
Reisebericht #01
comma soft
Translated by AI
Humboldt——Gruppe
Wissen und neue Erkenntnisse zugänglich machen.
Making knowledge and new insights more accessible
Circular economy
Smoke grenade or important for your company?
Machine Learning Operations
The deeper you go, the more complicated it gets!

bdfbdbfd

Photo: Maël Balland / Cover: Chuttersnap

Welcome, dear curios!

We all suspected years ago what is increasingly influencing the economy today. Whether it's AI, big data or cyber security,

The issues have been on our minds for a long time. And suddenly, it seems, they become explosive. In the form of risks that threaten the existence of the company or in the form of great opportunities to stay ahead of the competition. But what actually happened in the intervening period?

The period in between is exactly the one that has always interested us at Comma Soft. "Everywhere, early foreboding precedes later knowledge," said Alexander von Humboldt. We see our task as turning early ancestors into concrete knowledge and concrete implementation for your company. And we do this completely independently of specific orders. We research, develop and make things happen.

So what could be more obvious than to set up a group within the company to deal with uncovered or diffuse topics and consider what we can learn from them for our customers? And who could be a better role model than the great Alexander von Humboldt, who was not only an explorer, but also wanted to prepare the way for others and who was concerned about the development of society?

Our most important contacts find out what is happening in the Humboldt Group in two ways.

Because of: Through regular travel reports (like this one) and on our roadshow, where we bring specific topics to you in 1:1 conversations.

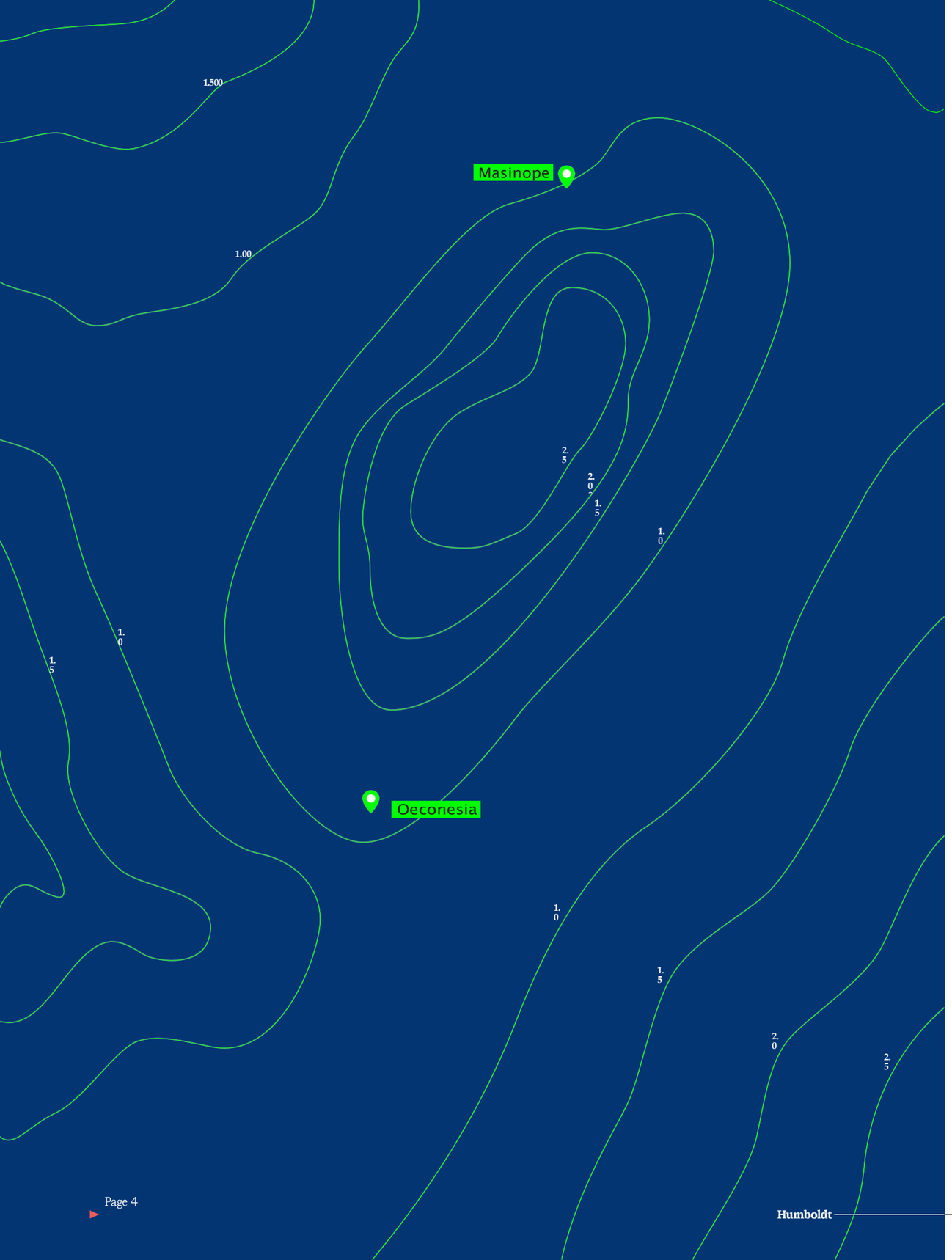
So join us on our research vessel, the Research Vessel Humboldt, a huge wooden sailboat with room for the entire Humboldt Group.

We report from the road and tell you what we at Comma Soft are doing with our curiosity (p. 42), dock on the island of Oeconesia and discover that the economy here is not only geared towards consumers ('Circular Economy', p. 06), find out on Masinope, the island kingdom of the 1,000 Rivers, how its inhabitants face the rapid change of their land surface ('Machine Learning Operations', p. 26), look into the cabins of two members of our crew and find out what moves them (p. 24 & p. 40) and tell what excites us about Alexander von Humboldt (p. 50).

Enjoy reading and discovering! With nautical greetings from your Humboldt Group,

Benjamin Schulte
COO Comma Soft AG

P.S.: How do you like our first travel report? We are looking forward to your feedback! Feel free to send it to **fragen@humboldt-gruppe.com**



Content

Also in the issue:

Photo: Filippo Cesarini

A journey to Oeconesia:

Is circular economy just a smokescreen - or is it becoming important for your business?

After a long and exhausting journey, we finally reached land. The initial expedition started for the Humboldt Group on the Island of Oeconesia. The mysterious and rather unknown place has the reputation of an Eldorado of the world economy. Critics again speak of a place that is teeming with sustainability smoke candles. So we naturally wanted to get an impression ourselves - with a neutral mind and a clear view.

After docking, our first port of call was the market, in order to fortify ourselves a little and, above all, so that we could get tools and spare parts for the RV Humboldt. Arrived at the market and inspecting the individual stands, our machinist had directly found a stand with the required material and approached the trader behind it.

"I would like to purchase these two hammers here and the wrench set from you."

The dealer began to laugh. And then it really struck us: At the Oeconesian market, the goods did not just go from trader to interested party; no, the flow of goods also went in the other direction over the goods table.

Still a bit puzzled but still friendly, the machinist asked again:
"Excuse me, but is this tool available for purchase from you or not?"

"No, dear stranger! Hardly anyone knows the word 'buy' on Oeconesia anymore, only the larger utilities. Linear models have long been out of fashion here. But you can rent the hammers and the wrenches for a certain time. Or you can trade them in for something."

"Rent tools? Or trade them in? What am I supposed to trade it for? I am a machinist. My job is to operate on a ship. I can't offer you a product in exchange."

"But you're good with your hands, aren't you? I'll make you a proposal. I'll give you the hammers and the set of keys. And in return you plug the holes in the roof of my stand up there. I can't do it alone, but it gets pretty uncomfortable under here when it rains. So, what do you think?"

"Deal!" □

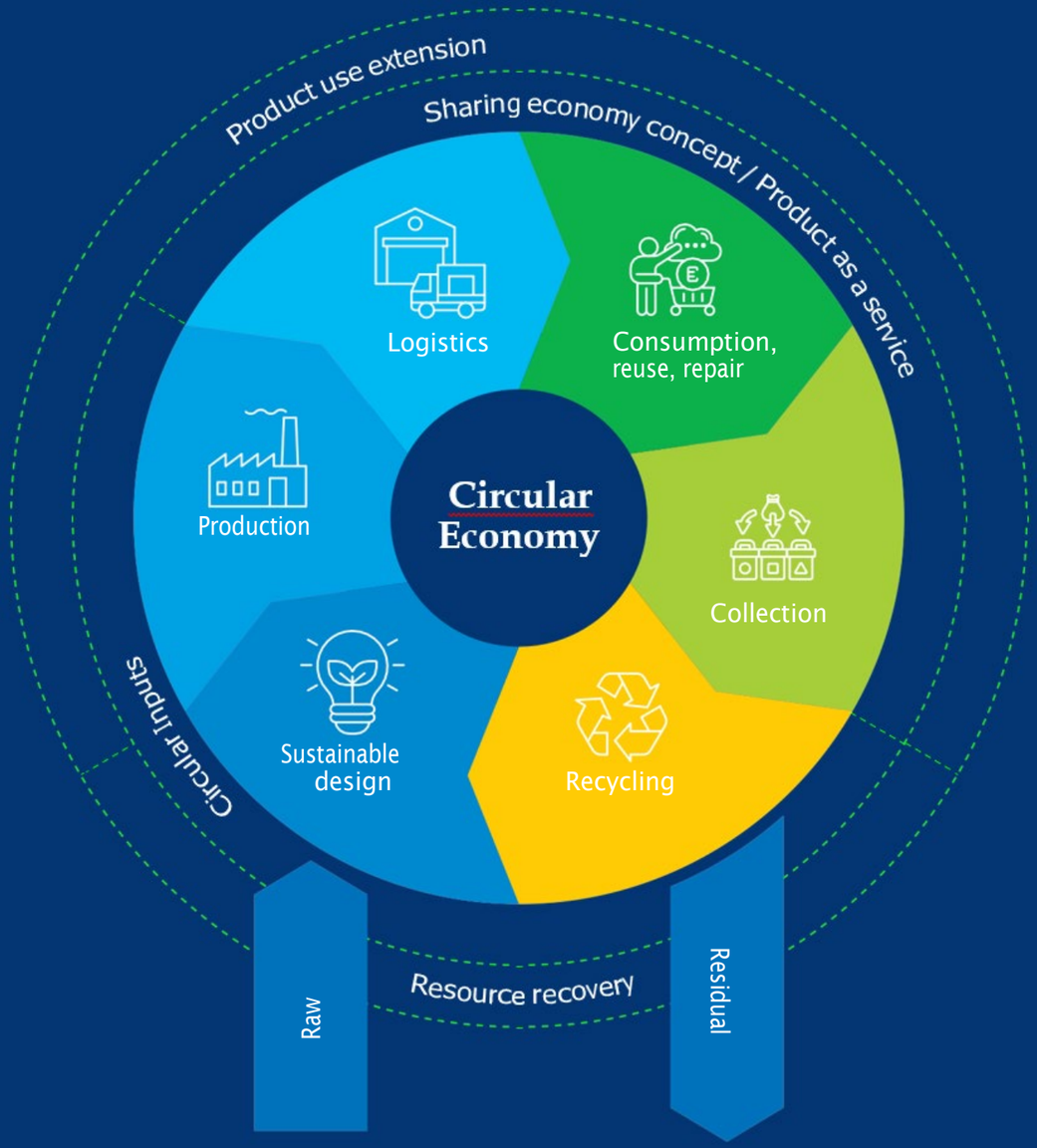
What is the Circular Economy?

