



## Industry 5.0 *AI in manufacturing and distribution*



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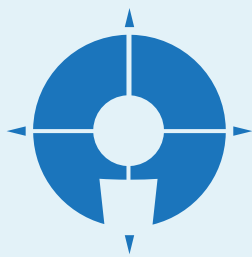


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## Colophon

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## Taking a look at the future

Dear reader,

Industry moves forward and continuously changes, even from day to day. Starting with the steam engine, we have moved on to manufacturing without physical labour by humans and AI-modules becoming smarter without human help. Companies around the globe need to follow this trend and are in a huge competition to be the leader in these development. An interesting read on this battle is *Bezonomics* by Brian Dumaine. The book accurately describes how Amazon is taking over all sorts of businesses due to their advantages in AI, and expectancy is that this will grow more and more in importance.

This edition contains various articles Industry 5.0 and the future of manufacturing. Maiky Geerman interviewed Yannick Jacobs from DPD about their innovative ideas in deliveries. Bauke Wijnands spoke to Martijn van de Ven, founder of Wefabricate about their founding and missions for the future. Sara Casado Rodriguez spoke to Thijn Nijsten about the traineeship of iTrainee and the application of it, while also discussing the development of Industry 5.0. Talking about recent developments for the future, ChatGPT could not be left undiscussed. Eva Henckens investigates the future of this program in education.

Joost van der Haar did research into Human-AI collaboration. He interviewed Christina Imdahl, professor at the TU/e, discussing what the future of this collaboration might look like. Besides this, Maarten van der Laars gives us an insight into his time in the happiest country in the world; Finland. Sjouke Duinstra talks about his recent trip to the ESTIEM Council Meeting in Porto, where he discovered what the culture of ESTIEM is like. This edition ends with columns from Farah Schepens and Rosan Kolff, discussing their experiences in a board year.

As you are familiar with, we will start this edition with a poem:

Industry's transformation, from 1.0 to 5.0, unfolds,  
Where digital systems have stolen the show from steel or plastic moulds.  
Collaboration between humans and tech takes its cue,  
A future of innovation emerges, both bold and true.

Enjoy reading this edition of the SCOPE,

**Marijn Konings**

Chief editor SCOPE



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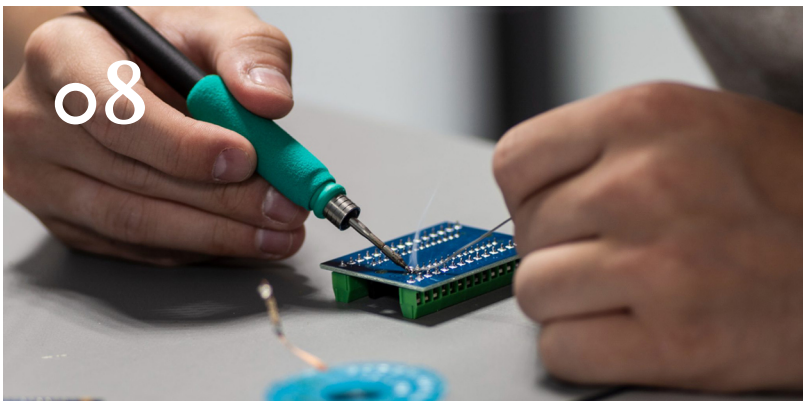
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Many people fail to grasp the true complexity and intense planning involved in the (rapid) delivery of packages to your doorstep on the same or next day. In 2020, around 8.2 billion packages were sent and delivered in Europe alone.

With 1500 distribution centers spanning across Europe, the largest cross-border road network in Europe, and an astonishing number of packages sent to various countries each day, DPD has established itself as a major force in the world of package deliveries. In this edition, SCOPE looks into the future prospects of this crucial sector by exploring DPD's innovative approaches to package delivery.

**TEXT** Maiky Geerman **DESIGN** Marijn Konings



# Day by day delivery at DPD

In the world of package delivery, constant innovation is shaping the industry, paving the way for more efficient and sustainable practices. The emergence of Industry 4.0 and 5.0 has brought about significant advancements that are revolutionizing how packages are handled and transported. I spoke with Yannick Jacobs, Manager Insight & Analytics at DPD, about these emerging technologies.

Firstly, AR and VR technologies are becoming more influential by the day. They enable more efficient package sorting by providing real-time visual cues and instructions to package handlers. With AR overlays, workers can easily identify the correct sorting location, minimizing errors and expediting the process. Yannick: 'For example, we are testing loading our vehicles with AR. This way, we can allocate all packages as efficient as possible while also making the

delivery job easier by already loading the packages in the right order'. These technologies could also facilitate better real-time information on package destinations, enabling seamless tracking of specific parcels within the warehouse.

