakeholders before the selection and realization of a technical solution starts. As for visibility solutions, there is a wide range of mature providers and solutions on the market, be it hardware, software or services, serving common visibility needs as well as special niche requirements. The implementation approach can differ from a fully integrated architecture (within an existing landscape) to a plug-and-play software installation.

For vision definition and implementation, a modular use-case based approach is recommended. The gained improvement effects can be made visible quickly, which leads to a didactical learning process. The incremental evolution makes it important to always keep the overall vision in mind. In case of deviations between requirements and vision, the vision needs to be adjusted first.

First steps to supply chain visibility can be done right away. Ask your operational teams today for their visibility needs and understand their requirements and from that point form a vision for creating an effective solution.

Constantin Reuter, Principal, Camelot Management Consultants, Basel, Switzerland;
Nina Eckenbach, Senior Consultant, Camelot Management Consultants, Cologne, Germany
- www.camelot-mc.com
- www.camelot-itlab.com

Successful Supply Chain Engineering Projects

Implementing Large-Scale SCE Projects in the Pharmaceutical Industry with a Project Management Office

©ZinetroN - stock.adobe.com

©Miebach Consulting

Ole Grasedyck, Miebach Consulting

Large-scale projects in pharmaceutical logistics are complex, long-term and investment-intensive projects that can only be successfully implemented with an assertive and goal-oriented large-scale project organization structure. The installation of a powerful overall project management, consisting of the comprehensive project management (PM) and a supplementary project management office (PMO), is critical to success. Overall project management requires both specialist logistics expertise and specific management skills.

The PMO has become increasingly established in supply chain engineering (SCE). In this context, a PMO is installed as an essential part of the project organization. Since SCE usually involves long-running large-scale projects, the PMO assumes an institutional function with a „permanent character" in the project. In addition to the administrative aspects, a PMO puts the management component in the foreground. Often, overall project managers have a strong technical orientation and it is therefore important that this gap in management is filled by a complementary PMO. Experience shows that a PMO can generate the following potential benefits:

- Securing implementation success by complementing project management in a target-oriented manner
- More flexible readiness to act on the part of management and implementation of task force activities
- Use of production and logistics consultants who are not only technical experts but also managers
- The „language of management" is combined with operational implementation orientation
- Reporting, communication and targeted support in the right place is an enabler in large projects

Transparency and Communication

A higher-level PMO focuses on transparency and communication throughout the customer organization as well as control/coordination including accompanying peripheral projects. The focus is on the following topics:

- Stakeholder management and communication within the corporate organization
- Introduction of PM tools and templates
- Task force/special projects
- Preparation and support of steering committees, organization and documentation of meetings
- Creation of transparency, preparation of reports and management-oriented presentations
- Deadline controlling (including board-appropriate reporting)
- Cost controlling/business case
- Risk & opportunities management
- Change interventions

The project management of the general planning in logistics has a strong executive character and includes topics such as quality assurance, overall schedule, budget control, management of change requests, interface coordination of the subprojects construction, intralogistics and IT, etc. Figure 1 shows an example of how the PMO, together with the PM, represents the overall project management as a central management function in the large SCE project.

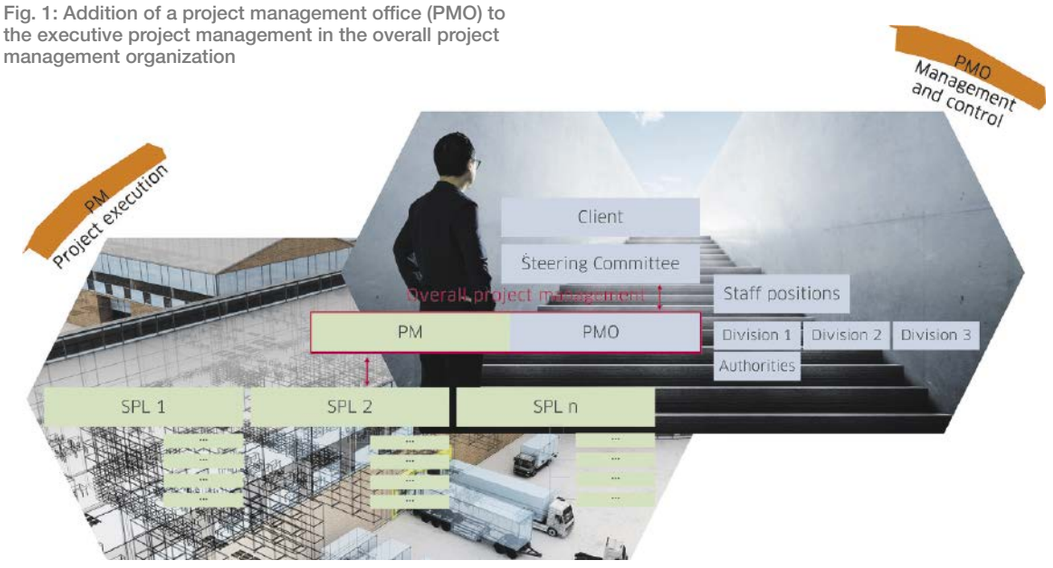
The conceptual design and ongoing implementation of the PMO follows a proven standard operating model, as shown in figure 2.

Strong Coordination Needed

In the onboarding and set-up PMO phase, the PMO is initially designed as an element of the entire project management. Here, a very strong coordination with the technical general project management takes place. Experience has shown that the subsequent selection and procurement of the right personnel resources is a very critical issue, and since this can also become critical from time to time during the course of the project, it is advisable to monitor „resources" regularly via the (subproject) status. In large-scale pharmaceutical logistics projects, it is important that the project team members have not only management skills but also logistics and pharmaceutical expertise, since experience has shown that gaps in this area hinder project progress at a very early stage.

The introduction of the project management tool set includes the definition and coordination of the required tools and templates (e.g., project status report). Here, „less is more" —the aim is to enable project managers to lead in a goal-oriented manner with „a handful" of project management tools. PMO sets appropriate standards for the project. The definition of the objectives, task packages and rules for the project organization and subprojects is carried out with the project specifications at subproject level and the project handbook for the overall project. In addition, the topic of „risk management", which is important in the pharmaceutical industry, is set up early and holistically and established as a relevant component of the subsequent implementation management.

Fig. 1: Addition of a project management office (PMO) to the executive project management in the overall project management organization



The set-up of the web PM tool and communication as well as clarification of the change management instruments is also an important part of the PMO implementation preparation. A goal-oriented meeting structure is critical to the success of subsequent implementation management. Here, the focus is on communication as well as management and information of all project participants. The core meeting is the weekly meeting in which the overall project management requests the project status from the subproject managers. A typical project organization chart for large-scale pharmaceutical logistics projects includes the building/tenant fit-out, intralogistics, simulation (with a focus on intralogistics processes and technology), IT (warehouse management system) and ramp-up (intralogistics and IT) trades, which are integrated as separate subprojects under the overall project management.

Project Handbook Is the „Basic Law“

With the project kick-off, a joint initiation of the project takes place and first meetings are launched afterwards. The project handbook is presented in excerpts and is the „basic law“ for further project implementation. It provides the leverage for the project managers to be able to lead the assigned project staff outside the disciplinary management possibilities of the corporate organization. Early on after kick-off, the project schedule should be approved for the duration of the project, and the subsequent ongoing adjustments can be controlled by the PMO across the board.

The top issue in the pharmaceutical sector, „cost optimization“, is also taken into account at an early stage by installing a cost management system. A cash flow plan, including all logistics trades that are put out to tender, can be easily transferred to a controlling function once the trades have been awarded. The PMO coaches the sub-project managers, e.g. in communication towards the management meetings and with regard to the use of project management tools, and there is ongoing support in the implementation of meetings, technical sparring and, on a case-by-case basis, the implementation of workshops. The PMO accompanies the implementation of all relevant management meetings. Weekly or regular communication via status meetings, in which the relevant project management leadership levels report and exchange information, is the basis for overall project management to make decisions and initiate escalations.

An important aspect of implementation management is status monitoring and reporting. Clear rules for setting statuses (in terms of time, costs, quality and resources) and presentation of implementation progress, next steps, risks with countermeasures, and decision-making requirements create transparency. In addition to regularly querying and preparing subproject status reports, PMO queries the progress of subproject schedules and aggregates them into an overarching overall project schedule.

Particularly in the case of the tenders frequently carried out in logistics in the area of intralogistics and warehouse management systems, it is critical for success that the selection of technology and IT suppliers is carried out on schedule and in the required quality with permanent control of the responsible sub-projects. The topic of „regulations“ is also essential in the pharmaceutical sector and should be addressed early on with PMO support.

In the fade-out phase at the end of the project, the project handbook developed at the beginning is completed as a document and, if necessary, training documents are created. The handover and briefing of the employees of the specialized departments takes place.

In summary, it can be stated that the installation of a PMO significantly increases the probability that large-scale pharmaceutical projects will be successfully implemented.

Ole Grasedyck, Principal, Miebach Consulting GmbH, Berlin, Germany

- grasedyck@miebach.com
- www.miebach.com

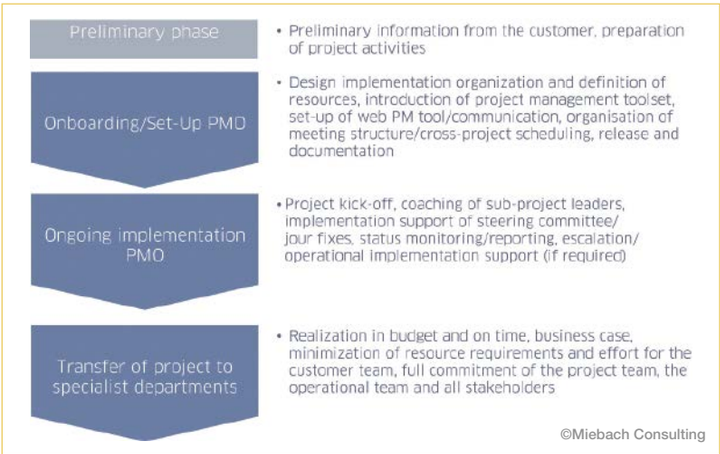


Fig. 2: Executive PMO — Overview of the different PMO facets at Miebach Consulting

© GEFO

An Investment in the Future

Logistics Company Orders Construction of new Ships for €400 Million

The vessel "Tosca" with LNG propulsion is a convincing example of the new environmental investment of Gefo.