The term Circular *Economy* (also 'Kreislaufwirtschaft') aims in the narrower sense at closing the material cycle. In its full form, the Circular Economy requires (almost) no supply of naturally occurring resources, because the entire material requirement is covered by the existing economic cycle. The first approaches, which can be implemented in practically every industry, are the 5 Rs: Reduce, Reuse, Repair, Remanufacture and Recycle.

A further aid in implementing the Circular Economy is the division of material flows into a biological and a technical cycle. The five R's are mainly aimed at the technical cycle. The technical cycle contains products that are not used but needed, and whose raw materials are usually scarce goods. The biological cycle, on the other hand
only contains natural resources that are consumed, can decompose, and may remain in the environment without further treatment. For example, all parts of the product that wear out through abrasion or the like should be returned to the biological cycle.[1]

The following diagram takes a schematic look at the sectors of the Circular Economy in the broader sense and locates the five circular business models defined by the World Economic Forum[2]. It is important to note that the individual sectors are inextricably linked in the (completed) Circular Economy. But already on the way to the completed Circular Economy, this easy demarcation can make a relevant contribution. This is the only way to avoid undesirable effects and conflicting goals, e.g. e-scooters for short-term rent, which can now be found in every major city. These tend to be used by pedestrians rather than car drivers; their individual parts are also not manufactured in a way that conserves resources; moreover, they are rarely repaired and are often not disposed of properly.

[1] Plastics in the environment: micro- and macroplastics, Fraunhofer study.
[2] Circular economy: definition, importance and benefits, EU, 2023



Graphic: **The sectors of the Circular Economy and location of the circular business models**

Photo: Quang Nguyen

Take the first thought step:
A look through our magnifying glass

The term *Circular Economy* is often part of a social and idealistic debate.

There are both environmental and socio-political reasons for a transformation to a regenerative economy.

However, it still sounds like too cool an idea to return everything - really *everything* - that accumulates in resources, energy, materials and the like in the economic sector to the cycle.

Less often considered in this debate, however, is the growing economic viability of Circular Economy. In our view, the transformation to a more circular business model already makes economic sense today. And we don't mean direct savings in the cost of (increasingly expensive) raw materials or through more efficient production from recyclates. That alone can quickly pay off, especially for manufacturing companies. Rather, we would like to illustrate the advantages of circular business models from the customer's and user perspectives. Strategic opportunities await companies from all sectors.

Does this sound dubious to you? If so, we will clear up some of the doubts below and give you an overview of the topic. To do this, we will take a pragmatic look at the preferences and needs of consumers and customers. We believe that the Circular Economy meets customer needs better than other models - sometimes.

Because the basic idea behind Circular Economy, to close the material cycle of goods, services and products, changes the way companies view the customer relationship. This basic idea brings with it new, circular business models and allows companies to rethink the way they satisfy the needs of their own target groups and to carry them out in a new way. By changing the linear supply chain into a cycle between customer and company, companies receive constant feedback from customers and can thus adapt their products to changing needs much more quickly and efficiently. The customer is now not only the user of the product, but also the supplier of the raw materials. As a 'single point of contact', so to speak, he or she moves to the center of the company's considerations. At first, this sounds promising and at the same time perhaps trivial; however, the thesis only fits sometimes and not always. More on this later.

First of all, it makes sense for everyone who sees the sustainable existence of their own company as part of their business strategy to simply take a look at the potentials of and entry opportunities into the circular economy from the here and now. After all, the Circular Economy will shape the economy, business and profitability in the EU in the next few years.

10 years. In this context, far-reaching legislative proposals and guidelines have already been developed that will mean major changes for many companies, if not the withdrawal of their business basis. Digitization and data will play an enormous role in this transformation journey, as data transparency and modern technologies are essential for the transformation to a circular model.

What does my target group want?

If you look at changing customer needs in terms of the transformation process, you first have to consider: Which needs are changing and how? Our Experience on Oeconesien already describes in rudiments that people want alternative forms to the classic purchase.

We observe this in our exchanges with our customers:

More and more people want things that not only last a long time, but are also 'fancy'. → The need to be able to use product innovations sooner or faster.

More and more people want to use high quality products that they may not be able to afford to purchase or may not be

wanted to achieve. → The need for easier access to high-quality services and products. More and more people want to monetize valuable things from their own property - as part of a sharing economy. → The need to make better use of the value of one's own goods. More and more people want to own the latest trends, but redeem them at their residual value after a finite period of time. → The need to use products with a high degree of innovation quickly, but to a limited extent, and then trade them in.

These exemplary, changing needs can be served by **Circular Economy business models** - completely independent of idealism! Three types of these business models, based on the concept of the World Economic Forum, will be discussed in more detail here.[4]

1. As-a-Service & Sharing: Get paid for sharing

As a reminder, one goal of the Circular Economy is to decouple corporate sales from raw material consumption so that both economic growth and sustainable use of resources can be achieved. One way to achieve this is through (as-a-)service and sha- ring models.

This is the idea: In service and sharing models, the purchase of a good, service or product is replaced by a defined period of use, so that the buyer acquires a claim to the benefit, but the supplier retains ownership of the item.

This model offers several advantages for companies: On the one hand, the customer interface is permanently occupied and customer loyalty is increased. On the other hand, new target groups can be tapped, since service-based models do not require a large initial investment on the part of the user.

Concrete examples, some of which will already be familiar to you:

B2B

- Rarely used machines, for example in agriculture, are no longer purchased by the company but rented as needed or on a seasonal basis.
- In times of home office, less used office space is used as decentralized co- king space.

B2C

- For individual mobility in the city, the private car has now become obsolete in many cities thanks to car-sharing services, which means that valuable living space can be reclaimed in cities.
- Special occasion? Tuxedo, evening dress and jewelry can be rented if needed.
- Investment and effort are too high for your own PV system on the roof? Renting a single system can be the solution.

C2C

- The private car is being banned again in times of home- office is being used less and less. Platforms which are structured in the same way as Airbnb, make it possible to share a car with one's own car. Insurance, access to the vehicle and proper use are the biggest challenges here.
- On online loan exchanges, rarely used items such as tools, sports equipment, bicycle racks for cars, motor homes, etc. can be borrowed from private individuals, handling and insurance included.
- Do you have to buy expensive special equipment privately that is now lying in the basement? The solution is similar to the one above about sharing platforms, only here it's about the landlord:inside.
- Barely used living space left over? Since Airbnb this can be easily monetized.

[4] World Economic Forum, 2022

Photo: Sandy

That's the catch: it's important to look at the big picture. Because even sharing models can turn into the opposite under certain circumstances. One negative example is the e-scooters that have now been banned again from some cities. Originally celebrated as a new form of electromobility, it turned out that mainly pedestrians switch to e-scooters and that the lifetime of the batteries used is significantly shorter than planned[3]. The fact that the scooters themselves are not produced in a circular way means that the overall effect is an environmental burden rather than an environmental relief.

The same also applies to service-based business models: If the product is not returned to the production process at the end of its life, then we cannot necessarily speak of a circular economy in the narrower sense.

The exception here are products that are consumed by the customer. If the service-based approach achieves an overall reduction in emissions, pollutants, etc., the model can be counted as part of the Circular Economy. An example of such a case would be the offer of an efficiently fertilized field as-a-service as opposed to the sale of fertilizers.

[5] Federal Environment Agency, 2021

Photo: Fabio Fistarol

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2. Product Use Extension: Good is what lasts - sometimes

An important component of a circular economy is the efficient and resource-saving production and use of products. This is not only about optimizing production processes, but also about developing long-lasting and frequently reusable products.

The business model that deals with this sub-sector is Product Use Ex- tension.

That's the idea: Product Use Extension is more than just extending the service life. It starts with a modular design of the product that enables components to be easily replaced and repaired. This means making individual parts removable and repairable, and making handling information available digitally to customers and craftsmen. Product use extension also means actually increasing the degree of use of products. This means that products are used more intensively, but also more efficiently, which avoids overproduction and the associated costs.

Also for this business model some more or less known examples:

B2B

- Software-as-a-Service (SaaS), e.g. collaboration tools, databases, etc. is kept permanently up to date without re-installation/roll-out/re-licensing.
- The IT infrastructure adapts to the changing needs of the company. an. More memory, more computing power? No problem with the cloud.
- An exclusive hotel chain operator/apartment landlord wants new, modern furniture/kitchen in rooms every three to five years → providers could replace furniture as needed.
- Managing old and defective products is time-consuming and costly. Why not outsource the task? → Repair, Remanufacture & Product-return-as-a-Service.

B2B2C

- A platform connects insurers, craftsmen and users to repair damaged goods instead of replacing them with new ones.

B2C

- Household electronics often become technically obsolete after a few years. In a CE model, the manufacturer replaces old household appliances with new, more innovative models, reusing the individual parts of the old appliances.
- Functional clothing is expensive and often breaks down in use. To increase confidence in the durability, some manufacturers therefore offer a free repair.
- Electronics are usually very difficult to re-parent. A modular design therefore enables customers to significantly extend the product's service life.

C2C

- Sharing increases the degree of utilization. Therefore also here: Privately expensive special equipment

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that is now lying in the basement? Sharing via sharing platforms increases the mate- rial efficiency of the product.

Products are either repaired, expanded and adapted, or they are taken back by the manufacturer or supplier, broken down into individual parts and assembled into new, modern goods. A current development within the EU is the 'Right to repair' coupled with the upcoming digital product passport. The Commission's current proposal stipulates that in future, repair is to be preferred to replacement and that companies must make repair data transparent to their customers. Furthermore, an online platform is to connect consumers with craftsmen and sellers in order to make repairs and refurbishments easier.

That's the **catch:** extending the service life of products can also be viewed cri- tically. Michael Braungart, the inventor of the Cradle to Cradle principle, sees this as an obstacle to innovation. While it may be easy to plan to take back and rebuild products that are three years old, products that are ten years old are usually so technically outdated that only downcycling is possible.

3. Design for Recycling: Built to be expanded

Design for recycling means that products are designed in such a way that their components can be recycled easily and sensibly.