However, Yannick's main expertise lies in the handling of millions and millions of data entries. See, multiple new packages are registered in HUB Eindhoven per second, and the



## Trivia:

*What was the heaviest package ever handled at DPD Eindhoven's distribution center?*

*Send the answer to Maiky for a chance to win free drinks at The Villa. (You can be 5% off)*

warehouse currently has a staggering capacity of 25000 packages Per Hour. In the near future, the HUB will be expanded even further, increasing the capacity to an even higher number of parcels per hour. After our interview, I had the pleasure to witness the orchestra of parcels, navigating through the seemingly endless amount of conveyor belts. Each package with its own origin, contents, size, and destination. You can imagine the astounding amount of data to be processed and how crucial it is to provide meaningful insights in this otherwise vast mess of asynchronous movements and deliveries. Yet, handling these amounts of data is one of the main challenges for parcel delivery companies. As the industry evolves, advancements in AI and Internet of Things (IoT) technology offer promising solutions to streamline and optimize the data processing and management. AI algorithms can efficiently analyze enormous datasets, identifying patterns and trends that might otherwise remain hidden. Additionally, IoT devices enable real-time tracking and monitoring of packages anywhere, enhancing operational efficiency and providing valuable data for decision-making. However, with the increasing reliance on these interconnected systems, ensuring robust cybersecurity measures becomes essential to

safeguard the integrity and privacy of the data.

Another important topic, sustainability, is also core value for DPD. DPD is operating 100% CO<sub>2</sub>-neutral. "To have achieved this, it is crucial to optimize delivery routes and how the vehicles are loaded", Yannick tells. Furthermore, the company tries to eliminate waste such as excessive carton or plastic by helping customers find more sustainable solutions. One main type of waste, for example, is the excessive plastic wrapping around pallets, according to Yannick. Together with partners, DPD is trying to find ways to recycle or reuse this plastic in order to minimize waste.

Lastly, simulation and digital twin technologies are emerging as valuable tools for companies such as DPD. These innovative solutions enable creating virtual replicas of their logistics operations, facilitating in-depth analysis, optimization, and predictive modeling. By accurately modeling the complex interplay of factors involved in package delivery, including sorting, routing, and vehicle loading, companies can identify bottlenecks, inefficiencies, and areas for improvement. Additionally, digital twins take simulation a step further by creating dynamic digital replicas that mirror the physical environment in real-time.

These digital twins leverage real-time data from IoT devices, tracking the movement of packages, vehicles, and resources within the delivery network. By continuously monitoring and analyzing this data, companies gain unprecedented insights into their operations, allowing them to proactively address issues, make data-driven decisions, and ensure smooth and efficient operations.

With all these emerging technologies, it is undeniable that the future of package delivery will undergo some remarkable transformations. Companies like DPD are embracing innovation to revolutionize operations, optimizing package sorting, leveraging data insights, and achieving sustainability goals. The adoption of these technologies enables efficient processes, reduced environmental impact, and the creation of virtual replicas to optimize logistics operations. By embracing transformative technologies and addressing challenges like cybersecurity and waste reduction, the industry is poised for a more sustainable and efficient future.