The shipping company Gefo is building a range of new specialized tankers at shipyards in China, Turkey, Romania and the Netherlands. The total amount invested comes to €400 million and will result in 26 new-build vessels and 13 purchases of modern tonnage. According to the company, competitive construction prices could only be achieved in the countries mentioned.

The vessels destined for the open sea include a total of nine new chemical tankers, of which three are ships with a 7,500 tons deadweight (tdw) while six are chemical tankers with 3,800 tdw. All nine seagoing vessels are built with stainless-steel tanks so that they can be used for any kind of liquid chemical products, including acids and alkalis. Five tankers have been acquired by purchase, also for sailing with high-grade chemicals.

Five new gas tankers and 12 chemical tankers, 11 of which are also equipped with stainless-steel cargo tanks, are being built for service on intra-European waterways. Eight additional purchases have been made. One third of the new chemical tankers have already been chartered out to chemical shippers on a long-term basis.

Gefo is a leading logistics company in the European chemicals and mineral oil industries and had revenue of €430 million in 2021, of which 80% came from products in the chemicals industry. With the newly built vessels, it expects a throughput of 20.0 million t and revenue of €500.0 million in the future.

All units destined for the sea and for the Rhine, especially also for the chemical triangle ARA (Antwerp-Rotterdam-Amsterdam) are built with double hulls for environmental and safety reasons. The products shipped by Gefo—18.3 million t in 2021—are all 'dangerous goods' with explosive or toxic contents. The steadily growing environmental awareness among chemical and mineral oil shippers and tanker shipping lines is what encouraged the shipping company to make the €400 million investment, the largest in its history.

Youngest Special Tanker Fleet

In 1961 Gefo was founded as Gesellschaft für Öltransporte (Oil Transport Company). Today, it´s fleet consists of 150 specialized tankers, half of which are owned vessels and the other half chartered vessels. With an average age of 9 years for the sea fleet and 13.2 years for the river fleet, the company will have the youngest special tanker fleet in Europe. The operations of the fleets, which can be categorized as chemical shipping, mineral oil shipping and gas shipping, are coordinated from Hamburg, Antwerp, Duisburg and Luxembourg. 25 sea tankers are primarily employed in the voyage between the ports of the North Sea, the Baltic Sea and the western Mediterranean.

© GEFO

From the large number of the new seagoing vessels that have already been delivered from the shipyards the "Tosca" with LNG propulsion is an outstanding example of the new environmental investment. It reduces emissions of particulate matter by 100%, of sulfur oxides by 100%, of nitrogen oxides by 80%, and of carbon dioxide by 25% compared with conventional marine gas oil (MGO) propulsion.

Going Carbon Neutral

In accordance with the Paris Agreement Gefo is endeavoring to make its ships carbon-neutral by 2045. This will require the successive replacement of the entire current four fleets of seagoing and inland waterway vessels with new buildings powered by green hydrogen, green methanol or green ammonia or battery operation in 20 to 25 years. In Gefo's professional opinion, retrofitting the current existing fleets with new, non-polluting engines would not be a worthwhile undertaking since the fleets would then be a quarter of a century old or older.

Thanks to its experience in shipping gas, with 20 gas tankers in service, the company is currently involved in the development of methods for shipping and disposing of CO_2 at underground storage facilities in the seas (carbon capture and storage, CCS). A process that is not yet possible in Germany, though it is already practiced in other countries such as Norway.

The hydrogen propulsion equipment modalities for a Gefo sea-going vessel have been submitted to the classification society DNV for approval. The German government supports the project. Realization would mean the first zero-emission seagoing cargo ship since the end of sailing.(sa)

■ www.gefo.com

2022 ISPE Facility of the Year Award Category Winners

The International Society for Pharmaceutical Engineering (ISPE) announced the 2022 Facility of the Year Awards (FOYA) category winners.

The Innovation category was awarded to CRISPR Therapeutics for its facility in Framingham, Massachusetts, USA. The company has harnessed the CRISPR/Cas9 gene-editing platform to develop and deliver potentially curative therapies to patients with serious diseases. The project was awarded based on the innovative design of the facility, which provides an end-to-end solution for production and fills operations.

Janssen Biologics won the Project Execution category for its Vaccine Launch Facility (VLF) Expansion in Leiden, The Netherlands. The existing VLF represented an opportunity to enable large-scale Covid-19 vaccine drug substance manufacturing by building a new, 25,000 sq ft sterile manufacturing facility adjacent to the existing VLF. This fast-tracked project was developed to design and build the new facility within nine months and to secure regulatory approval for initial commercial batches produced in the facility within 12 months.

Takeda Pharmaceuticals International won the Supply Chain category for its Alofisel Global Program in Madrid, Spain; Grange Castle, Ireland; Osaka, Japan; and California, USA. Alofisel is a first-in-class stem cell therapy product and the first allogeneic mesenchymal stem cell therapy to receive approval by the European Medicines Agency. The project was designed with a product shelf life of only 48 hours and requires seamless cold chain transportation.

The Pharma 4.0 category was awarded to Takeda Pharmaceuticals International in Singen, Germany for its TaSiVa project. The TaSiVa facility took an innovative approach to the project of implementing pharma 4.0 technologies as part of the overall project delivery. The facility was built with state-of-the-art process equipment and then layered with advanced digital technologies in several key areas. A complete IT infrastructure upgrade was completed at the site during the early phase of the project thus providing the platform to utilize advanced information technology (IT)/operational technology (OT) solutions as part of the project delivery.

The first of two companies to be awarded in the Social Impact category is Catalent for its Project Mercury in Bloomington, Indiana, delivered in the face of the global pandemic. With an unknown manufacturing process for a vaccine candidate under development, the team pivoted on existing projects to ensure success, adding 40% more scope including secondary packaging and inspection. The project added 40,000 sq ft to cover the most stringent of the unknown needs of the process, reducing the risk to supply. The project team also cut six months off their schedule and beat the clock while managing the complexities of execution within the Covid-19 restricted environment and delivering the needed capacity to meet important pandemic demands.

The second of two companies to be awarded in the Social Impact category is Janssen Biologics for its Vaccine Launch Facility (VLF) Expansion in Leiden, The Netherlands. During the VLF expansion construction activities were executed during an increased level of positive Covid cases in The Netherlands. J&J kept the personal safety of all project team members as its top priority by implementing various safety measures to reduce the risk of exposure to the Covid virus. These additional safety measures resulted in no significant stoppages or slowdowns of work during construction. (rk)

Integrated Drug Development Models

CDMO Partners Must Be Able to Show Manufacturing Resiliency on Top of Efficiency

Several convergent trends increasingly define the small molecule landscape. A growing proportion of the drug development pipeline is made up of more complex, highly potent APIs (HPAPI). These molecules are commonly associated with innovative cancer treatments, such as antibody-drug conjugates (ADC), but they also have shown effectiveness in treating autoimmune diseases, diabetes and a range of other indications. Alongside the growth in HPAPI molecules, emerging companies are increasingly driving the development of innovative molecules and products. For many companies, particularly small, emerging and even virtual biopharma companies which lack extensive in-house manufacturing capabilities, the path forward typically includes working with an external partner such as a contract development & manufacturing organization (CDMO). CHEManager asked Giovanna Libralon, Senior Director Commercial Development Small Molecules at Lonza, to share her view on the various forces impacting the industry, and how a single CDMO partner with an integrated development model can provide streamlined services, improve technical transfer, reduce timelines, and increase financial gains.

© Lonza

Giovanna Libralon, Lonza

CHEManager: Mrs. Libralon, what do you see as the current market trends in small molecule and HPAPI manufacturing?

Giovanna Libralon: Highly potent APIs (HPAPIs) have a wide range of potential uses and benefits of patients, particularly for oncology and immunotherapy applications. Due to its wide set of applications, the growth of the HPAPI market is outpacing the overall API market by almost two-to-one at about 10% CAGR, compared to 6% for the overall small molecule market.

In parallel, antibody drug conjugates (ADCs), a technology for HPAPI-based cancer therapies, are expected to attract even more attention in the next five years at 26% CAGR as of 2022. ADCs allow for targeted HPAPI payload delivery specifically to cancer cells and are designed to minimize interference with healthy tissue, leading to reduced adverse toxicities—a huge challenge in cancer treatment. As a result, there has been a significant increase in research on ADCs over the last 15 years, which is a key driver for the positive HPAPI market outlook.

Another factor contributing to growth is the acceleration to market. More than 70% of small molecules new molecular entities (NMEs) have a special designation or expedited regulatory pathway with the need for rapid development and commercialization.

This is particularly challenging for emerging companies that are driving innovation. Smaller companies, which hold two-thirds of the early-stage pipeline, are increasingly filing their molecules rather than selling these assets to big pharma during clinical development since they are receiving increased funding from investments firms. Funding for biotechnology companies reached record levels in 2020, and this increased access to funds is believed to be one of the drivers for small and emerging companies to take products all the way to launch. The tendency to develop therapies for niche indications with small patient populations—about 67% of FDA approvals in 2020—is undoubtedly a factor here as well. This has led to smaller firms owning a majority of FDA approvals at 62%, roughly doubling since 2021.