This is the idea: The business models that make circular materials available for production are described by the World Economic Forum as 'Resource Recovery' and 'Circular Inputs'. While resource recovery is concerned with extracting as many resources as possible from end-of-life products, circular inputs are concerned with processing these resources in such a way that they are of sufficient quality to be reintroduced into the production process. Alternatively, renewable raw material sources can also be used. For example, the company CCm Technologies produces fertilizer from wastewater and CO2 from biogas fermentation processes.[6]

One way to increase recovery and input of circular materials is through di- gital platforms where waste products and scrap from production are traded. For example, the start-up Cirplus[7] enables the trading of plastics to increase the use of recyclates.

Here's the catch:
Again, it is important to keep an eye on the whole in order to avoid conflicting goals. For example, the aluminum vaporization of films for the production of Tetra Paks reduced the packaging weight, which in turn led to a reduction in the amount of fuel used in logistics. However, vaporization was at the expense of recycling, since the materials produced in this way can no longer be separated.

□

[6] Ellen MacArthur Circular Example

[7] Cirplus, www.cirplus.com

Photo: Stimseeker

Our 5 maxims of the circular economy

"But these business models are not really that separable." - "Locating it is somehow still difficult." If such or similar thoughts have crossed your mind up to this point, we say to you: rightly so!

We will come to the location and the question of whether thinking about a circular business model already makes sense for you in a moment. But as far as the distinction between the two is concerned, we would like to give you a few important basic guidelines on the concept of the circular economy:

01 All concepts of business models of the Circular Economy are not clearly defined.

→ Product Use Extension plays an essential role in the concept of sharing.

→ Remanufacturing or reuse can be seen as a product use extension of the individual parts.

The business models described here touch each other at many points or are directly linked to each other.

02 Circular Economy is a macroeconomic concept that requires intersectoral collaboration across industries.

03 There is no company that can cover the entire cycle of the CE concept. Nevertheless, every company can establish circular methods and (partial) business models in its sector.

04 The division into different business models serves as an aid to thinking and is only one of many ways of approaching the topic of the circular economy. The subdivision serves primarily for a better understanding.

05 In addition, however, the division into business models also provides access for their own business, freely according to the motto: Visionary thinking, start small.

□

Photo: Thierry

Useful life & cost:
This is how your self-location can succeed

Now that we have somewhat deconstructed the big concept and addressed the associated 'new' needs, we need to look at when and how the move to a more circular business model can make sense for you. In the matrix, we have positioned products in two dimensions from the consumer's point of view (chart 1).

The horizontal axis indicates how high the acquisition costs of a product are. On the left are products that require a low investment (fashion, household items) and the further to the right a product is located, the higher the acquisition costs.

On the vertical axis, the product life is compared with the innovation cycle. Higher up are products where innovation happens much faster than the product becomes unusable. Further down are products for which innovation cycles last much longer, so that the product remains up-to-date throughout its life.

Depending on which quadrant a product is in, some CE business models can help meet customer needs more than others. They also have a resulting CE target, shown here in the green boxes (chart 2).

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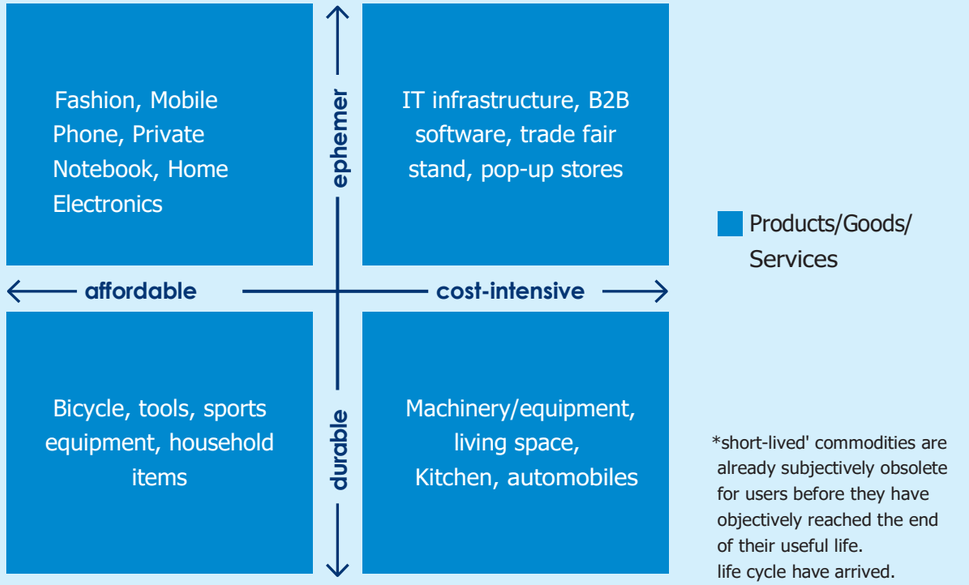
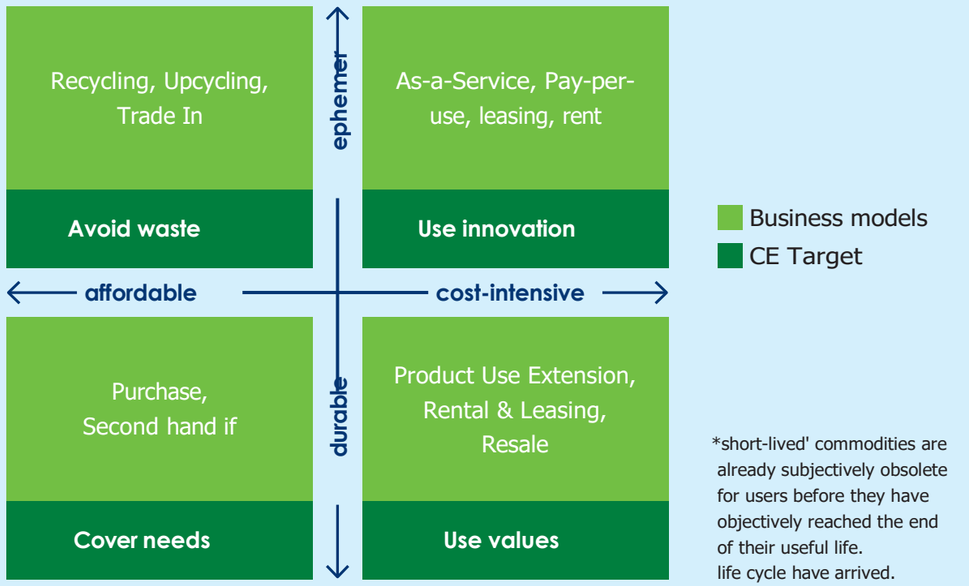
Figure 1: **Signpost to circular business models: Consumer Price & Ownership or Useful Life of Products**



Graphic 2: **Follow the signpost: Assign business models to the product**



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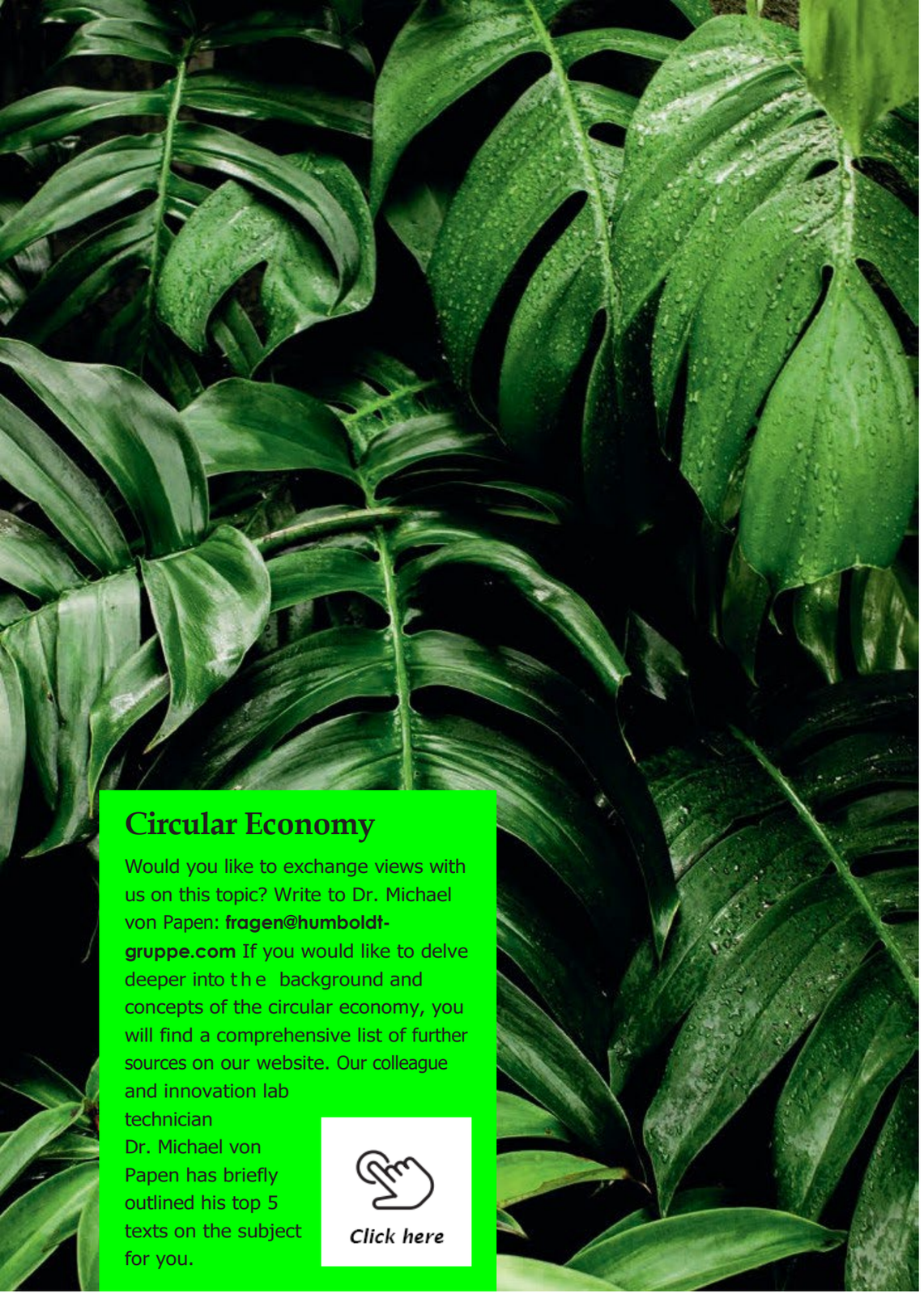


Photo: Nothing

Circular Economy

Would you like to exchange views with us on this topic? Write to Dr. Michael von Papen: **fragen@humboldt-gruppe.com** If you would like to delve deeper into the background and concepts of the circular economy, you will find a comprehensive list of further sources on our website. Our colleague and innovation lab technician Dr. Michael von Papen has briefly outlined his top 5 texts on the subject for you.

Click here

Do you find starting points?