## Yannick Jacobs

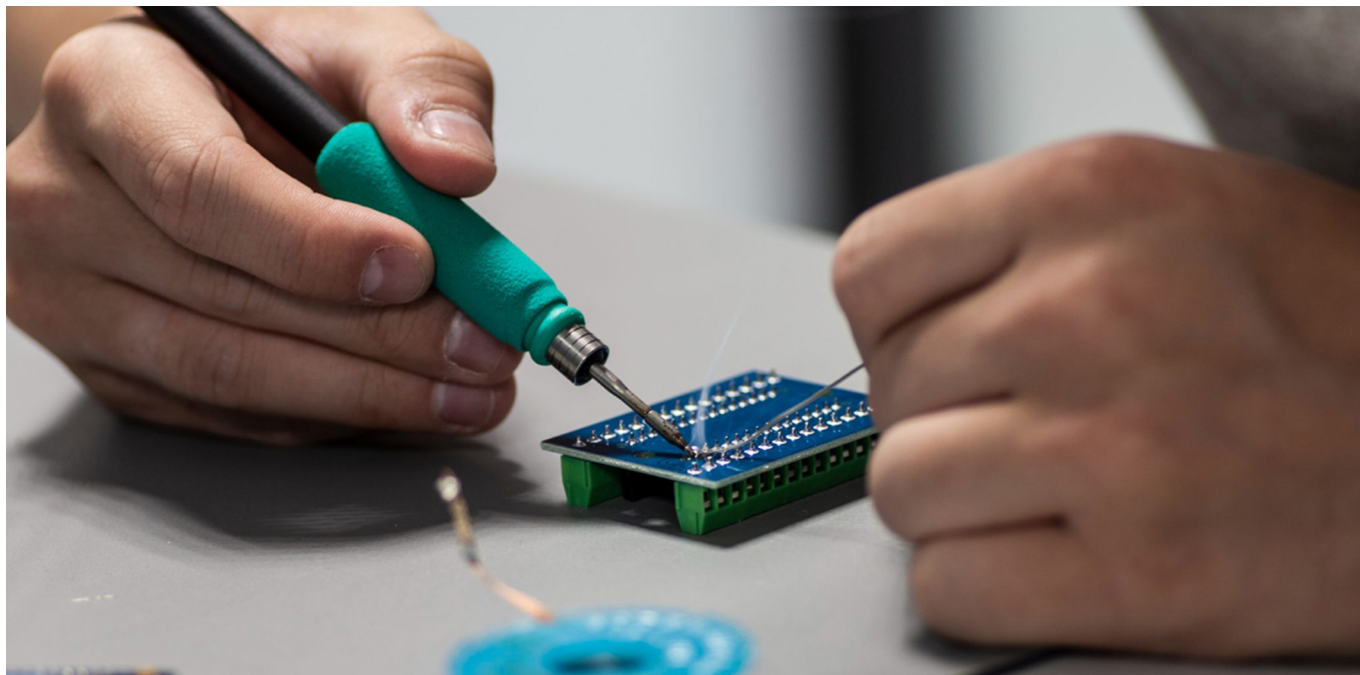
Yannick Jacobs is Manager Insight & Analytics at DPD. After finishing a Bachelor of Science in Econometrics and operational research and management in Amsterdam and a following Master degree in operations research and management science in Tilburg, Yannick started working at DPD in 2015 after finishing his graduation internship at the same company. For the past 8 years, he has been working at DPD in the field of data analysis, where skills such as SQL and supply chain optimisation have been key.





Automated guided vehicles are replacing order pickers at Amazon warehouses, robots replace waiters in restaurants and the virtual helpdesk answers our questions instead of the experts by phone. What about the manufacturing industry? How to automate as much as we can? This is the story of Wefabricate.

**TEXT** Bauke Wijnands **DESIGN** Marijn Konings



# The future of our manufacturing process

After two years of managing the R&D department at Prodrive, Martijn van de Ven, currently CEO of Wefabricate, developed a vision on industrial automation. He created a different approach on how production processes had to be automated, and how an organization should be built to support this vision. He started Wefabricate around three years ago and the search for fellow visionaries and colleagues started. The strategy of Wefabricate was formed based on foreseen major industry trends. Firstly, assembly and production processes within companies become increasingly complex and labour intensive. Secondly, different disciplines like electronics, mechanics and software become increasingly integrated with each other. Martijn: “what we also see is

that the manufacturing industry is very conservative. The traditional manufacturing industry is not able to meet the requests for highly complex products to a large extent. We think that for example the formulas that semiconductor manufacturers use to optimize their machines, should also be usable for the conservative players in the industry. Next to that we believe that standardizing and fully automating our production processes will make us more productive than any other manufacturer. We strive for being the Google of manufacturing by answering any complex manufacturing request with a simplified standardized approach.”

### The cell structure

From the beginning onwards,

Wefabricate has had a clear vision on the organizational structure. They want to be ambitious, grow rapidly and make impact as fast as possible. Along with that, very important is the company culture. So, what is the structure required for an extremely fast-growing company? Imagine having 10.000 employees, how do you ensure that everyone identifies him or herself with the central vision? Following Martijn the organizational structure that facilitates extreme growth is one in which teams operate highly autonomous and have many responsibilities. “So, teams get a small piece of the company. We tell our teams; this is your responsibility, we have the following ambition but organize it in your very own way and find the right people. We only facilitate the



teams.” As a result, the company operates in a cell structure. Different processes or products are operating in different so-called ‘cells’, which are individual entities (BV’s) in the Wefabricate Group. The ‘Cellyst’, who is the driving force of the cell, has full ownership over his or her cell and with that responsibility for connecting market, technology and the people. In the meanwhile, they allow Wefabricate to support them in their general processes. For example, buying materials, payment administration, logistics and automation is done centrally by Wefabricate.