© Lonza

Considering those trends, what commercial and supply chain challenges do pharma companies face?

G. Libralon: The rising demand for HPAPI-based therapies is creating the need to continuously invest on HPAPI capacity and capabilities to support customers from the early stages through commercialization.

Moreover, considering that more than 70% of NMEs get accelerated approvals, the ability to identify and solve challenges earlier in development with agility and flexibility is key to allowing successful product

launch. CDMOs that are able to offer integrated solutions, that is drug substance and drug products, enable rapid development and accelerated timeline. Smaller companies, that bring a majority of these innovative complex molecules to the drug development pipeline, are typically lean and rely on external service providers as their focus is on the science and the innovation of their compounds. This allows for the companies to be very nimble and agile, and as a result innovative. However, this means smaller companies face the challenge of managing multiple partners at a time, which could lead to longer timelines and by extension higher costs. This is where collaborating with a CDMO with integrated services may be strategic to ensure that processes are as streamlined as possible.

Another challenge is that more than 70% of these new small molecules entering the pipeline have poor bioavailability. This is a challenge that must be addressed early in the drug development phase to allow for a successful path to the clinic. This can involve enabling technologies such as amorphous solid dispersions, micronization, and other particle engineering methodologies.

The development of high-quality pharmaceutical products is not only demanding from a manufacturing viewpoint, but also a regulatory challenge. How can CMOs/CDMOs support the pharma sector in achieving this goal?

G. Libralon: In light of the aforementioned challenge, developing a product via an accelerated program can create additional regulatory challenges, particularly for emerging companies. Many small and mid-sized biotech companies do not have the capacity or the regulatory affairs experience needed to develop an appropriate regulatory strategy. All too often, this can cause delays throughout the development process. Involving a CDMO partner with an extensive development and manufacturing network and subject matter experts (SMEs) to advise in early development discussions may help structure a program that meets the expectations of regulators, helping secure approvals at each phase.

Some of the biggest regulatory challenges when developing drug products are the varying national requirements as well as its different interpretations. While the Food and Drug Administration (FDA) and the European Medicines Agency (EMA) application and inspection expectations are aligned based on the international harmonization guidelines, they may not always be fully identical. There may even be different expectations from regulatory bodies of other countries which are outside of the harmonization initiative. An experienced CMO or CDMO is invaluable in navigating the differences of both regulatory agencies and their input and insights have the potential to reduce cost and time in the long run.

How does a pharma company benefit from having a partner with an integrated development model? How does this strategy help with the manufacturing process, especially with the accelerated HPAPI timelines?

G. Libralon: A single CDMO partner with an integrated development model can provide streamlined services, improve technical transfer, reduce timelines, and increase financial gains. A 2017 study by Tufts University found that a single-source outsourcing model shortens the drug development cycle by up to 14 weeks while increasing financial gains by up to $45 million. This data suggests outsourcing to a CDMO where all activities are managed by one system may give emerging companies a critical leg up that would put them ahead of competitors.

For example, pharma companies conventionally work with several CDMOs for different stages of their development process; as well as different CDMOs for drug substance and drug product. However, different CDMO partners will each sample, test, and release the product before going forward—creating duplicative activities that continue to consume time and resources.

The challenge is that workstreams are difficult to isolate and often cross between different stages of the process. This includes packaging requirements, quality control and quality assurance, and liability questions. For example, manufacturing ADCs requires small molecule expertise for the HPAPI payloads and linkers, but also large molecule capabilities for the antibody. Having multiple partners to produce your ADCs' biologics and chemical components may unnecessarily elongate timelines as they will be in separate locations.

Working with a partner like Lonza who can provide integrated services means that they have a bird's eye view of the processes and thus reduce complexity, effort, time, and costs. Integrated models are especially useful under accelerated timelines, where time and budget are of the essence. Collaborating with a CDMO who has capabilities to deliver your small molecule product from proof of concept to commercialization on top of navigating complex regulatory frameworks can make a huge difference. Specifically, it can significantly help ease technical transfer and reduce shipping costs and time.

In which areas does the use of (new) digital technologies play a particularly important role?

G. Libralon: Digital technologies play an important role in the pharmaceutical development continuum. Software developers have made significant strides in service to drug substance process research and development scientists, especially at the critical juncture between discovery and clinic. For example, R&D information technology providers have commercialized rules-based and machine learning-enabled predictive retrosynthesis software suites to support chemists in the development and prioritization of commercially viable strategies for complex API production. New digital technology is also impacting the ways in which we conduct process optimization. Self-optimization algorithms, applied to networked and PAT-integrated microreactors, are changing the pace and cost associated with DOEs can be successfully concluded. This is invaluable, given the backdrop of rising API complexity in modern APIs—and the associated number of steps subject to optimization studies. These are two technology areas where our Small Molecules Global R&D organization is actively working—adapting both with Lonza expertise and proprietary data, to pass the benefits to our clients.

In February, Lonza has completed an expansion at its site in Nansha, China, extending developing and manufacturing capabilities and capacity for highly potent APIs. What is the strategic purpose behind an HPAPI manufacturing site in China?

G. Libralon: Our site at Nansha, China, is an integral piece of our global drug substance and drug product design, development and manufacturing network. The main advantage of our presence in Nansha is that it allows us to leverage world-class, high-quality and reliable local suppliers of raw materials to help further increase the speed of problem-solving and manufacturing within our global network. The Nansha site also allows us to have a close pulse on the regulations in China which helps us support our global customers produce commercial products for the Chinese market or support the production of clinical materials for trials in China.

The expansion of our Nansha site demonstrates our commitment to ensuring integrated manufacturing services from early- and late-stage development to commercial manufacturing and serve our global partners. With solutions from early- to mid- to late-phases of development, these new labs strengthen our global manufacturing network. Specifically, we're committed to supporting small and emerging companies who are bringing the majority of these innovative HPAPIs into the pipeline. A recent example is the partnership with Vivesto, a Sweden-based biotech, to manufacture their ovarian cancer drug candidate at our Nansha site.

The impacts of pandemics—as demonstrated by the disruption of global supply chains due to Covid-19—as well as national policies and trade-related developments will likely require many Western CMOs/CDMOs to shift at least some production back to Europe and the US. Could this industry sector be beneficiary of restructured supply chains?

G. Libralon: One trend we've observed at Lonza is the increased demand for API production in Europe and the US. However, if we consider that most raw pharmaceutical materials are manufactured in China—on top of the growing early phase pipeline developed by Chinese companies—, it's strategic to have a presence in the region. Our global footprint, including China, allows for better control of supply for raw materials as well as a close understanding of Chinese regulations. This is important to support our global customers for worldwide clinical trials while continuing to produce commercial products for the Chinese market.

■ www.lonza.com

Aim for the Stars

Streamlining Drug Development with AI

Industry 4.0 is sweeping across the globe. Bringing in its wake revolutionary developments such as the internet of things (IoT), augmented reality, and digital simulations, it has become abundantly clear that the world will never be the same again.

In the pharma industry specifically, the dramatic expansion in digitalized healthcare data has motivated the use of artificial intelligence (AI) to process large and complex datasets. By applying AI, it may be possible to generate useful insights which, for example, could guide the use of personalized medicine for patients through real-world evidence (RWE) or improve the design of clinical trials. Similarly, in silico methods could enable computational libraries of drug compounds to be screened virtually to provide a faster selection of lead drug compounds with less expenditure, or to identify opportunities for drug repurposing.

De-risking Drug Development

The potential of AI to optimize decision-making by predicting the drug candidates most likely to be successful is of particular importance in the context of the low success rates and enormous expense in drug development.

The price tag associated with bringing a single therapeutic to market is often in the range of $1 billion, spread over 10–15 years. Meanwhile, approximately 90% of therapeutic molecules fail in clinical trials and never obtain regulatory approval. The time and expense sunk into drugs that often ultimately fail during clinical trials have led to the development of AI algorithms that can virtually screen drug compounds, allowing resources to be allocated more effectively.

For example, algorithms, such as Nearest-Neighbor classifiers, support vector machines, and deep neural networks (DNNs) are used to screen drug compounds based on synthesis feasibility and can also predict in vivo activity and toxicity. Different AI-based tools, such as machine learning approaches, can also be used to predict physicochemical properties—including solubility and intrinsic permeability. These properties can influence pharmacokinetics, or the movement of drugs in the body, and thus play an important role in determining the success of a drug compound.

©wladimir1804 – stock.adobe.com

Elisabetta Micelotta, Nanoform

Jamie Unwin, Nanoform

The Need to Enhance Solubility and Bioavailability

Poor solubility, and consequently poor bioavailability, is perhaps the greatest hurdle that drug candidates need to overcome. A trend toward increasingly complex and, consequently, more hydrophobic pharmaceuticals means that poor solubility is a leading cause of failure in clinical trials. Approximately 60–70% of new drug candidates are poorly soluble in water. Poor aqueous solubility leads to poor absorption of oral therapies in the gastrointestinal (GI) tract and poor bioavailability, preventing the therapeutic from reaching its target area in a sufficient concentration to achieve the desired effect.

It is no surprise, therefore, that there is an increasing spotlight on how technologies that can improve bioavailability can be implemented to allow more drugs to reach the market. Nanoparticle engineering approaches, in which the size of drug particles is reduced to the nanoscale, are among these technologies. These work by increasing the active surface area of the drug particles, thereby increasing interaction with solvent particles and enhancing solubility.