If, for example, the products are short-lived due to the high speed of innovation, as in the case of cell phones, laptops or fashion items, a transformation step to 'design for recycling' is a good idea. If high acquisition costs are involved, as in the case of computer centers, B2B software or trade show booths, the transformation to a service-, pay-per-use- or leasing-based model comes closer to meeting the needs of the customer than in the case of others.

For more durable products with a low rate of innovation, models such as sharing can increase the degree of use and thus better serve customer needs such as 'improving the value use of one's own goods' or 'facilitating access to products and services'.

Now, we have already established that the three business models of as-a-service or sharing, product use extension, and design for Recycling, which we have looked at more closely above, cannot be clearly distinguished from one another. In our matrix, for example, a new, smart trade fair stand can be located in the upper right quadrant as an as-a-service product, but its individual parts can of course also be thought of as design for recycling. The list of business models in the quadrants is also not complete, but can be extended.

This also means that the path to transformation can encompass several CE business models. Above all, the question arises as to the suitability of one's own products, goods or services. In order to get closer to an answer to this question, we would like to conclude by giving you a few suggestions - more or less as a conclusion to our visit to the island of Oeconesia.

□

Authors:

Dr. Thorsten Beckmann

Dr. Andrej Fischer

Dr. Michael von Papen

11 Food for thought on on the way to more circular business models

How can you now think about the issue strategically and in relation to your business? 11 questions that have proven their worth:

01 What do I actually know about my own product? What exactly does it consist of? What does it contain, for example, which chemicals? And what environmentally friendly alternatives are there? → This is where the analysis of your own data, the simulation with the help of a digital twin, or a thoroughly digitalized supply chain can help.

02 Can my product be repaired well? How costly would it be to increase the reparability? → The development of a digital product passport can save time, costs and unnecessary maintenance.

03 Can my product be designed and built more modularly? What potential gains could this entail? → Here, too, simulations or digital twins can be efficient aids in getting to the bottom of this question.

04 What role do modularization, individualization and variant management play in my current development and production process? → With the help of Business Intelligence & Analytics, you can get an overview and check whether the data basis in the company is sufficient for such approaches.

05 How exactly do my customers dispose of my product? Where does it end up and can it be sorted and recycled? How easy is it to get the product back from customers at the end of its use? → Simple and effective means of communication are required here. Platform approaches, data-driven tracking strategies, and AI-supported service pro- grams are helpful here.

06 Do I know the needs of my customers (data on user behavior/preferences, etc.)? Which customer need is primarily served by my products? Can the same customer need also be covered as a service? What would be necessary for this? Will this customer need change in the near future, e.g., due to the major trends of our time (digitalization, sustainability, ...)? → Target group analyses, data-based evaluations of purchasing behavior and, for example, measuring the effectiveness of online and offline advertising can be solutions for gaining this knowledge.

07 How high are the acquisition costs for customers? Can I potentially gain new customer groups by changing the business model? → A reporting tool and prediction approaches supported by machine learning would be helpful here.

08 How does the speed of innovation in my industry compare with the service life of my products? Does it make sense under certain circumstances to offer customers the option of exchanging their products for new ones at an earlier stage? → Here, too, simulations and tracking can be valuable sources of information.

09 For which of my customers are shorter innovation cycles or sustainable products particularly relevant? → With the help of individual custo- mer analytics, you can quickly obtain answers to these questions.

10 How often do I currently have touchpoints with my end customers? Can this be changed by a service-based business model and what advantages would result from this? → Ideation workshops with best practices and experts in strategic corporate development can be a good way to start addressing this question.

11 And fundamentally: Are my customers or my customers' customers affected by these points? To what extent does this have repercussions for my own business? → That is the question with which your transformation process begins. □

Photo: Fatma Çakmez

Below deck - The cabin talk with the **ESG experts Dr. Michael von Papen**

What does the crew of the RV Humboldt actually do between the exciting adventures? They are consultants at Comma Soft, of course. And much more! What keeps the colleagues busy as consultants and pri- vates? Let's take a look inside the cabins. Come with us on a Stippvi- site to Dr. Michael von Papen - or Mitch, as we call him.

Hi Mitch! You are known as the Lead Consultant Digital Sustainability at Comma Soft. But the topic of sustainability also accompanies you in your free time: You are one of the sti- ments of the Scientists4Future podcast, which you have co-hosted regularly since episode ten. The similarity to Fridays4Future is no coincidence, is it?

In fact, the idea of Scientists4Future emerged around the same time that the Friday demonstrations were attracting attention. At the time, a politician said that such topics should be left to the pros. So we thought: OK, let's do that and let the professionals have their say. We create a stage on which experts from the scientific community can speak out on the topics of sustainability, climate change, environmental protection, and so on.

You have obviously succeeded! You have now published over 30 episodes. Which of them do you remember most fondly?

Phew, difficult! All the topics are exciting, and the scientists I spoke to all brought their own diverse aspects and perspectives to the table. For example, I found the episode with Verena Mohaupt from the Alfred Wegener Institute in Bremerhaven very interesting. She and her team went on an Arctic expedition by ship. The goal was to obtain important climate data. The scientific journal Nature has named her one of the 10 people who played a decisive role in science in 2020. With such a risky expedition, she more than deserves it!

What was particularly risky about this expedition?

The research team first froze in the ice with the ship and then drifted with the currents. It was not clear where the journey was going. And while the ship was stuck in the ice, Verena and the crew had to take turns keeping polar bear watch. Imagine having to stand guard at night in the cold with a rifle on your shoulder ...

Your work as a lead consultant is a little less risky. But you are also very close to the topic of sustainability here.

Exactly. There are some thematic overlaps between my role as a consultant and Scientists4Future. I am currently advising companies, for example, on how they can anchor the topic of circular economy within their company. Of course, it helps when I talk to an expert like Michael Braungart, the 'father' of the Cradle2Cra- dle principle. I get a lot of impulses that I can pass on directly as a consultant. And conversely, I also bring the questions that some companies ask back to the podcast. For example, there is a lot of news circulating on the subject of sustainability that is not always properly prepared. Here, the perspective of science can serve as a corrective and provide guidance.

Do you have an example?

Yes, one example is the conversation with a bee researcher. The debate at the time revolved about the fact that many pesticides and glyphosate contribute to mass mortality. That is certainly the case. But she also pointed out that monocultures of crops have an even greater negative impact on insects, making bees more susceptible to disease, for example. So the problem needs to be addressed from multiple angles. That was very enlightening.

Thank you so much, Michael! We look forward to your next podcast episode! Until then, we'll be reading what you write about ESG, the circular economy and other sustainability topics on the Comma Soft blog.

Dr. Michael von Papen, Lead Consultant Digital Sustainability and Sustainability Officer at Comma Soft, has been a member of the Scientists4Future group since 2019. He hosts the S4F podcast with guests from science and research and discusses with them how our environment, economy and society can be made more sustainable.

Photo: Jonatan

Machine Learning Operations

The deeper you go, the more complicated it gets: How MLOps Can Automate Dealing with Constant Change.

Masinope, the island kingdom of 1,000 rivers. After a closer look we know that they are not rivers: These are not rivers, but around two islands that are closely interlocked by numerous skerries and ice floes. The 'rivers' in between are places where the sea emerges. A complete network, which is also constantly in motion due to tides and rapidly fluctuating temperatures and therefore impossible to map. In this inhospitable region live the Vesi- putous on the northern island and the Ket- terä on the southern one. Both manage to move through the patched-up landscape. They transport materials between factories, workshops, greenhouses and homes located on the archipelago.

How do they keep track in the volatile island world, we asked ourselves. Could they help us with the mapping? Let's face it: there is still no map of Masinope.

The residents strongly advised us against this venture. Why hold on to something that is constantly changing? Instead of dwelling on it, they invested their energy in finding ways to live with the change.

Specifically, we talked about this with the leading professor of transport sciences there: "To get from one archipelago to the other, the Vesiputous used special community boats for a long time," he reported.

"With the boats specially laid out for the local weather conditions, the waterways could be travelled

orderly. However, the capacities were limited. Who could use a boat and when was regulated by strict schedules." Among the Ketterä, on the other hand, all inhabitants had their own small boat, the professor continued. "With this, everyone was mobile, but traffic too often ended in chaos and capsizing. Also the moorings were a right uncontrolled growth, since all built themselves boat and mooring place after own Gusto."

What we observed during our visit to Masinope was a combination of both approaches: Some time ago, both the development and operation of the boats were standardized for the whole of Masinope. Today, boats can be joined together to form bridges, even entire platforms, and can be recombined again and again without any delays or gaps.

"More difficult than creating the technical prerequisites for this was changing minds," says the transport professor. "Masinope has developed a new way of working together for this, where the technical experts are in a joint planning and implementation team with the transport planners and representatives of the population, in order to consider and integrate all aspects.

New standards were created and, at the same time, there should be enough freedom to be able to react quickly to new waterways and scale according to usage needs without everyone needing their own boat. The whole thing is also a process in which we are constantly readjusting ..."

Does this sound familiar? A volatile world in which, on the one hand, regulations give orientation and constrict at the same time, on the other hand, a proliferation of solutions arises that create short-term and selective relief, but in the long run create even more complexity?

The best example of this is the introduction of AI solutions. Or even more concretely: Solutions based on machine learning (ML). Here, companies repeatedly come up against limits:

- There is a lack of data to trai- ne the solutions, but regula- tory and internal com- pliance requirements hinder the use of external data.
- If enough data is available, data science teams may develop excellent algorithms, but the technical implementation into operations lags.
- The great heterogeneity of machine learning developer tools as well as the lack of standards and frameworks so far further complicate operationalization.
- The integration of ML systems into existing applications and processes is complex, and operation costs a lot of time and capacity.
- ML solutions are developed on the drawing board and then do not work under the real conditions of processes and departments.

The list could certainly be continued. Similar to Masinope, the solution to the problem requires a new approach that brings all stakeholders on board.

The boat in this case is called Machine Learning Operations (MLOps). □

Photo: Martin Sanchez

MLOp ... what?

A uniform definition of MLOps has been difficult to find so far. From our point of view, MLOps is a holistic concept with which data- and ML-based services can be quickly pro- duced into operation and further improved. MLOps is based on a wide variety of data science and software development approaches as well as best practices in machine learning (ML).

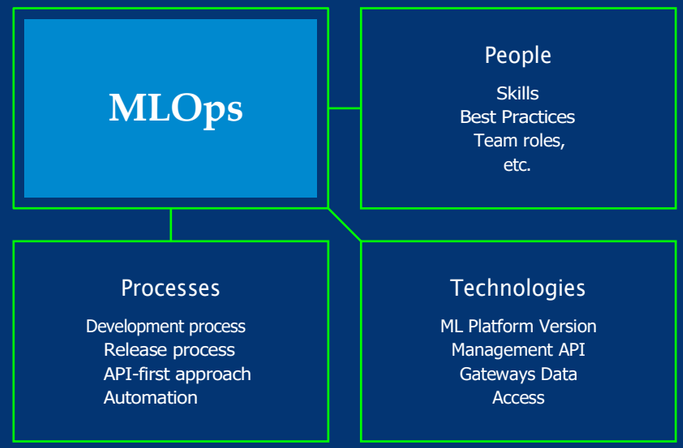
The advantage of MLOps is that ML solutions can not only be developed quickly, but can also be used directly by specialist departments and integrated cleanly into the existing IT landscape. Otherwise, this often leads to disruptions because the interaction with different processes and systems does not work in practice or because the user's business requirements are not adequately mapped.