Martijn: “Another aspect of our organization is that we first believe and then see, instead of the other way around. I don’t believe that the spreadsheets that ASML presented to its investors decades ago were showing the scenario that we are in right now. Look where they are now! If you believe in being able to make the change and have impact, then we believe in it, because we have the best people to do so!” The company believes in people that have a healthy level of unrest in them, who are constantly searching for inefficiency to solve and want to make impactful solutions.

### Impactful and disruptive products

We now know the company, but what about the products they are selling? Wefabricate specializes in producing high-quality products for clients in

diverse industries such as high-tech, health, and food. By leveraging advanced automation solutions in their factory, Wefabricate achieves remarkably short lead times while maintaining product quality. In addition to serving global customers, Wefabricate also develops and launches innovative, scalable end-products with significant sustainable impact, utilizing their in-house production capabilities. These start-ups are organized as separate cells as well.

An example of such a BV selling an impactful disruptive product is Fyllar, producing refill machines for the retail market. It is already present in the Walmart in Mexico and in the Lidl in the UK. The main goal is to reduce plastic packaging significantly, the cost reduction is achieved by the right proposition for our customer (retail + brands) and for the end-consumer. Moreover, Wefabricate aims to integrate with the hardware and software of washing machines. As a result, waste of plastic is reduced and inventory of washing soap can be decreased which simplifies its supply chain.

### The data analytics and optimization team

We go back from the cells to Wefabricate as a whole. Within Wefabricate, there are a lot of optimization issues. Think about planning, machine scheduling and the use of QR codes in workflows. Now, what should be prioritized when all aspects are important and valuable? Following

Kjell van Straaten, member of the data analytics and optimization team, it all starts with setting up a business intelligence platform. “Our data analytics algorithms should generate insights from all data flows in the factory. Having those insights, we determine where return on investment is highest, in order to determine the course of the company. We are working hard to create a generic data model that can cover all the different cells. This seems like a hard job, but at the end of the day, all production steps have material inflow, use equipment, the material is processed and the result is inspected. In general, all production process steps can be effectively captured in this generic model. Thus, our data model will be applicable for all cells. Hereafter, the optimization part will become relevant.” Further, the team aims to make the data analytics insights understandable for all employees, such that process owners can analyze their own processes themselves instead of having to outsource these analyses to the data analytics and optimization team. This is in line with Wefabricate’s vision to make the cells highly autonomous. Kjell says; “our team of course provides the data infrastructure and tools, but the cells have the business context and knowledge. So, in the end they are responsible for the output of the data and their insights. We only facilitate.”

Also part of the data analytics and optimization team is Lars Klooster. For





# *“We strive for being the Google of manufacturing by answering any manufacturing request.”*

his OML master thesis, he researches maintenance required for certain machines. Currently it is not known when maintenance is required and being too late (broken machinery) or too early (waste) costs money. His research should answer the question what product requires what specific maintenance schedule and when risks are acceptable. Maintenance for product A can be way more expensive and needed less frequently than for product B, which requires constant maintenance. Next to that, broken machinery can differ in costs per specific process. Lars says; “in line with the vision of our team, my research serves as an extra tool which can be optimized and should be scalable in a dynamic environment. The algorithm is now focused on two specific machines, but in the end it should be usable for all machines.”

## Future

According to Martijn, in 5 years Wefabricate has a significant international footprint. “By then, we have reached a maximum level of vertical integration in-house and we are located all over the world. We copy paste our formula everywhere such that we

can always outplay our competitors. At a certain level of maturity of automation, we will franchise our concept such that the formula can be developed at an even faster pace. We have an infrastructure that becomes easier to adopt for our customers and we have more impactful production processes. We call it plug and play!”

In line with Martijn’s vision, the data analytics and optimization team should be ready for all relevant requests. With regards to the franchise concept, Kjell his team must prepare the data structure in such a way that the franchise concept can easily be implemented. On the question how Wefabricate attracts all required knowledge, Kjell answers; “We try to do as much as possible in-house. However, in case we don’t have the knowledge ourselves and another company has already developed a certain tool, it is worth to adopt that knowledge from outside. We do not like to reinvent the wheel, in case a solution can already be bought. Whenever there is no external party that can help us out, we develop the required solution ourselves and we select a competence owner for that topic. An important note here is that we only develop this competence in case

it will still be relevant in 5 years.”