Nanoparticle Engineering in the Industry

There are a number of examples of nanoparticle engineering technologies in the industry, including nanomilling and spray drying. The former involves milling drug particles in a wet medium, while the latter approach transforms a fluid material into a dried powder by spray drying active pharmaceutical ingredients (APIs) with a polymer to create an amorphous solid.

Controlled Expansion of Supercritical Solutions (CESS) is another nanoparticle engineering approach that has emerged to control the size of drug particles. CESS reduces particle size by dissolving the drug particles in supercritical carbon dioxide and recrystallizing under controlled temperature and pressure, and can generate uniform nanoparticles as small as 10 nm in some cases. Reducing particle size to this extent opens up exciting possibilities for both dramatically improving solubility (and thus bioavailability) and even facilitating new drug delivery routes by enabling transport across biological

membranes that would ordinarily be impassable.

Combining AI and Advanced Nanoparticle Engineering

Each nanoparticle engineering technique has its own technical challenges, a common one being a lack of predictive capability for success. However, in order to implement predictive technologies in conjunction with nanoparticle engineering a key challenge must be overcome: the vast number of potential different drug molecules. This makes the available physicochemical data from existing molecules inevitably sparse in the universe of possible molecules. This, in turn, adversely impacts the predictive ability of generic AI algorithms that are built within the realm of nearly unlimited amounts of training data.

"Using predictive AI, the process of applying new technology to a candidate struggling to achieve the necessary bioavailability can be de-risked."

Sparse-data AI-based approaches can provide a solution. For example, the CESS approach can work in tandem with STARMAP 2.0, a bespoke sparse-data AI engine that predicts the success of the CESS process. STARMAP 2.0 has run predictions on every molecule ever disclosed. It augments sparse-data AI with detailed expert knowledge to overcome the challenge associated with an inherently limited amount of data and make reliable predictions regarding CESS-powered nanoforming success.

Predicting the Winning Drug Candidates

AI is a powerful tool for predicting successful drug candidates. The best results will be achieved when the latest AI-based approaches are used in harmony with new solubility-enhancing technologies, such as CESS, to maximize success rates.

For instance, STARMAP can quickly and efficiently screen thousands of compounds, allowing the rapid identification of the best candidates for CESS. In addition, the STARMAP evaluation of a specific molecule to be nanoformed using CESS provides practical guidance for setting the optimal process parameters. An example of this is a collaborative study between TargTex and Nanoform to process TargTex's glioblastoma multiforme drug candidate. The results from the STARMAP evaluation of the drug candidate helped identify the processing conditions required to produce nanoparticles with the desired characteristics.

"Poor solubility, and consequently poor bioavailability, is perhaps the greatest hurdle that drug candidates need to overcome."

Using predictive AI, the process of applying new technology to a candidate struggling to achieve the necessary bioavailability can be de-risked. At the same time, opportunities are created for libraries of previously undruggable molecules to be reassessed. This can potentially enable failed assets to be brought back to life again and in general accelerate the cycle of APIs from drug discovery to a pre-clinical and further to a clinical phase.

AI-powered Nanoparticle Engineering of the Future

Ultimately, the value in applying AI in Pharma is in making new and better drugs available faster than would be possible otherwise. By augmenting sparse-data AI with expert knowledge and applying it to the latest nanoparticle engineering techniques, opportunities are created to eliminate the risk associated with new techniques and give therapeutics a second chance to reach the patients who need them.

Meanwhile, AI-based techniques could be used to screen all known drug molecules for drug repurposing potential to help combat challenging diseases. The possibility of identifying 505(b)(2) opportunities using AI also opens up exciting opportunities for enabling swift patient-centric innovation. In the midst of Industry 4.0, it is a highly exciting time to be working in the field and ensuring patients also benefit from the remarkable leaps in AI-based technology.

References to this article can be requested from the authors.

Elisabetta Micelotta, Science & Technology Team Leader, and Jamie Unwin, Commercial Insight Officer, Nanoform, Helsinki, Finland

■ https://nanoform.com

Challenging the Status Quo

Avoiding the Risk of Misallocating Technology Resources

Management pays a lot of attention to new ideas and cutting-edge technologies, but most of their resources are consumed by mature legacy technologies that are often not actively and rigorously managed. The reasons are in many cases cultural and political. The authors have devised a visual matrix to help teams understand which technologies bring the most potential to businesses in the long run.

Hervé Baratte, independent consultant

Gabriele Rosani, Capgemini Invent

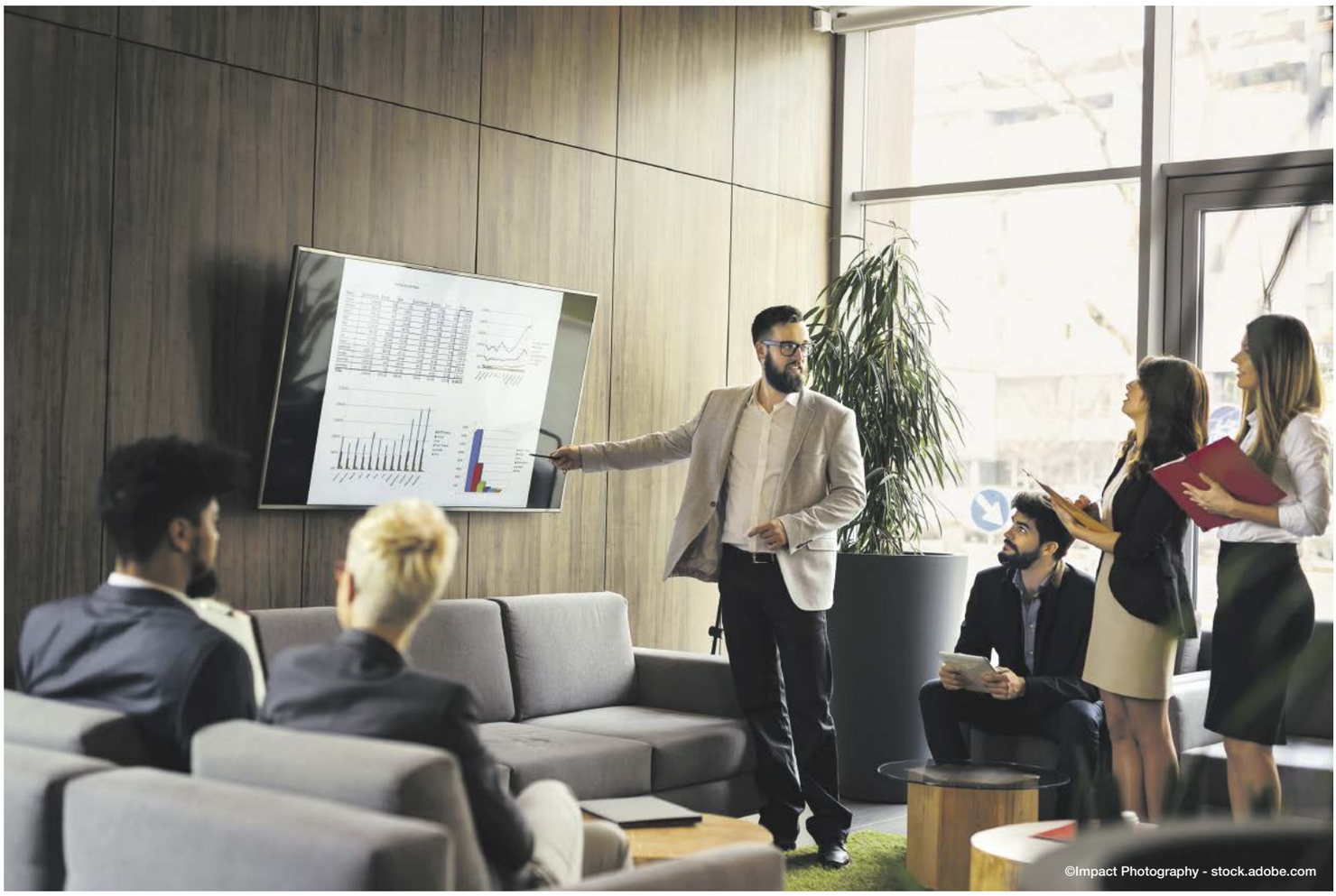
Jonas Vetter, ECSI Consulting part of Capgemini Invent

Most corporate innovation strategies have one thing in common: they focus heavily on breakthrough innovations and novel technologies. There are, of course, good reasons why breakthrough innovations draw senior executives' attention: If successful, those "big bets" have the potential to transform the way value gets created and distributed in an industry, eventually changing the competitive landscape.