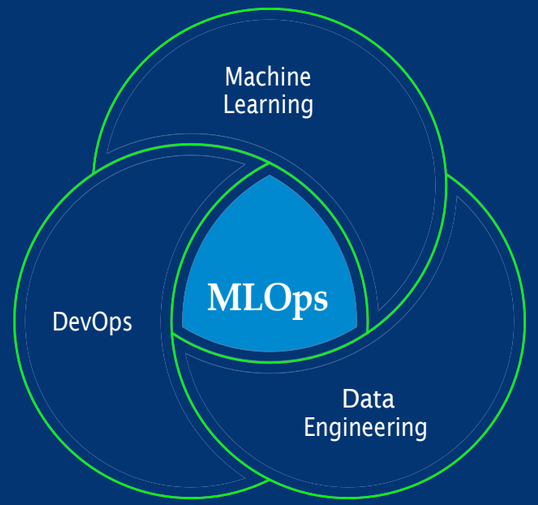
The topic of MLOps is often reduced to its purely technological aspects. Many tool providers promise that a certain problem X will be solved with a certain tool. In practice, this does not go far enough. The tool must also fit the organization and the skills of the people. In our experience, it is therefore crucial for **the successful use of MLOps** that the human factor is taken into account in addition to technologies and processes (upper graphic).

This is also reflected in the composition of project teams working according to the MLOps approach: Ideally, they are small, agile teams in which three different competencies are represented: Data Science, business and IT infra- structure competence. This ensures that business and IT requirements as well as the prerequisites for functioning operations are thought through together and implemented in a closely interlocked manner. This enables quick wins and avoids lengthy projects that lead nowhere.

Anyone who has ever dealt with agile digitization projects will have noticed the similarity between **MLOps and DevOps**. DevOps aims to enable agile, cross-domain collaboration between software developers (Dev) and system administrators (Ops).

Compared to projects in which they work separately and asynchronously, DevOps projects shorten development cycles and improve the quality of solutions through close collaboration. In MLOps, the AI aspect is added by machine learning and data engineering experts and is rounded off by the competence of the specialist areas (lower graphic).





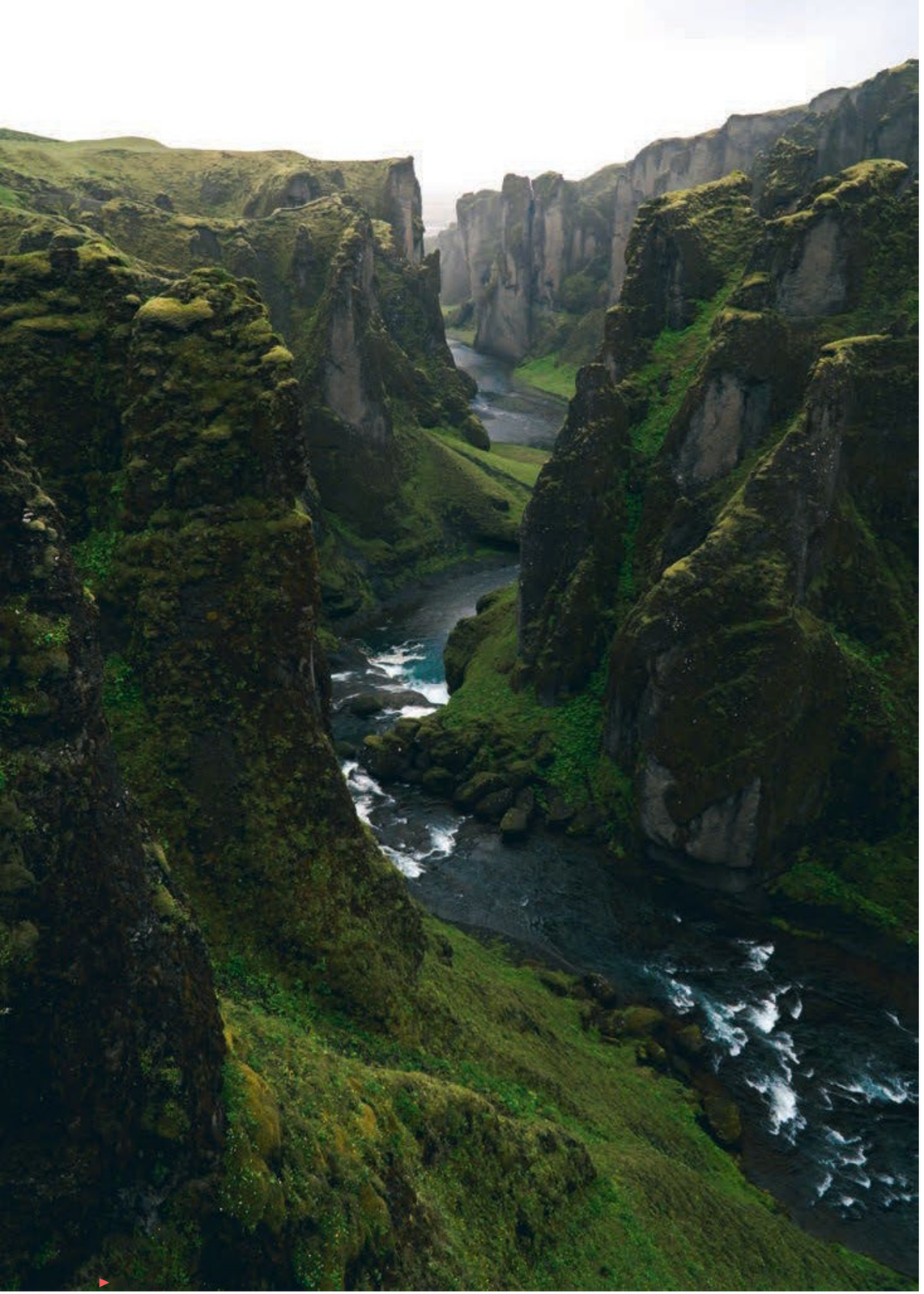


Photo: Jonny

It remains complex - but automated

The lack of integration of ML applications into companies' business processes is a recurring cause of failure.
ters of ML projects. During implementation, it is crucial to invest not only in technology but also in the enablement of employees.

In addition, the procedural and infrastructural prerequisites must be created in order to be able to implement ML projects safely and effi- ciently. MLOps does this by focusing on automation: from data preparation to model training to operation, everything should be automated without process interruptions and thus speed up implementation.

The operation of the infra- structure, the quality control of the developed ML software and its monitoring are also automated. This means that ML models can be quickly implemented productively and further improved without having to rewrite code for operation. This also ensures the stability and maintainability of ML applications. And last but not least, the automation relieves project teams, so that it doesn't need an army of developers and data scientists.

Now you might think that if you want to use machine learning in your company, you simply take MLOps and it runs. Unfortunately, it's not quite that simple. There is no ready-made standard framework that works for all companies and use cases without further ado. Above all, the prerequisites for automation are among the central challenges:

- Data sources are usually not accessible automatically (the well-known Excel long throw).
- The software written by ML developers is usually not developed with a focus on automation.
- The transfer to operations often involves manual handover processes or rigid release dates that make it difficult, for example, to update ML models in operations on a weekly basis.
- Developers, data scientists and specialist departments are usually not used to working together as a team in agile cycles, or cannot do so for structural reasons.

Photos: Doruk Yemenici, Alex He (r.)

Best Practices

The respective prerequisites in the company therefore first require an individual MLOps concept. This is illustrated by three projects that we have implemented with our customers: at ERGO, DPDHL and an IT service provider in the healthcare sector. Due to the different starting conditions, there was a different hurdle to overcome in each case and therefore always a different approach to the topic of MLOps.

1. **Compliance beats automation? ERGO solves automation gaps through blueprints and teamwork**
The insurer ERGO started professionalizing MLOps processes and practices in spring 2022. The goal was to be able to scale ML solutions quickly, roll them out internationally, and use them, for example, in underwriting, risk management, claims processing, and input management.

For this purpose, automation was consistently applied, e.g. the development process of the ML solutions. In the 'clean' doctrine of MLOps, every step should really be automated. At ERGO, this was not possible everywhere due to regulatory requirements and internal organizational structures. People have to make the step from development to operational use. But how can the commissioning of the ML models be carried out manually without causing delays? ERGO solved this problem by investing heavily in collaboration between ML developers and operational IT. Through targeted templates and standardized as well as scalable approaches and close collaboration, the interfaces and manual handovers can now be made as smooth as possible. In this way, the 'automation gap' has been closed. Now it is even possible to exchange the complete ML model a few days before the acceptance and go-live of a new solution

and to work with the current data without delays.

2. **Putting an end to the integration puzzle! DPDHL sets its own MLOps standards**
DPDHL is very well positioned in terms of machine learning: In-house data science and ML teams around the globe are working on hundreds of machine learning use cases, e.g. for analyzing customer satisfaction, predicting deliveries or optimizing internal processes. The problem: Since there have been no MLOps standards to date, separate infrastructures and tools have been used for each case. If the solutions were then to be rolled out across the group, a complex integration puzzle began.

DPDHL is therefore developing a uniform ML platform that will be used throughout the Group. It will then provide the technical basis for corresponding projects during development and operation and unify the development and operational infra- structure. This means that projects can go live from day one. Since questions about ideal integration only have to be answered once for all tasks, developed best practices can be easily applied everywhere in the future. This in turn increases the speed of development. More projects can be implemented and operated with the same number of developers than before.

3. **MLOps without borders: Secure collaboration with partners in the healthcare** sector One of our customers supports various players in the field of statutory health insurance as an IT service provider for example with modern app and software solutions and other services.

However, special regulatory requirements apply in the healthcare sector when data is exchanged. An ML platform must therefore be 100% multi-client capable, for example, when working with external parties. At the same time, the administrative effort should remain low. To meet both requirements, the IT service provider relies on a platform that is based on open source components. In this way, it is possible to put together precisely those components that meet the requirements and can be optimally integrated into the existing infrastructure. This solution enables both the development of own ML solutions and the cooperation with health insurance companies and partners. □

Photo: Jon

Let's cut to the chase:
From the concept to the concrete case

MLOps can therefore be implemented in very different ways depending on the company and industry. There are various degrees of automation, cloud or open source use, and a wide variety of technology platforms as a basis.