Wefabricate is a fast-growing company with a clear vision on its techniques and organizational structure. Completely automating a production process results in both success and challenges. How will the manufacturing process of the future look like?

## Martijn van de Ven

Martijn van de Ven has studied Mechanical Engineering, with an interest in systems control and manufacturing networks. Because of overlapping interest, he was asked by Ivo Adan, full professor at the OPAC group, to set up the MSE master. His first connection with manufacturing systems in the industry was at NXP. He performed an optimization project in Nijmegen and finally implemented multiple optimization algorithms in production plants in China and Hongkong. Thereafter, he did his thesis and started working at Prodrive. He became responsible for R&D having 900 employees and took place in management for two years. Finally, he founded Wefabricate.





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Sara Casado Rodriguez spoke with Thijn Nijsten, who follows the traineeship at iTrainee. iTrainee, with its specialization in SAP-training and talent development, provides traineeships for graduates to grow and eventually match with the perfect employer.

**TEXT** Sara Casado Rodriguez **DESIGN** Marijn Konings



## iTrainee

Since 2021 iTrainee 'Launching Great Careers', is the bridge between young innovators and business. By forming young people eager to take on the world through a high-quality and intensive training program. The anticipated benefits include the technical knowledge and the social skills needed. Under the guidance of iTrainee, recent students like Thijn Nijsten have an opportunity to not only learn, and but also discover an employer that really suits their needs. As iTrainee defines its program: 'Our traineeship gives you the chance to discover what makes your heart beat that little bit faster.'

Recent HBO and WO graduates interested in working as SAP consultants should contact iTrainee. As a SAP consultant, you are primarily focused on the functional and business aspects and less so on the technology itself. You will

typically advance to the position of functional specialist in one of SAP's modules. For those who are more technically minded, there is also plenty of work in the SAP world.

### Training

Before starting a new experience at iTrainee a strict selection procedure is at the front door. iTrainee: 'Better to be the best in one thing, than good enough at several things. We prefer to be the very best!' The first step to be part of the iTrainee community is a short introduction, showing your interests and by a motivation letter. An ability test is done right before the last and final interview that as Thijn defined it: 'It feels like a job interview'

Then, the SAP training begins including SAP-wide learning, functional and technical expertise and development soft skills. Thijn Nijsten: 'At the start of the traineeship

you are with a group of five to six people. Everyone has the same training: logistics, finance, business intelligence part and programming in general. Two times a week classes and every two weeks an exam. It feels like a continuation of the university.' Thijn also added: 'Thanks to having an industrial engineering degree helped me a lot during the training being familiar with some topics, recognizing processes a little bit faster than the rest. Despite all, you still need to study, but that is not new.' After two months, a guidance 1-on-1 starts by specializing and giving more individual focus by finding what suits you best.

### Industry 5.0

Industry must take the lead in the digital and green transitions if it wants to continue being the source of prosperity. By switching to industry 5.0, we will strengthen the function

and value of industry in society by offering a vision of business that goes beyond efficiency and productivity as the only objectives. It uses new technologies to create prosperity beyond jobs and growth while respecting the planet's production limits and places the welfare of the worker at the center of the production process. According to the European Union, Industry 5.0 "provides a vision of industry that aims beyond efficiency and productivity as the sole goals, and reinforces the role and the contribution of industry to society." and "places the well-being of the worker at the centre of the production process and uses new technologies to provide prosperity beyond jobs and growth while respecting the production limits of the planet." By specifically placing research and innovation at the service of the transition to a sustainable, human-centered, and resilient European industry, it enhances the current "Industry 4.0" approach.

### Transitions

The *First Industrial Revolution* was characterized by the switch from manual to steam- or water-powered production equipment.

The *Second Industrial Revolution* was made possible by electricity, which transformed factories into cutting-edge production lines, resulting in high productivity and substantial economic growth.

During the *Third Industrial Revolution*, production became increasingly automated. With the advent of communication technologies and field-level computers like Programmable Logic Controllers (PLC).

*Industry 4.0* enabled flexible production of high-quality personalized products at scale through real-time communication and collaboration between "manufacturing things."

By ensuring that production respects the limits of our planet and places the welfare of industry workers at the center of the production process, the *Industry 5.0* is understood to acknowledge the power of industry to achieve societal goals beyond employment and growth and to become a resilient provider of prosperity.