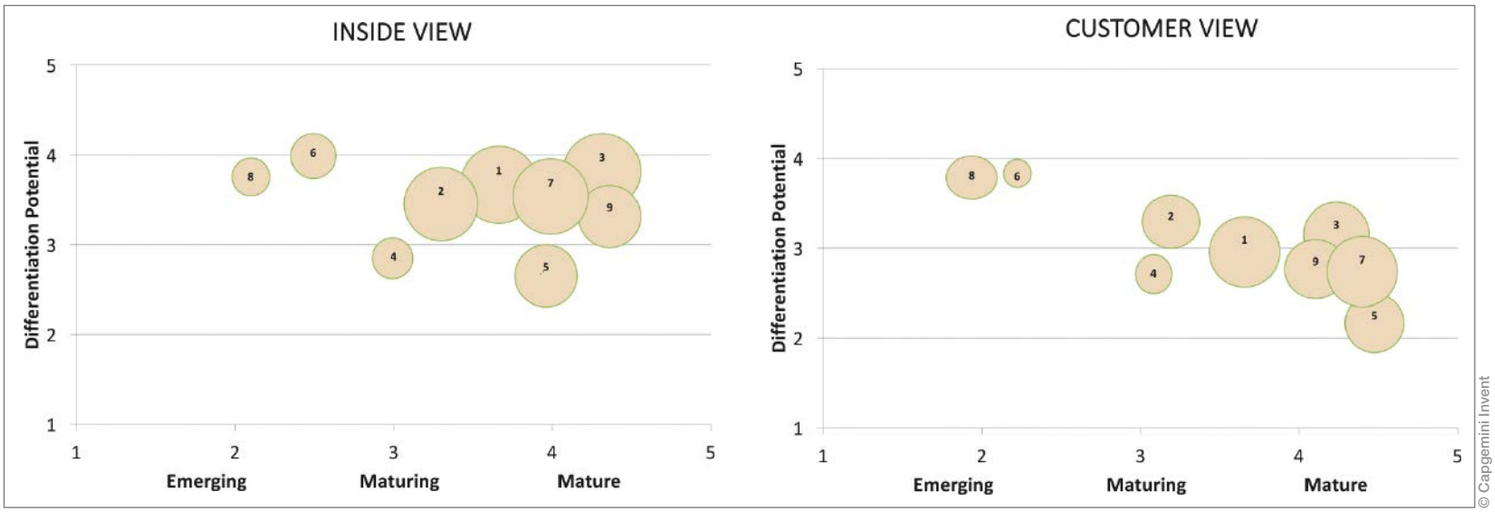
Overinvestment in Legacy Technologies

Yet, this poses a dilemma for many incumbent chief technology officers (CTOs). On one side, the lion's share of management attention and enthusiasm is taken by new ideas and cutting-edge technologies. On the other side, most resources are consumed by legacy technologies that have accumulated over years and decades. Often, those mature technologies are not actively and rigorously managed. They simply stay the course, absorbing incremental resources that could be shifted into more differentiating assets.

We have regularly seen this at play among well-known firms across different sectors, from fast moving consumer goods to chemicals to automotive. These companies tend to overinvest in their legacy technologies. Such investments are often considered a given. The legitimate question of whether investments in incremental technological improvements hold any significant customer value is too often left unasked.



©Impact Photography - stock.adobe.com



The value of nine technologies according to the internal team and the customers. Note: Bubbles represent the nine key technologies with size reflecting the annual investment amount.

But challenging the status quo is easier said than done. Leaders often hesitate to lay hands on the "holy cows" in the technology portfolio. Why? The reasons companies continue investing additional funds in mature technologies longer than they should are often cultural and political, which tend to transcend rational considerations like strategic differentiation and capital allocation. Mature technologies typically have strong owners and advocates within organizations. Rooted in the status quo, these groups are predisposed to resist change, defending their territory. Furthermore, as these legacy technologies have been around for a long time, their advocates are often some of the most established characters in the company.

Challenging the Status Quo

How then should CTOs challenge the status quo? In our experience, a critical first step is to create awareness within teams through a "visual awakening."

We suggest applying a simple but powerful visualization matrix: On the horizontal axis, the team—a cross-functional group of business and R&D managers from different units—maps the maturity of their technologies over three phases (emerging, maturing, and mature), with the size of each bubble indicating the annual investment. On the vertical axis, we ask the team to evaluate the differentiation potential, i.e., the strategic edge implicit in the technology, on a scale from one to five.

For many team members this will be the first time they see a comparative picture of the entire portfolio rather than the view of one isolated technology at a time. This helps to correct biases and misperceptions and sets the technologies into a broader strategic context.

After the technologies have been mapped internally, we repeat the exercise with a group of customers, guiding them with a standardized set of questions. Comparing the customers' evaluation of value against the internal team's is an eye-opening experience. In many cases, the team overestimates the differentiation potential of their technologies in respect to their customers' perception.

> *"Some companies tend to overinvest in their legacy technologies."*

The Visual Matrix in Action

In the case of a specialty chemical company serving the life sciences sector, the team mapped the nine most resource-intensive technologies along the maturity continuum and then evaluated their differentiation potential. After the exercise, we repeated the mapping with a set of key customers. The result was striking. As shown in the picture below, the chemical company overestimated the differentiation potential of technologies by an average of around 1.5 points, or 30%. For the costliest technologies, the difference was even wider.

Seeing this reality clearly visualized on the matrix triggered a set of tough and emotional discussions, but eventually opened the door to a fundamental reassessment of whether to continue investing in the less differentiating technologies. This was a welcome relief in the face of resource-scarcity and offered routes to financing urgently needed lab positions and equipment.

Reaching consensus on the differentiation potential of their technologies is the first and most crucial step companies need to take when rethinking the balance of their portfolios. Only then should they start discussing how to evolve operations, engage with suppliers and partners for targeted technologies, and ultimately calculate potential benefits for their bottom lines. In the previous example, the team proceeded to a second step of discussions. After aligning on the strategic value of each technology, they identified two clusters: one cluster of the less differentiating technologies where they would look to unlock resources (for example, by outsourcing to, or partnering with, suppliers), and a second cluster of the differentiating technologies to which they would allocate freed-up resources. At the same time, they introduced a process to measure the differentiation potential of each old and new technology periodically, allowing them to keep their portfolio matrix and strategic clusters up to date.

> *"Leaders often hesitate to lay hands on the 'holy cows' in the technology portfolio."*

Taking a New Perspective

As the example illustrates, the matrix is instrumental to challenge the status quo and to trigger discussions. However, having a good tool is not enough per se. Much of the value comes from shifting mindset and behaviors during the portfolio discussions. Psychological safety coupled with candor are important cultural elements: If people are afraid to criticize, openly challenge others' views and raise counter perspectives, the status quo will always prevail.

What makes technology-driven companies successful is not just their ability to turn out novel innovations. It is also about their ability to manage the old ones efficiently and effectively. To avoid the risk of misallocating resources, CTOs and their teams can apply this simple but powerful matrix to build a new perspective—a "visual awakening." This is the foundation for frank strategic discussions needed to overcome the political and cultural tethers to legacy technologies, ultimately leading to better balance in the technology portfolio.

Hervé Baratte, Independent Consultant, Baratte Consulting;

Gabriele Rosani, Principal, Capgemini Invent; and Jonas Vetter, former manager, ECSI Consulting, part of Capgemini Invent

- gabriele.rosani@capgemini.com
- www.capgemini.com

Return of the Human Touch in Industry 5.0

People will once again Play a more Important Role in Production

Like many other industries, the chemical industry has focused heavily on the digitalization of production facilities in recent years. Industry 4.0 saw many companies investing in cyber-physical systems, data processing and cloud computing to create highly efficient production environments. However, the evolution continues, and now, through Industry 5.0, the skills and creativity of humans will once again play a more important role in production — supported by cognitive assistance systems.

Humans have clearly played a subordinate role in the concepts associated with Industry 4.0 without their importance in the process industry really being taken into account. As we move forward, ongoing development in the field of artificial intelligence (AI) is opening up many new opportunities for collaboration between machines and humans. AI is already being used in research and development, for example.

In the area of production, however, machine collaboration — or in other words, machine-assisted humans — is still in its infancy. But here, too, human skills remain indispensable, for example, when it comes to finding creative solutions to unexpected problems or even managing global crises. Humans, not computers, were in the driving seat in rapidly adapting to the ever-changing situation caused by the Covid-19 pandemic.

Is the time now right for humans to regain greater responsibility in chemical processing plants?

Machine Collaboration in Production

At its core, Industry 5.0 is about production processes being controlled by

Andreas Eschbach, Eschbach

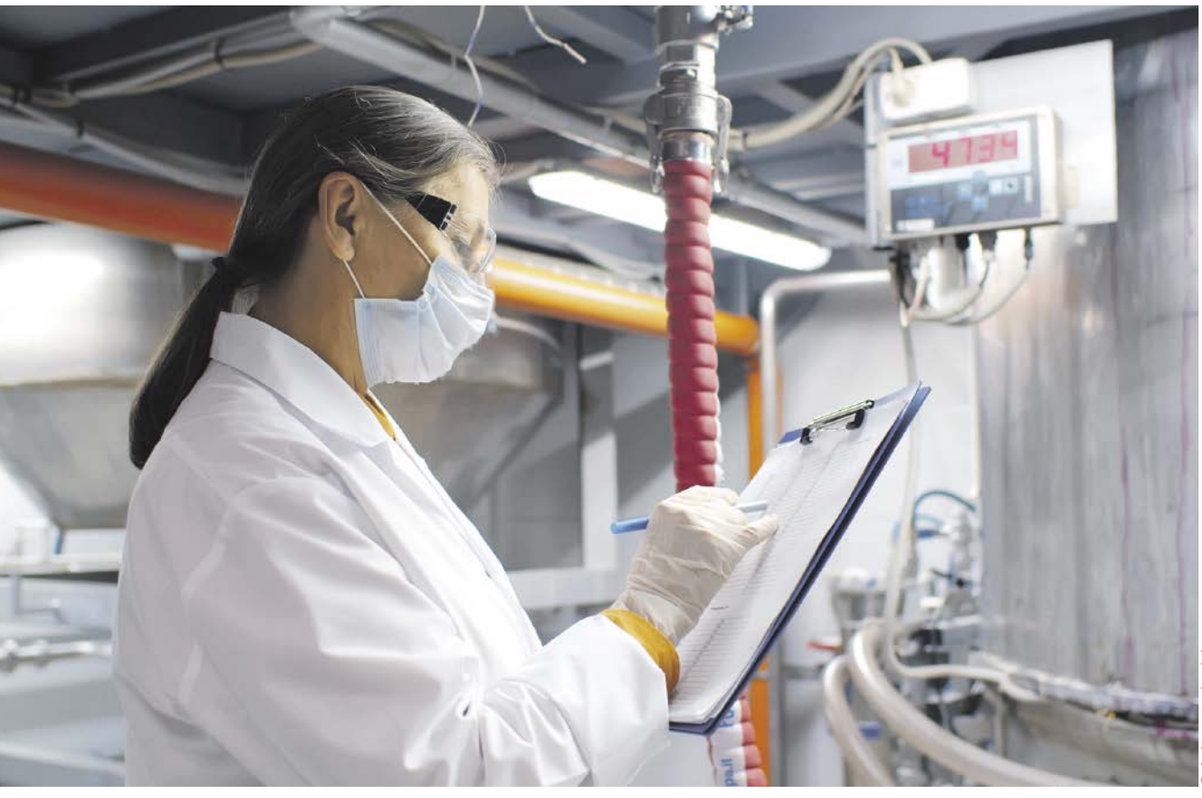
people supported by efficient cognitive assistance systems, such as the Shiftconnector software platform. After all, only when more and more data is available can humans work together with machines — as a team — and make the necessary decisions on a sound basis. In other words, machine-to-machine and human-to-machine communication must be expanded to include digitally supported, integrated communication between employees. The chemical industry will benefit from this approach in many ways, such as safer processes, higher productivity and resource efficiency.