The implementation can also be carried out completely in-house if the employees are trained accordingly and have practical experience with MLOps, or are supported by external service providers and partners.

Once the concept of MLOps has been anchored in the company and all questions regarding resources, compliance and the appropriate ML platform have been clarified, things can really get started: The practical implementation of concrete use cases. But which case is actually suitable and what all needs to be considered? You will find assistance in the following canvas. It structures an ML case and helps to specify the core requirements for its realization with MLOps.

The Canvas is divided into 3 areas: Initiate, **Develop, and Do.**

First, determine what you want to achieve through machine learning, what use case you want to map with it. This is the **'Kick off'** your project by capturing the vision or value proposition and answering the following questions:

- Who are the end users?
- What problems do they have? Why is it important that these are solved?
- What added value can machine learning achieve? Which processes are improved by it?

The '**Develop**' area is subdivided into further areas.

Data sources: This is where you determine what data is available for training ML models and what data is needed beyond that, e.g.

- Internal/external data
- Data Marts, OLAP Cubes, Data Warehouses,
  OLTP systems
- REST APIs
- Static documents
- Web scraping
- The output of other already existing (ML) systems
- Open source data

Tip: Also clarify what hidden costs are associated with obtaining and storing this data and what other tools you need to manage this data to avoid unpleasant surprises later.

Formulation of the prediction task: One of the tasks of machine learning is the creation

Start			
Who are the end users? What problems do they have? Why is it important to solve them? What added value can ML achieve in the process? Which processes will be improved as a result?			
Develope			
Data sources: What data is available for training ML models and what is needed beyond that?	Prediction task: What tasks does ML perform based on the defined problem and available data?	Features: What features are needed and what input data do you need for them?	Offline Evaluation: What methods and metrics do you use to verify the system before deployment?
Decisions: How are the predictions generated by the ML model used to make decisions?	Predictions: How are predictions generated with new input?	Data collection: What data needs to be collected for retraining the ML model?	Model Development: How will you update and retrain the ML model?
Make			
Live evaluation and monitoring: How do you proceed after go-live to further improve and update the ML model?			

of predictions or conclusions made based on the problem defined above and the available data.

You define which formulation of the prediction task is suitable for your project with the help of questions such as:

- Should the ML model be monitored during learning
  or not be monitored?
- How do you deal with anomalies? How are they recognized?
- What is the input and output for the prediction task?
- What level of complexity should the ML-Have model?
- Are several ML models combined?

Features: If you use structured input data for your ML algorithms, features must first be created from this data. Therefore, the next step is to clarify how this input data is to be represented:

- How do you extract features from sources?
- Domain experts must be involved
  be used to specify the characteristics?

Offline evaluation: In the next step, you determine which methods and metrics you will use to check the system before deployment:

- Domain-specific metrics, e.g. simulated with the training & test data.
- Technical metrics such as Precision, Recall,
  F-1 Measure or Accuracy
- Which and how much test data is needed for this?

Decisions: Now define how the predictions of the ML model are used to make decisions. Questions that help are:

- How do end users or systems interact with the predictions?
- What actions follow from this?
- Are there hidden costs, e.g. due to additional manual effort in the subsequent steps?

Predictions: Here you collect information about how predictions are generated with new input:

- When should predictions be available? When opening an application, on demand, at time intervals?
- Are predictions made for each data point created individually or collectively?
- Are people also involved in this process?

Data Collection: This is where you note what data needs to be collected for retraining the ML model. Ask yourself for this:

- How is new data labeled?
- What are the costs of collecting new data?
- Are there differences in media such as images, video and sound recordings?
- How is the data prepared?

Model Development: In this block, you will consider how to update and retrain the ML model:

- How often should the model be retrained? Hourly, weekly, with each new data inflow?
- What are the associated costs, e.g. through cloud usage?
- In general, how can the costs be minimally hold?
- How much time does the retraining take?
- How will any staff shortages be dealt with during this time?

The final step, consisting of **live evaluation** and **monitoring**, is not necessary until the actual 'Doing', i.e. after commissioning relevant. Nevertheless, it is important to know the requirements of live evaluation and monitoring beforehand, since the choice of the procedure has an influence on the selection of the ML algorithm:

- Are the evaluation metrics SMART? (Specific, Measurable, Achievable, Relevant, Time-bound)
- How is the performance of the system tracked in concrete terms? Are there A/B tests, for example?
- How is the added value measured in the business context? For example, can effort and time for processes be recorded and compared?

It is worth the effort to fill out this canvas. It gives you an overview of your specific requirements and also of where gaps may need to be closed before the project begins and what costs you will actually incur. On this basis, you can then also estimate how you can concretely approach and implement machine learning cases with MLOps.

□

The author: Dr. Lars Flöer

Download Canvas

The canvas provides a first starting point for the implementation of a Machine Learning based use case. You can find a blank canvas with our notes online at the Humboldt Group site. If you would like to exchange ideas on MLOps or would like a sparring partner to help you fill out the canvas, write to Dr. Lars Flöer:
fragen@humboldt-gruppe.com

Click here

Photo: Sami

Below deck - Home smart home
Smart Everyday Helpers by Ismail Nasser

If you're involved in innovation on a daily basis, you probably can't avoid changing your everyday life. At least that's the case for our colleague Ismail Nasser, who lives in his own smart home.

Isi, you've been working behind the scenes at Comma Soft for a long time. That has changed recently. Tell us about it!

My latest heart project is our self-developed application 4C - Comma Customer Center Cloud. We use it internally for time recording, skills management, forecasting, offers and invoicing for projects, for personnel development and much more. Since we have been offering 4C to other companies, I am now also active in customer support. This is an exciting change: I get to know what requirements other companies have for such a solution and can use this to develop it further. This not only adds value for the customers, but also for us at Comma Soft.

Apart from that, I have been in charge of IT, Support & Innovation, or ISI for short, since 2017. As Lead IT Consultant and IT Security Officer, I am responsible for internal IT and digitalization topics at Comma Soft. These include projects for the digitalization of our own business processes or the cloud capability of our CRM and ERP systems.

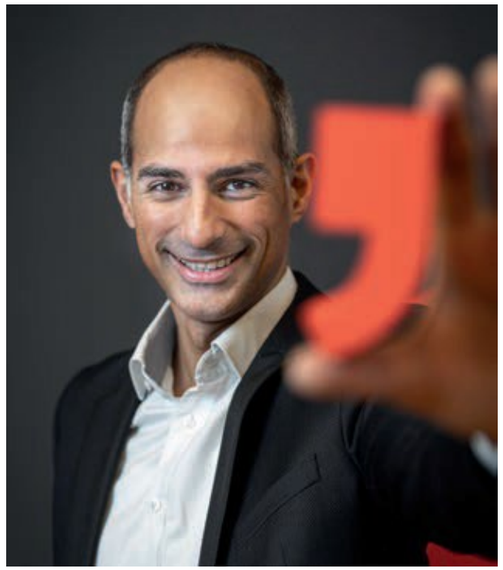
So you like to tinker with new, innovativen topics - and not only professionally!

Exactly! Privately, I also deal with technical solutions - especially in the area of smart homes. I have
z. I can open the door with a smart ring (the facial recognition software is still learning and is therefore in test mode). If someone walks through the garden after 10:00 p.m., the lights in the hallway turn on automatically, as does the lawn sprinkler. My wife was a bit skeptical at first, but now she asks me herself if I can't make things smarter. Our wine cellar, for example: We now enter on a tablet whether we feel like red, white, dry or sweet, etc., and then the bottles are illuminated.

Or my kids: They used to ask when dad was coming home. Now my smartphone sends a signal when I approach our house and estimates the distance. Then there's an audio announcement over the smart speakers: 3 minutes to go!

Wow. All that must take quite a bit of time. What motivates you to develop and implement such smart functions?

My goal is for smart home to solve problems and help me and my family to make everyday life easier. At the same time, everything should be safe. There must always be a backup solution if, for example, the power goes out. So I still have a key in my pocket in case I can't open the front door with my ring. But of course, there's always curiosity and playfulness behind it all. In December, for example, the seasonal jingle on my front door plays Last Christmas by WHAM! when visitors arrive. And mailmen hear a recorded "Thank you!" at the mailbox. These are nice-to-have features that make everyday life a little more colorful and cheerful. Fun is a must! □



Ismail Nasser, Senior Manager IT & Digitalization and 4C Product Manager at Comma Soft, develops smart home solutions in his spare time. He is also an enthusiastic pizza baker (only real Neapolitan pizza, of course).

Photo: S.

Off to new islands!

What we at **Comma Soft** make from our curiosity

We have given you the challenge to develop a vision for the digitization of our production.
You have passed this challenge today! Chapeau!", says Steffen von Glahn, management of Crespel & Deiters.

This feedback from one of our last customer projects got us thinking. Developing a vision - that is of course a challenge. And we are very pleased that we seem to have passed it. But how does such a vision come into being?

One thing that always drives us at Comma Soft in all our projects is our curiosity. But curiosity alone does not create a vision or an innovation. New things need to be worked on constantly - which is why we regularly go on expeditions. Read here in a short 'home story' how we do it - and at the end of the article, how you can perhaps use our findings for your company. For this, we take you on a short journey through time to three of our expedition formats, with which we discover 'new islands' and take the path from thinking to doing:

1. ChatGPT Task Force: On the trail of the trend

At the beginning of the year, our colleague Valen- tin - actually rooted in the Insurance & Health sector - came up with the topic of ChatGPT. Of course, most of us had already tested it ourselves and followed the media coverage with curiosity. But does the topic really have the potential to become the key technology of tomorrow? Or will it disappear again after a short hype phase? We wanted to find out and set up a ChatGPT task force - a format that we have already used for other topics,
z. Blockchain, for example, which turned out to be exciting for us at the time but not quite as relevant for our projects as it initially seemed to the public.

Would ChatGPT end up like that? Valentin was convinced that it wouldn't - after all, at Comma Soft we

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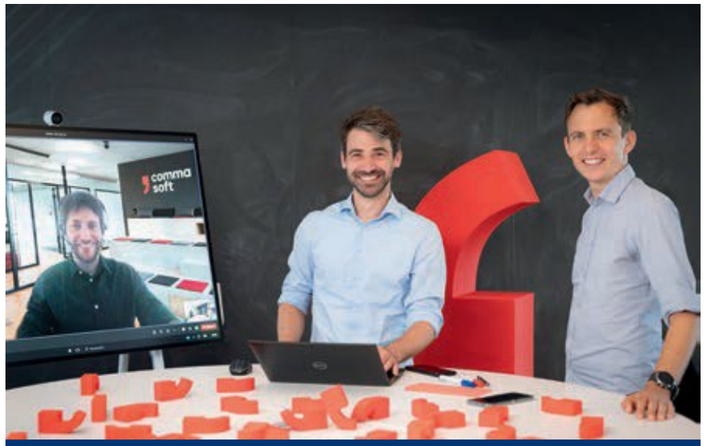


The ChatGPT task force around Dr. Valentin Kemper (m) with Nils Barkawitz (l) and Dr. Sebastian

have been working with generative AI models and large language models (LLMs) for a long time. He had the right instinct and was able to inspire us all with his enthusiasm to take a closer look at the topic. It was then clear that Valentin would lead this task force. Since then, he and a permanent group of five LLM, AI and deep learning experts have been investigating how the theoretical potential can reach market maturity and help our customers in concrete terms - and, of course, where there are still limitations and how we can circumvent them.