### Industry 4.0 vs. Industry 5.0

On the one hand, Industry 4.0 focuses more on digitalization and AI-driven technologies for enhancing the efficiency and flexibility of production than it does on the original principles of social justice and sustainability. While Industry 5.0 emphasizes the value of research and innovation in assisting the sector's long-term service to humanity within the confines of the planet.

The current Industry 4.0 paradigm is not chronologically continued by or replaced by Industry 5.0. The outcome of a forward-looking exercise, Industry 5.0 frames the coexistence of industry and new societal trends and needs. As a result, Industry 5.0 enhances and expands upon the distinguishing characteristics of Industry 4.0. With the understanding that the other Industrial Revolutions are simply the chronological continuation of their predecessors, Industry 5.0 may be distinguished from the others as a unique type of Industrial Revolution.

It is critical that we comprehend the distinctions between Revolution vs Evolution. The First, Second, Third and Fourth Industrial Revolution was a 'revolution', with a complete turnaround perspective. All periods, experienced a sudden, complete and radical change in the society, environment and technology. However Industry 5.0 does not look for an insurgent transformation, its actual purpose, is a gradual development into a more sustainable, human.

In short, Industry 4.0 is considered to be technology-driven, whereas Industry 5.0 is value-driven.

By ensuring that production respects the limits of our planet and places the welfare of industry workers at the center of the production process, Industry 5.0 acknowledges the power of industry to achieve societal goals beyond employment and growth and to become a resilient provider of prosperity. The Green Deal will call for an increase in reliance on sustainable resources, such as energy, and a shift toward a more circular economy. In order to make their industries more future-proof, resilient, sustainable, and human-centered, existing working methods and approaches—including the vulnerability of global supply chains—need to be reconsidered in light of the Covid-19 crisis.

How does Industry 5.0 impact on companies or training programs such as iTrainee? The implementation of artificial intelligence is only the first step of what is coming.

## Thijn Nijsten

Thijn Nijsten studied Industrial Engineering and subsequently the Master's degree in Operations Management and Logistics from 2014 until 2022. He stated: 'Once I finished my studies, I did not know where to go or start. I also did not know much about the variety of jobs that exist and I needed some guidance. That is why I joined iTrainee.'





The development of artificial intelligence and its integration into our daily lives has been a hot topic recently. With the introduction of Chat GPT at the end of last year, the conversation has become more complex than ever. While some argue that Chat GPT and similar technologies pose a threat to our society, others see them as an opportunity to revolutionise education and the workforce. In this article, I will explore why we should embrace Chat GPT in education, instead of banning it.

**TEXT** Eva Henckens **DESIGN** Marijn Konings



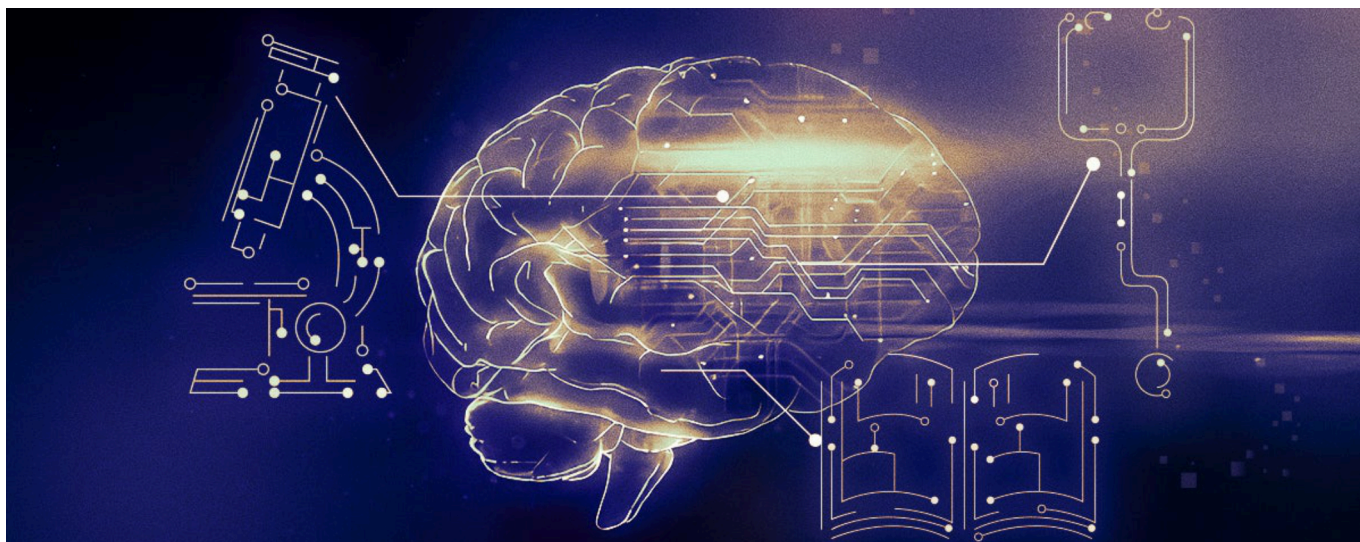
# Beyond banning: Embracing Chat GPT in education