Software solutions that support staff during shift handover are already on the market, but mostly only meet the requirements of Industry 4.0. In the future, it will be important to network the cyber-physical and human levels more closely, not only during shift handover, but also, for example, in Overall Equipment Effectiveness (OEE) reporting. To achieve this, the knowledge and communication of all stakeholders, such as rotating and day shift teams, production and site managers, as well as the company's top management, must be largely digitized to ensure complete transparency for all.

Plant Process Management (PPM) is one approach that can achieve this. It ensures clearly structured processes in operational control and corporate communication and can be used regardless of the degree of implementation of Industry 4.0 concepts. Information from every point in a production process can be captured, analyzed and integrated into other mission-critical systems such as Enterprise Resource Planning (ERP), maintenance management and production planning.

Industry 5.0 Is the Future

Industry 5.0 makes it possible to harness the skills and creativity of people to improve the safety and productivity of processes. But they certainly won't lack support. AI-supported technologies will be close at hand and, with extensive networking, will enable maximum interaction between humans and machines and also between employees. Shift personnel in chemical production plants will continue to work around the clock but will have to perform fewer and fewer routine tasks. This offers the industry the opportunity to create new, attractive jobs. Furthermore, in the future, it will become natural for employees to delegate more complex tasks to machines, much like the increasing interaction with voice-activated smart speakers and home appliances. But at the end of the day, it will continue to be the human, and not the machine that carries the ultimate responsibility of success or failure.



©nimito - stock.adobe.com

Andreas Eschbach, Founder and CEO, Eschbach

■ www.eschbach.com

CHEManager INTERNATIONAL

INNOVATION PITCH

©Costello77 - stock.adobe.com

Drug Discovery
AI-powered SaaS Platform for 3D Protein Structure Analysis

Connected Work
AI-based Frontline Worker Tools for Industrial Companies

WILEY

SPONSORED BY

GLOBAL ENTREPRENEURSHIP CENTRE
Scaling for impact

HAFEN STRAUBING-SAND
BIOCAMPUS MULTIPILOT

AI Makes Drug Discovery Faster

Software Saves Time and Costs in Early-stage Drug Development

The effect of a drug starts after a few minutes. The headache disappears, the stomach calms down, or the fever drops. What an effective opportunity for mankind: We are used to medication helping us when we are sick. However, the development of a drug usually takes a decade. The Dresden, Germany-based start-up PharmAI has found a way to significantly speed up the process. To do so, they use artificial intelligence and rely on the capabilities of smart algorithms. Joachim Haupt, co-founder and CEO, and Florian Kaiser, co-founder and CTO, explain PharmAI's technology and describe the company's options and steps ahead.

Joachim Haupt, PharmAI

Florian Kaiser, PharmAI

CHEManager: Mr. Haupt, which challenges is drug research currently facing?

Joachim Haupt: The two most important challenges are certainly time and budget. The development of new drugs normally takes a decade. This is associated with high costs. Therefore, finding solutions for rare diseases is unfortunately not lucrative for many companies. PharmAI would like to solve these problems. We see the PharmAI technology as an enabler and are convinced that we can help to accelerate drug development with our approach.

Mr. Kaiser, how does it work?

Florian Kaiser: Artificial intelligence (AI) and smart algorithms are the foundation of our software DiscoveryEngine. It uses information about the composition of proteins in the human body, viruses, or diseases. Using a combination of smart algorithms to process protein structures and AI to detect significant features, the software builds specific fingerprints of the binding site of a protein target. These fingerprints are the essential component, allowing our DiscoveryEngine to identify suitable drugs from libraries with billions of small molecules. You can think of it like a big jigsaw puzzle—with millions of pieces.

What are the concrete advantages of this method for drug research?

F. Kaiser: Our proprietary method is fast, cost-efficient and very effective. It also conserves resources. By using our method, our customers only need to test a few hundred molecules in vitro to obtain hits for their drug target—in contrast to several tens of thousands with classical high throughput screening (HTS). The positive implications are manifold: Timelines are reduced from 12 months to 3 months, assays, which would not work with HTS, can be used, and the chemical diversity of the identified molecules is very high.

When did the idea of founding your own company arise from this approach?

J. Haupt: Important preliminary work for this took place at Biotechnology Center (Biotec) of TU Dresden several years ago. It was clear to us that this new development could revolutionize early-stage drug discovery. That's why we founded our start-up in 2019. A lot has happened since then. We all learned a lot and our software became so much better and much more flexible with respect to the use cases.

Who is interested in your work? What important projects have there been since the founding?

F. Kaiser: There have been quite a few. One wonderful project was part of the ongoing cooperation with 2Bind from Regensburg. We combined AI and highly efficient biophysical tests to a new method. This makes it possible to detect undesirable side effects of drugs in record time and very early in the development process. Previously, it took many months to confirm these effects in the laboratory. With our new approach, results are available after only eight weeks.

J. Haupt: NanoTemper Technologies from Munich is also an important partner. Together with their team, we published the tool Proto at the beginning of 2022. Proto assists scientists in their decisions on how to label proteins. The resulting web app uses more than half a billion protein structures, many of them from AlphaFold.

Together with NanoTemper you have decided to offer Proto for free. Is that smart? As a start-up, don't you also have to earn money?

J. Haupt: Whether this decision is considered smart or not really depends on the perspective. We understand PharmAI as enabler of a faster and more cost-effective drug discovery. And I think that we are on the same page with NanoTemper here. However, it was NanoTemper's decision to offer Proto for free and I think that was a smart decision. To attract more small laboratories into drug research, these need tools that make their work easier and reduce costs. This is the only way to develop therapies for many more rare diseases. Every patient deserves help. AI helps us to help them.

What role will AI play in the laboratories of this world in the future?

F. Kaiser: I think a big one. It holds enormous potential. We will only need days or hours to find answers to questions that previously took us years. That means we can devote ourselves to many more topics. It's going to be exciting. Our work will definitely not be boring in the future.

Personal Profile

Joachim Haupt is CEO and co-founder of PharmAI. He graduated with honors in Bioinformatics from Martin-Luther-University and holds a PhD in computer science from TU Dresden. His career in drug discovery started at the Leibniz Institute of Plant Biochemistry. Since then, he has built a long scientific track record in the areas of cheminformatics, computational drug discovery, and structural bioinformatics. Apart from his scientific career, he founded a number of companies. And he casted church bells.

Florian Kaiser is CTO and co-founder of PharmAI. He holds a PhD in computer science from TU Dresden. During his academic career at Biotec, he contributed to algorithmic development for large-scale protein structure analysis. Florian is heavily involved in the application of AI to biological problems and always keen to identify and tackle new challenges. At PharmAI, he puts cutting-edge AI technology to the test to accelerate drug discovery.

Business Idea

Structure to Knowledge

Over the past five years, PharmAI has built and fine-tuned the DiscoveryEngine—a software for drug discovery with cutting-edge machine learning techniques and bioinformatics algorithms based on the latest scientific research. Originally developed for virtual screening, the DiscoveryEngine was extended to off-target search and prediction of properties of proteins. PharmAI is offering smart services for pharma and biotech research, allowing easy access to advanced computational tools for clients without cheminformatics capacities. Over the last year, PharmAI established a software-as-a-service (SaaS) toolchain, which can be easily combined to a custom solution fitting the needs of platform providers.

Hybrid Business Model

PharmAI follows a hybrid business model of service projects on a pure fee-for-service basis complemented by a subscription model for SaaS products. The most popular service is the PharmAI Focused Library, which enables clients to screen chemical libraries with hundreds of millions of compounds. The customer provides information about the target and selects a screening library. PharmAI conducts the virtual screening and delivers a shortlist of some hundred chemically diverse compounds together with a comprehensive report within about a month. Subsequent in vitro tests show hit rates that are several hundred times higher than conventional methods and over ten-fold higher than state-of-the art computer methods. As a result, the customer only needs to test some hundred compounds but obtains hits as if they ran an HTS campaign with tens of thousands of compounds—at a fraction of the conventional timeline.

The SaaS offering allows to deploy solutions in the cloud for customers with specific needs and a high throughput. Due to the rich feature set in structural biology, cheminformatics and AI, the components of the DiscoveryEngine are applied to solve tasks like ADME-T characterization of small molecules, protein sample preparation and virtual screening.