First, personal experiences with ChatGPT were shared: Who has already used it, what works well, what less? Where does ChatGPT already take work off and where does it, on the contrary, rather create additional work? In which context have we already seen it? What legal and ethical issues and challenges (especially in the corporate context) do we stumble upon? Does it perhaps give rise to new job titles and roles such as 'prompt engineers'?

Of course, the task force did not do this brainstorming alone. Other curious colleagues from very different areas and also many customers contributed their impressions. Opinions varied widely, from critical concerns about data protection, to diplomatic weighing of the pros and cons, to enthusiasm about the new technology.

the new possibilities of word processing. Ideas for solutions arose directly from this debate. Here are a few examples:

- Our cyber security expert Jan investigated what **security risks** arise when training AI models and how this issue can be addressed by using
  The new model is based on a set of 'ready-made' models that can be implemented in companies.
- Ayda, who leads the Digital Workplace team at our company, took a look at the Microsoft Copilot assistant based on genera- tive AI and mapped out how the assistant can make **working with Microsoft 365** easier.
- Valentin looked at the impact of ChatGPT on the **health care sector**, where information is compiled automatically in so-called meta-studies or prepared in a way that patients can understand.

We have currently reached the point where the results of the task force are being used in concrete projects: In ideation workshops, for example, we are working on the implementation of a ChatGPT-supported knowledge management solution at a customer in the insurance industry. By the time you read this, the go-live will probably be in a few days.

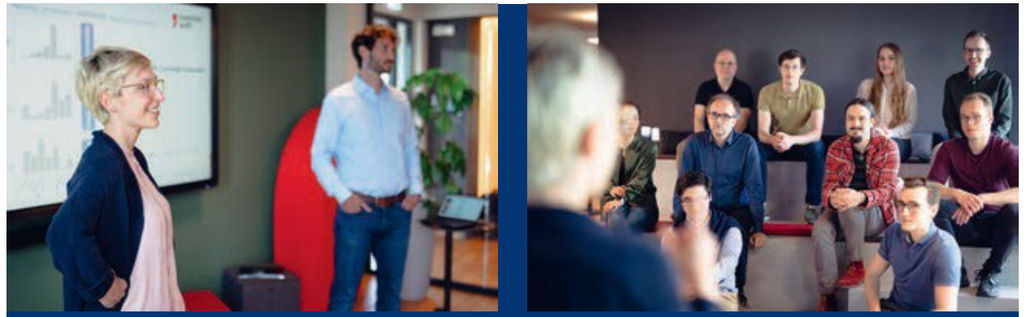
2. Data Science Stand-up: In search of new territory

With a topic like ChatGPT, quick reaction is required. However, our science heroes not only want to react to emerging topics, but also proactively discover new ones. This is exactly the goal of our Data Science Stand-up, which our colleagues Meike and Florian started about three years ago. As data scientists, they are interested in data per se. But they also wanted to add the human factor - and quickly found like-minded people at Comma Soft.

They meet once a month on a Friday afternoon (yes, that counts as working time!). Since Meike works in the production team at Comma Soft and Florian in the insurance team, the stand-up was cross-industry from the start. However, the interdisciplinary idea goes even further: Participation is open to all, whether Data Scientist, IT Consultant or Marketing Colleg:in.

The only requirement is that you have to actively participate and present a topic. The run of participants therefore changes and the baton for moderation and organization is passed on regularly. This creates a breath of fresh air and fuels the dialog. What topics have we already discovered as a result? We will be happy to provide you with examples here as well:

- **Federated learning:** This decentralized approach to training machine learning models, which respects data privacy, is used, for example, in Digital Twins in the automotive industry, as colleagues from the production sector reported. The exchange made it clear to us that the principle can be used wonderfully in the fields of health, pharmaceuticals and life sciences, where sensitive data of patients and study participants must be protected. The corresponding solution 'ImmunoHub' can be found today in COVID-19 research, among others.



(l) Dr. Meike Köhler moderates the Data Science Stand-up (r) Discussion during the stand-up.

Photo: Taras

- **Open source frameworks** for text recognition **(OCR)**: This technology is relevant if, for example, the input path at insurers is not only to be automated but also supported with AI. The technology can also be used in other companies with large inboxes,
  z. e.g. in logistics. But it is also suitable for fraud detection in banking. And what works for text must also work for audio and visual material, right? Colleagues took up the impulse and carried it into projects in the healthcare sector, where it is now being used, for example, in services for assigning appointments or for checking ultrasound images.
- **ChatGPT:** The topic does not stop here either. However, the stand-up is about more 'relaxed'. For example, we discuss general developments in the area of generative machine learning models and consider what alternatives there may be to ChatGPT if customers cannot use it, e.g., for compliance reasons.

Niels Ranosch presents the new stand-up on Digital Innovations

The topics are varied and enriching, and the format is well received by the colleagues - and inspires them to hold further stand-ups that focus specifically on digital innovations, for example. Often, new ideas and approaches develop from the Friday stand-up that are taken into the project business on the very next Monday.

3. FASTGenomics: When ideas learn to walk

Task forces and stand-ups are inspiring. But what horrifies every scientist (and entrepreneur) is when ideas end up in a drawer and gather dust. How do you get them to hit the streets instead? With some of the topics we highlight in task forces and stand-ups, this happens all by itself. Through exchanges with customers, the topics find their way into projects, and questions from the projects are fed back in turn. However, if there is not (yet) a corporate case behind it, but a research project, the waters look somewhat different. A framework is needed in which prototypes can be developed, tested and discussed with the scientific community. Companies often have their own R&D departments for this. At Comma Soft, we take a more flexible approach and implement R&D (Research & De- velopment) projects when we get a research project out of the cradle. But before we now take our desire for implementation itself ad absurdum and dwell on theory, let's take a look at a concrete research project take a look: FASTGenomics. Have you ever heard of 'Single

Dr. Benedikt Reiz (l) and Dr. Henning Dickten during a visit the laboratory of partners from the pharmaceutical industry

Cell Sequencing'? Neither had we before this project! It was a conversation between our founder and owner Stephan Huthmacher and Prof. Joachim Schultze at a board meeting of the University Society Bonn (UGB) in 2014 that made him aware of the topic.

It involves the identification (sequencing) of individual (body) cells - a then very young technology that opened up a new dimension for research into the functioning of the human body and the development of diseases.

The big question at the time was: How do you deal with the huge data sets needed for this and how do you find the proverbial needle in the haystack? Here it was a good fit that Stephan Huthma- cher himself is a studied physicist. In the part

At that time, there were already solutions for structuring, reducing and ultimately analyzing huge data sets with the help of artificial intelligence. To make a long story short: We wanted to help with this know-how and transfer it to bioinformatics, even though - or precisely because - no one had tried it before.

The idea: FASTGenomics was to become a collaboration platform that could be used to exchange huge amounts of data and at the same time enable different perspectives on data. In single cell sequencing, researchers as well as physicians and partners from industry work together and each require an individual professional view of data and research results.

Authors:

Dr. Henning Dickten

Dr. Benedikt Reiz

The implementation: Our colleague at the time, Christina (today she is a professor at HTW Berlin), and her team took on the topic. The development of ideas, the first concept, mockups, requirements workshops, programming, re-

The process was carried out in agile sprints and hackathons. This was accompanied by pitches at conferences and interviews with potential future users and partners. The first prototype was ready after a few weeks and was further refined. But after about two years, the project stalled. There was a lack of new ideas. But fortunately not on curious colleagues! Our Python evangelists Henning and Benedikt, Gene ticians, came along with new perspectives from the life science industry. Then the platform was finally ready for the public.

What is summarized here in fast motion actually took five years. Like a child learning to walk, we fell on our faces again and again. And after a few tears, we got back up again and run on. Besides curiosity, it also takes perseverance. And the journey is not yet

completed: The platform has been further developed and adapted to data protection requirements, e.g. through federated learning, and further improvements have been made through feedback from users in international research collaborations and from students of bioinformatics. If we stick to the figurative language: Instead of learning to walk, we are now learning to dance!

The by-catch: In this research project in particular, exciting additional results were added to those actually planned: a large network of researchers and universities. Understanding of the pharma & life science industry, which resulted in a separate business unit. The knowledge of how to manage R&D projects and how to get from a wild idea to an implemented innovation.

□

Innovation formats

Are you interested in innovation formats and would like to know more about how they can be implemented in practice? Write to Dr. Henning Dickten at **fragen@humboldt-gruppe.com**

Task force, stand-up, R&D projects: These are three formats that could not be more different. When is which format suitable also for you? And what needs to be con- sidered? You can read about this on the website of our Humboldt Group.