First, let's consider what Chat GPT is and how it works. Chat GPT is a language model that has been trained on a big amount of data, allowing it to generate human-like responses to prompts. This means that it can understand and respond to questions, provide solutions, program, and write essays. The technology is constantly improving, and its applications are expanding, making it an attractive option for

many industries.

On the 14th of March 2023, the TU/e sent an email to all students stating that the use of Chat-GPT will be forbidden for educational purposes. I understand this response, and it might be a good decision for now, but I strongly believe that we should start embracing and incorporating the technology, instead of banning it. There has been a growing concern

about the impact of Chat GPT in education, with some suggesting that its use could lead to a decline in critical thinking skills among students. They fear that students may become overly reliant on technology, potentially losing the ability to think for themselves. I understand this concern, but it is important to recognize that it should not be used to complete entire assignments, such as writing essays or coding projects.



Instead, students should be taught how to use the technology responsibly and ethically, which includes understanding when it is appropriate to use it and its limitations.

One useful approach is to incorporate Chat GPT as a personal tutor, providing students with immediate feedback and suggestions as they work on assignments. Additionally, students can use Chat GPT to ask specific questions or seek inspiration for topics, helping to enhance their understanding and creativity.

A limitation that should not be overlooked is that Chat GPT is not creative in the same way as humans. Rather than generating original ideas, it proposes responses based on patterns and data it has been trained on. This means that the responses provided by Chat GPT are limited to what it has learned from past data and may not necessarily be creative or

innovative. Because AI relies on data to learn, it can reproduce biases that are present in the data it is fed, which means that AI-powered tools like Chat GPT may maintain existing biases.

Humans possess a unique ability to think critically and creatively, which cannot be fully imitated by AI. AI should always be seen as an addition, not as a replacement for human thinking. By combining the strengths of AI with human creativity and critical thinking, we can create more innovative educational experiences for all.

Of course, there is a risk that students realize that it is not useful to use Chat GPT to write complete assignments but still do it out of laziness or convenience. Luckily Open AI, the owners of Chat GPT, has recognised this risk and offers a program on their website that allows users to determine whether a text was

AI-generated or not. The program is not perfect yet but it is constantly improving. When the program is fully developed, it can be used to ensure that Chat GPT won't be overly used by students.

While the recent decision by TU/e to ban the use of Chat GPT for educational purposes is understandable given the concerns surrounding the technology, I believe that this decision should not be seen as a permanent solution. Instead, it should be an opportunity for educators and policymakers to consider the potential benefits of Chat GPT, and develop strategies for its responsible use in the future. By working together, we can ensure that Chat GPT is used in a way that enhances our education system.

Are you interested in speaking with companies, or writing articles about a topic of your choice? Contact [pm@industria.tue.nl](mailto:pm@industria.tue.nl) and join SCOPE!



More and more companies are implementing AI algorithms in practice. Recent breakthroughs in AI and promising theoretical results show their potential. However, algorithms that perform well in theory do not always perform well in practice. A common reason for this is poor collaboration between human planners and their algorithms. To learn more about this challenge and how to address it, SCOPE talked to Dr. Christina Imdahl, whose research focuses on the interaction between humans and algorithms in operations management.