- PharmAI, Dresden, Germany
  www.pharm.ai

Elevator Pitch

Shorten the Timeline

PharmAI's mission is to make early-stage drug development significantly more efficient by increasing success rates while reducing costs. This is achieved through a breakthrough AI-powered platform for 3D protein structure analysis. The DiscoveryEngine technology shortens the timeline for discovering new therapeutic molecules dramatically. PharmAI was founded in 2019 as a spin-off from the Biotechnology Center of the TU Dresden. As of today, 13 members are part of the international PharmAI team.

Milestones

2019
- PharmAI founded as spin-off from TU Dresden, Germany.
- Strategic partnership was established with biophysical screening provider 2Bind.
- PharmAI was awarded member of the TechBoost start-up program of Deutsche Telekom.
- Collaboration with device manufacturer NanoTemper Technologies.
- Extension of business model to Software-as-a-Service (SaaS) solutions.

2020
- PharmAI hosts its own computing infrastructure in a secure datacenter.
- PharmAI was invited to contribute to a long-term drug discovery project for modulation of protein-protein interactions in neurological diseases.
- Collaboration with the Saxon Institute for Computational Intelligence and Machine Learning initiated to enlighten the black box and make PharmAI's machine learning interpretable.

2021
- Transformation of the PharmAI software stack into a cloud-ready and scalable micro service architecture.

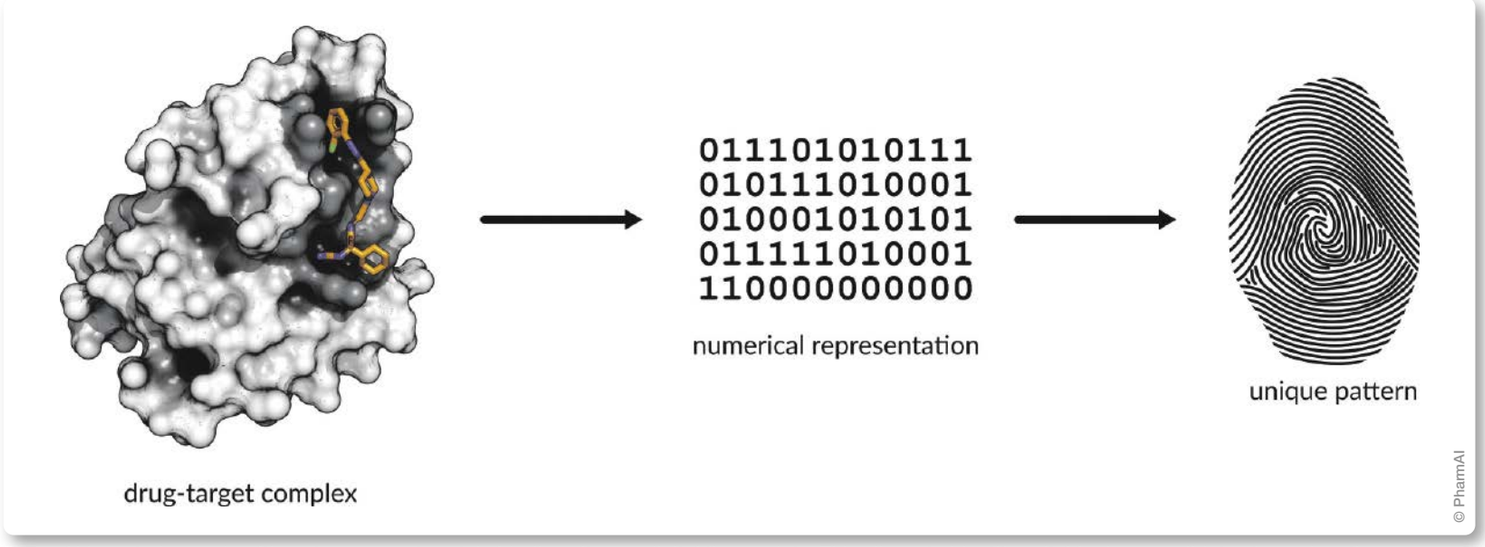
2022
- First SaaS product "Proto" available to the general public in cooperation with NanoTemper Technologies.

Roadmap

2022
- Scale-up of SaaS offering with a new product.

2023
- SaaS solution deployed at platform provider.

2027
- First drug from PharmAI's pipeline in clinical trials.



PharmAI invented new algorithms to represent protein binding sites as digital fingerprints. This allows to identify suitable drug candidates from gigantic compound libraries.

Empowering Frontline Workers with AI

First Platform for AI-based Connected Worker Solutions to Drive Efficiency and Safety

Today's industrial workforce is different as it's rapidly changing, diverse and dramatically less stable than it used to be. Therefore, companies today must cope with the new normal where workers are hard to find, hard to engage, and hard to keep. Augmentir as an AI-powered connected worker software helps companies to face that challenge and meet production goals by delivering effective on the job support, collaboration, skills management, and training for a more flexible industrial workforce. Russ Fadel, CEO and co-founder of Augmentir, explains the company's technology and provides an outlook on its further development.

Russ Fadel, Augmentir

Personal Profile

Russ Fadel is a serial entrepreneur and the CEO and one of the three co-founders of Augmentir. Prior to founding Augmentir, Russ founded four successful companies in the industrial software sector, including the two most recent — ThingWorx, the leading Industrial IoT (IIoT) platform company (acquired by PTC), and Lighthammer, the pioneer in enterprise manufacturing intelligence software (acquired by SAP). Russ has been intimately involved in the last three software revolutions around humans and machines in manufacturing and service. Augmentir is a continuation of this theme.

CHEManager: Mr. Fadel, you are one of the pioneers of the Internet of Things (IoT). Five years ago, you founded a new software company that puts the worker at the center of digital transformation. How did that come about?

Russ Fadel: In fact, our founding team — in addition to myself, Phil Huber, VP of Development, and Lawrence Fan, Chief Data Scientist — have a rich history in introducing innovative software into the manufacturing sector. Phil co-founded Wonderware in 1987, an early pioneer in human-machine interface software for industrial automation. Wonderware is still widely used today, now owned by AVEVA. In 1997 I founded a company called Lighthammer, the first product that integrated shopfloor activities with the enterprise layer, which was acquired by SAP in 2005 and is still marketed under the name of SAP MII. Later in 2009, I established ThingWorx, and along with Phil and Lawrence, we built the first industrial IoT platform that was later acquired by PTC.

By founding Augmentir in what is now called the connected worker space in 2017, we are continuing this trend of being at the forefront of software technology revolutions. We believe that for way too long, workers have been the blind spot of digital transformation. With platforms like Augmentir, we are combining valuable digital tools with AI-based workforce intelligence to provide the missing link and integrate frontline workers into the value stream.

In the connected worker space, aren't there already numerous software providers? Why another platform — what makes Augmentir unique?

R. Fadel: In fact, we consider ourselves as frontrunner in the second wave of this software sector. We built Augmentir on a foundation with artificial intelligence (AI) and this is very important: Today's workforce is increasingly connected, and there is a wealth of operational data about how work is being done that can be valuable if its captured and understood. With AI, we can make sense of this data and use it to both improve processes in general but also the work performed on an individual level in providing personalized guidance and support. The first generation of connected worker software was put on the market with the idea of addressing the skills gap and the loss of tribal knowledge. While these challenges persist, companies today face even greater challenges.

Such as …

R. Fadel: The challenges around hiring and retaining workers. In the manufacturing sector, the tenure rate of frontline workers went down by 20% in a 4 years period between 2015–2019. Covid has accelerated this macro trend: Manufacturing has the highest increase in staff turnover in any industry. So, with a variable workforce — people resigning, changing jobs, or uncertainty on who is showing up each day — it is difficult, if not impossible to reach your quality, safety and productivity goals. Today's workforce is quite simply not as stable as the workforces of the past.

The existing onboarding and training process doesn't cope with this volatility. Just digitizing work doesn't solve these problems either. Therefore, we believe that the entire hire to retire process must be reimagined. We know this is not only a covid or post-covid scenario. With baby boomers retiring these developments existed already prior to the pandemic hence it is quite obvious that this is going to continue into the future.

Indeed, many companies are urgently looking for solutions. What does yours look like?

R. Fadel: We believe the solution is really a software-enabled, flexible workforce. Digital software tools that make both day-to-day frontline work as well as onboarding and offboarding staff more efficient so organizations become more flexible and resilient. To use AI to really provide real-time insights into each workers training, guidance and support requirements. With Augmentir we provide AI driven personalized instructions and performance support that intelligently and dynamically closes skills gaps at the moment of need allowing everyone to perform at their best, and to establish instant collaboration between people that have questions and instances providing immediate answers, be it a subject matter expert (SME) or an AI bot.

You talked earlier about using data to drive improvements. How do you go about it?

R. Fadel: Connected worker systems for digital guidance and assistance not only provide workers with mobile instructions and in-situ training, they also return a great deal of valuable input. This includes, for example, feedback on work steps that have been performed, hygiene measures that have been carried out, or documentation of conditions, errors, and much more. However, this wealth of data cannot be reliably interpreted with conventional business intelligence tools. Until now, highly specialized data scientists have been needed to convert it into actionable insights. Today, proven AI algorithms are taking over this task. They are capable of reliably recognizing patterns, identifying outliers, cleaning data and finding correlations. This use of AI is helping companies answer questions like: Where should you focus for process improvement? Who would benefit most from targeted training? How many hours of productivity opportunity do you have? What training materials or instruction content need improvement? This is why connected worker solutions that are built on an AI foundation support continuous improvement and lean initiatives in the workplace, and therefore serve as the foundation for future growth.

Business Idea

The Future Workforce, Powered by AI

Augmentir believes that today's industrial frontline workforce, with a global footprint of over 350 million workers, has been underserved by technology. The company's aim is to change that by a revolutionary software focused on increasing the productivity and quality of processes involving frontline workers.