Click here

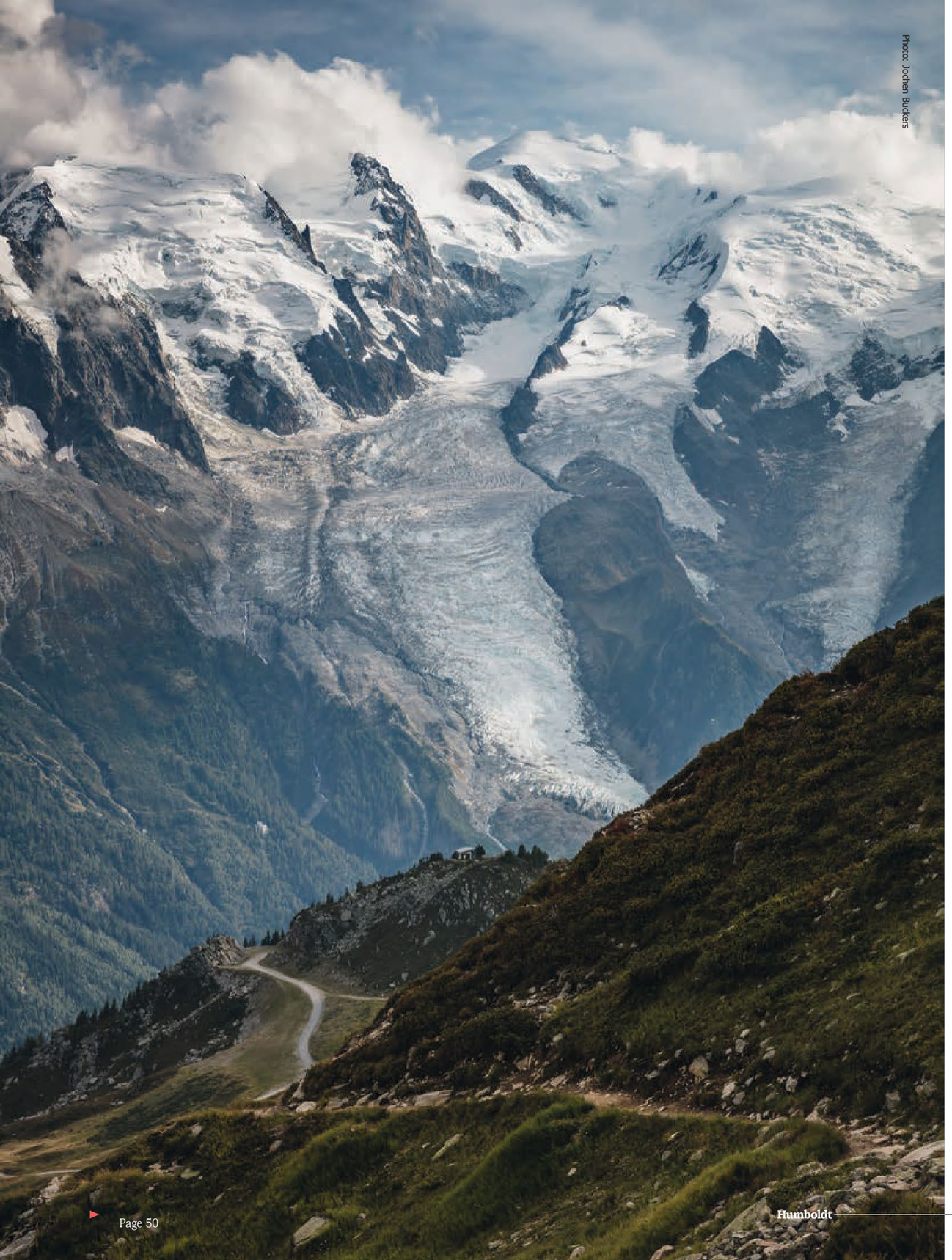


Photo: Jochen Buckers

The Comma Soft Humboldt—Group

What we model on our namesake

When we had to find the name of our working group, it was clear to our colleague Dr. Markus Knappitsch that it had to be named after Humboldt. He reveals why here!

Alexander von Humboldt continues to inspire his followers today with his enormous thirst for knowledge and as one of the polymaths.

For me personally, he was one of the most important intellectual role models during my university career, always inspiring me to excel.

Humboldt was interested in almost all fields of knowledge of his time, including geo- graphy, biology, geology, meteorology, astronomy and even ethnology. Despite often adverse circumstances, his incredible **curiosity led** him to travel to the most remote places in the world. His expeditions took him from the depths of the Prussian salt mines to the dense forests of Russia to the summit of Chimborazo in present-day Ecuador, considered the highest mountain in the world at the time. In the process, he spared no effort. Together with his companion Aimé Bonpland, a botanist, he transported numerous scientific measuring instruments to the snow-covered top of Chimborazo during a daring expedition in 1802.

This expedition was part of his le- gendary five-year journey through South and Central America, which took place between 1799 and 1804. Humboldt and Bonpland collected thousands of specimens, including some 60,000 plants, many of which were still unknown. They also discovered and described numerous animal species, such as the Humboldt penguin.

During his arduous ascent, Humboldt continuously collected valuable scientific data. **Data-savvy and detail-oriented**, he spared no effort to do so. His precise measurements enabled him to recognize the relationship between altitude, temperature, air pressure and plant growth. These findings led to the development of the concept of isotherms, lines of equal temperature, which are used today in meteorology and climatology.

On his travels through the dense jungles of South America, he also tirelessly searched for new things. In a dugout canoe, he explored the ramified river network of the Amazon and the Orinoco, tirelessly mapping

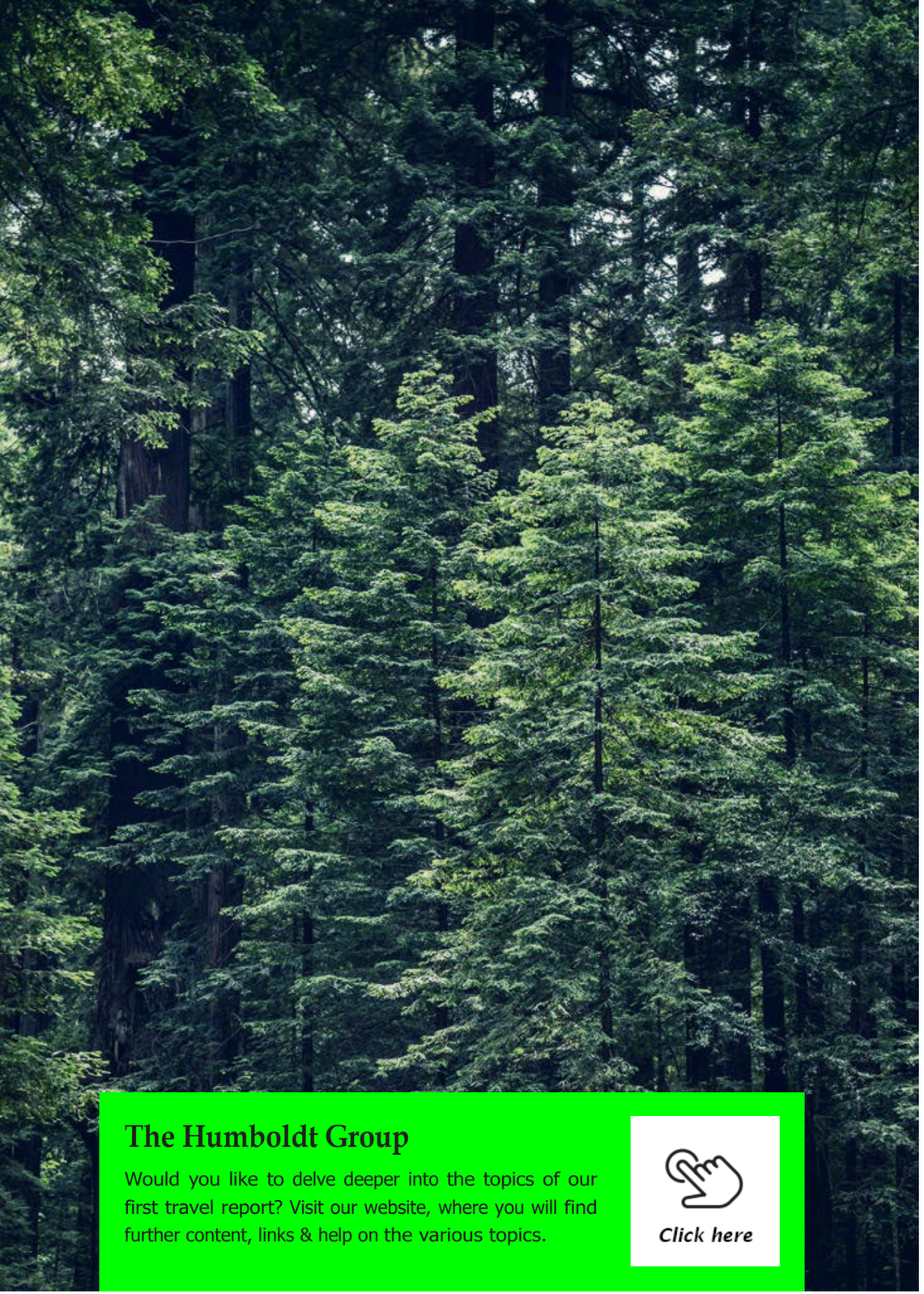


Photo: Rene Bieder

The Humboldt Group

Would you like to delve deeper into the topics of our first travel report? Visit our website, where you will find further content, links & help on the various topics.

Click here

the landscape. During his travels, he also learned about the languages and cultures of the indigenous peoples and fought for their rights. His commitment to the indigenous people of South America brought him great renown, and even today his name is extremely popular in large parts of the continent; streets, rivers and public squares bear his name.

Alexander von Humboldt was also **exceptionally well connected in the scientific community of** his time. In Jena and Weimar, he spent a lot of time with the intellectual giants of the time, Schiller and Goethe, as well as his older brother Wilhelm von Humboldt, who would later revolu- tionize German higher education.

Goethe, himself an enthusiastic natural scientist, had recently published his paper 'Versuch, die Metamorphose der Pflanzen zu erklären'. Humboldt later developed his ideas further and investigated how climate and location influence local vegetation. He came up with the concept of vegetation zones, which has shaped our understanding of ecosystems to this day.

Humboldt brought together the humanities and natural sciences and advocated a holistic view: everything is connected to everything else. His pioneering work in the field of comparative geography and ecology led to the emergence of the modern geosciences. In addition, Humboldt was a pioneer in the study of geomagnetism and laid the foundation for paleomagnetism research.

He was always an inspiration to his environment and endeavored to make his **knowledge and new findings accessible to** the scientific community. After his brother Wilhelm founded a new university in Berlin in 1810, Alexander gave dozens of lectures there, reported on his findings from his expeditions, made new ways of thinking accessible to his audience and classified his knowledge.

The quantity of his correspondence shows how extensively he came into contact with experts from a wide range of scientific disciplines: he wrote an estimated 50,000 letters during his lifetime. With the help of his global scientific network, his five-volume work 'Kosmos - Entwurf einer physischen Weltbeschreibung' (Cosmos - Draft of a Physical Description of the World) was created, in which Humboldt attempted to give a scientific overall view of the world.

This monumental work has influenced generations of scientists and is still considered a milestone in the history of science.

For me, as for our Humboldt Group, its namesake embodies curiosity, courage, precision and holism. With the Humboldt Group, we want to open up new knowledge in the field of technology in his spirit and make it accessible to our customers. We strive to keep the spirit of Alexander von Humboldt alive by constantly educating ourselves, working in an interdisciplinary manner and always being open to new ideas and innovations. In doing so, we strive to think both in detail and in the bigger picture, so that we can better understand the world around us and shape a sustainable future.

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Comma Soft AG
Pützchens Chaussee 202–204a
53229 Bonn
0228 – 97 700
info@comma-soft.com

Responsible in the sense of press law

Comma Soft AG
Benjamin Schulte, Mitglied des Vorstands,
Chief Operating Officer

Responsible editors

Julia Pedak, Benjamin Schulte,
Hanna Wangler

Authors of Comma Soft AG

Dr. Thorsten Beckmann
Consultant Pharma & Life Science

Dr. Henning Dickten
Head of Consulting Pharma & Life Science

Dr. Andrej Fischer
Executive Manager Consulting

Dr. Lars Flöer
Lead Consultant Artificial Intelligence

Dr. Markus Knappitsch
Executive Manager Consulting

Dr. Benedikt Reiz
Senior Consultant Pharma & Life Science

Dr. Michael von Papen
Lead Consultant Digital Sustainability

Idea and concept

Giso Weyand
www.gisoweyand.de

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