Augmentir's platform is a suite of AI-powered connected worker tools that helps companies optimize their most important asset—their operational workforce—in three steps.

1. Digitizing Work: Augmentir delivers immediate value through digitization of your operation. This includes:

- Digital work instructions, which help guide workers with accurate information that is augmented with rich media and AR/MR experiences.
- Industrial collaboration tools, which enable companies to support their workers wherever they are, while growing their knowledge base through an integrated performance support system.
- Digitized training & skills management with built-in reporting, allowing you to accurately track and manage your team.

2. Optimizing Work: Augmentir extends simple digitization by using AI to optimize performance support and training for your workforce.

- Empower workers perform complex tasks with higher levels of productivity due to dynamic inline assistance based on recency, skill level, and actual job performance.
- Using its AI-based True Performance indicator, Augmentir helps identify reskilling/retaining needs for each worker to optimize the workforce development.

3. Continually Improve: Deliver continuous improvement across your workforce and work processes. Augmentir's AI helps to drive improvement opportunities: AI uncovers previously hidden improvement opportunities and supports workforce development initiatives.

All in all, the Augmentir platform helps frontline workers to perform at their best regardless of their training, experience, recency, and ability. Based on a modern enterprise SaaS software approach and due to scalable pricing Augmentir enables companies of all sizes to get started in minutes and quickly realize ROI.

- Augmentir, Horsham, PA, USA
  www.augmentir.com

Augmentir

Elevator Pitch

Connecting the Disconnected

Augmentir was founded in 2017 and is the world's only provider of AI-based connected worker software. Its software suite of AI-powered connected worker tools helps industrial companies deliver effective skills management, training, collaboration, and on the job support for today's more dynamic, more flexible industrial workforce.

Companies in manufacturing, service, energy, and construction leverage Augmentir's AI in conjunction with the platform's digital workflow and remote collaboration capabilities to optimize their frontline operations and deliver significant growth and continuous improvement in the areas of performance support, training, and workforce development.

Milestones

2017
- Augmentir is founded

2018
- Launch of successful Beta Program for its product, with over a dozen industrial companies participating

2019
- Augmentir exits in stealth mode and launches the industry's first AI-powered connected worker platform
- Company expands its customer base in more industrial markets, including automotive, consumer goods manufacturing, mining, and industrial equipment

2021
- Augmentir raises $7.5 million in Series A funding
- Augmentir selected to join the Webex Ecosystem as Cisco's Connected Worker Partner

2022
- Augmentir announces 350% revenue growth and 230% increase in its customer base during 2021
- Expansion of international team including German speaking countries

Roadmap

2022+
- Augmentir plans to continue to expand globally, offering its solution to a range of industrial companies, continuing to add new integrations and out-of-the-box connectors into the business systems that customers use the most.
- The platform will evolve further with advanced AI functionality to support more valuable data-driven insights and workflow learning capabilities, as well as new features for GxP regulations.

Fig. 1: Personalized guidance enables workers to deliver outstanding on-the-job performance.

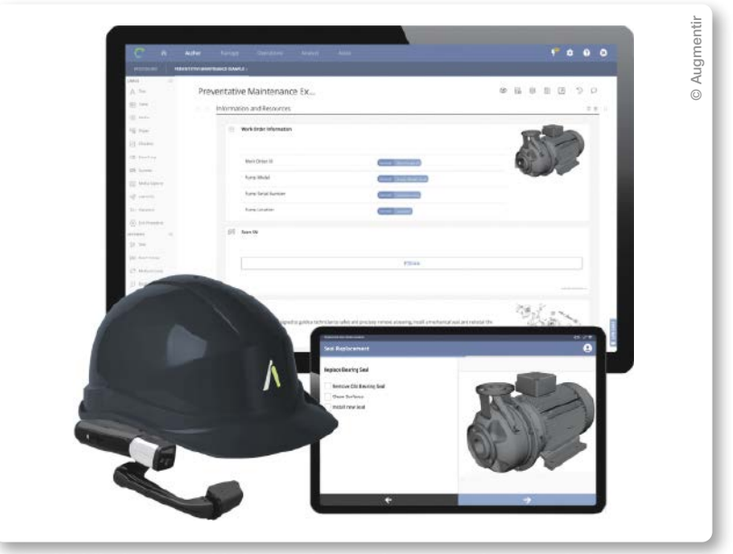


Fig. 2: Mobile Apps provide instructions and support where needed, on any device.

Achema 2022

Achema, to take place on August 22–26, 2022, in Frankfurt, Germany, is the world forum for chemical engineering, process engineering and biotechnology. With manufacturers and service providers from over 50 countries presenting their products for chemical, pharmaceutical and biotech research and manufacturing as well as energy and environmental services, the event is the driving force and groundbreaker for the international process industries and their suppliers. The accompanying congress features scientific lectures and numerous events.

■ www.achema.de/en

ChemOutsourcing 2022

ChemOutsourcing, to take place on September 12–13, 2022, in Parsippany, New Jersey/USA, is the largest USA-based API show and attracts annually 700–800 experts from the pharmaceutical, biotech, chemical, and chemistry services industries. It focuses on API development spanning early drug discovery through chemical development and commercial supply. Attendees are executive scientist "buyers" from pharmaceutical companies responsible for sourcing starting materials, intermediates, active ingredients, and commercial supply.

■ www.chemoutsourcing.com

FEICA 2022 Conference and Expo

The next edition of the 2021 FEICA European Adhesive & Sealant Conference and Expo is scheduled to take place in Hamburg, Germany, on September 14–16, 2022. The event attracts 600+ industry leaders from all over the world to discuss market drivers and trends, innovation, sustainability and technological advancements. The FEICA Conference and Expo provides essential insights into the key issues affecting the adhesive and sealant industry and great networking opportunities for formulators, customers and suppliers.

■ www.feica-conferences.com

CPhI Worldwide 2022

On November 1–3, 2022, CPhI Worldwide will welcome thousands of pharma professionals and suppliers from around the world under one roof in Frankfurt, Germany. Its co-located events ICSE, P-MEC, FDF, InnoPack & BioProduction are each divided into product-specific zones in order to give each industry sector more visibility and allow visitors to easily locate and source the products they're looking for. This year's CPhI Worldwide presents even more possibilities to connect and do business with the pharma industry's most influential leaders.

■ www.cphi.com

Index

Imprint

Publisher
Wiley-VCH GmbH
Boschstr. 12, 69469 Weinheim, Germany
Tel.: +49 6201 606 0

General Managers
Sabine Haag
Dr. Guido F. Herrmann

Publishing Director
Dr. Heiko Baumgartner

Product Management + Managing Editor
Dr. Michael Reubold
Tel.: +49 6201 606 745
michael.reubold@wiley.com

Editor-in-Chief
Dr. Ralf Kempf (rk)
Tel.: +49 6201 606 755
ralf.kempf@wiley.com

Editor
Dr. Sonja Andres (sa)
Ressort: Logistics
Tel.: +49 650 901 661
sonja.andres@t-online.de

Media Consultants
Thorsten Kritzer
Tel.: +49 6201 606 730
thorsten.kritzer@wiley.com

Jan Käppler
Tel.: +49 6201 606 522
jan.kaeppler@wiley.com

Stefan Schwartze
Tel.: +49 6201 606 491
stefan.schwartze@wiley.com

Production Managers
Jörg Stenger
Melanie Radtke (Advertising)
Oliver Haja (Layout)
Ramona Scheirich (Litho)

Team Assistants
Bettina Wagenhals
Tel.: +49 6201 606 764
bettina.wagenhals@wiley.com

Lisa Colavito
Tel.: +49 6201 606 018
lisa.colavito@wiley.com

Beate Zimmermann
Tel.: +49 6201 606 316
beate.zimmermann@wiley.com

Wiley Reader Service
65341 Eltville
Tel.: +49 6123 9238 246
Fax: +49 6123 9238 244
E-Mail: WileyGIT@vuservice.de

Original Articles:
Specially identified contributions are the responsibility of the author. Manuscripts should be addressed to the editorial office. Instructions for authors may be requested from the publishing company. We assume no liability for unsolicited, submitted manuscripts.

Printed by: DSW GmbH & Co. KG, Ludwigshafen, Printed in Germany

WILEY

WILEY

CHEManager.com

International Issues

Your Business 2022 in the Spotlight

FEATURES:
PROCESS TECHNOLOGY, PHARMA & BIOTECH
APRIL

FEATURES:
FINE & SPECIALTY CHEMICALS, DISTRIBUTION & LOGISTICS
MAY

FEATURES:
PHARMA & BIOTECH, INNOVATION
SEPTEMBER

FEATURES:
REGIONS & LOCATIONS, CIRCULAR ECONOMY
DECEMBER

Editorial
Dr. Michael Reubold
Publishing Manager
Tel.: +49 (0) 6201 606 745
mreubold@wiley.com

Dr. Ralf Kempf
Managing Editor
Tel.: +49 (0) 6201 606 755
rkempf@wiley.com

Sales
Thorsten Kritzer
Head of Advertising
Tel.: +49 (0) 6201 606 730
tkritzer@wiley.com

Jan Kaeppler
Media Consultant
Tel.: +49 (0) 6201 606 522
jkaeppler@wiley.com

DACHSER
Intelligent Logistics

Logistics in its element.

DACHSER Chem Logistics

Your advantages with DACHSER Chem Logistics:

- Standardized logistics solutions combined with specialized chemical logistics expertise
- Access to our global network
- Complete transparency with innovative IT systems
- High standards of safety and quality for the chemical industry, assessed according to SQAS
- High degree of expertise in dangerous goods transportation and the storage of hazardous substances
- Cooperation with the German Chemical Industry Association VCI and other associations in Europe

dachser.com