**TEXT** Joost van der Haar **DESIGN** Marijn Konings



# Human-AI Collaboration

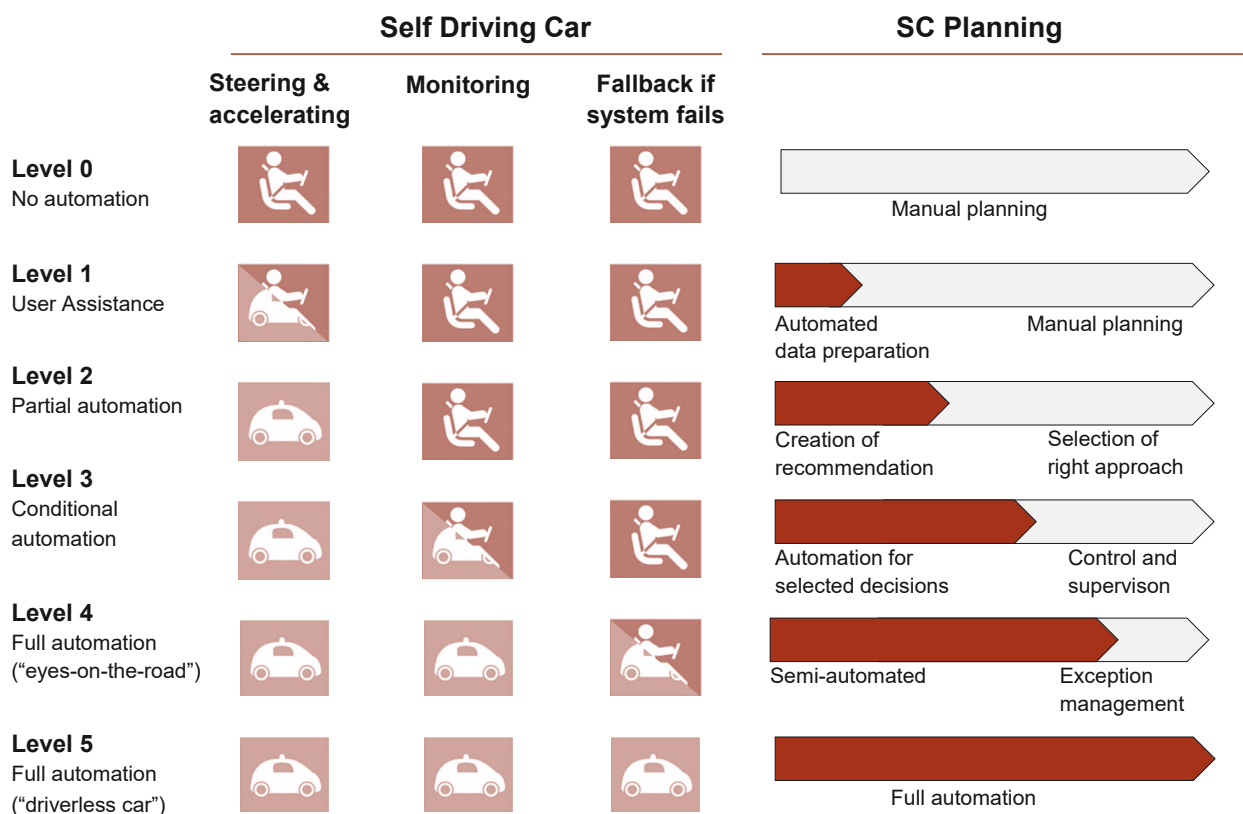
The potential of AI is enormous. It can extract knowledge from data at an unprecedented scale, allowing for better forecasts and decisions. At the same time, it can easily automate many low-value and low-risk processes, freeing up valuable work-hours. Its increasing popularity is therefore not surprising. Nonetheless, AI models have some important shortcomings. Like traditional methods, they can only

be as good as the input they receive. Unlike many traditional methods, however, they are often black-box methods. This lack of transparency leads to reduced trust in AI models. The question is therefore: how to leverage the strengths of AI, while limiting its weaknesses?

### Augmentation, not replacement

According to Christina, the answer can be found by analysing the

strengths and weaknesses of both human decision makers and AI algorithms. Take for example the information they base their decisions on: “AI cannot make decisions on things that are not in the database. Humans can see the whole picture, and they can also explain things that were not there before.” Consequently, humans can add the most value in environments where AI models would miss



## Automation in self-driving cars and supply chain planning

important information. Data might be of poor quality, it might come in too late, or it could be outdated due to unexpected events outside the control of an organization.

Human decision makers, however, have other weaknesses. Christina gives an example: "People are more hesitant to adjust forecasts downwards, so most adjustments are small and positive. They are not adding much value. This is the overoptimism bias. Downward adjustments tend to be better than upward adjustments, because you generally only do it if you have a good reason to do so." AI models do not have these kinds of weaknesses.

Weighing the strengths and weaknesses of human decision makers and AI does not need to lead to giving full control to one or the other. In fact, Christina argues that humans and AI often complement each other. She believes we can draw a parallel with the development of self-driving cars.

Rather than going from zero automation to a driverless car directly, technology is developing gradually. Similarly, she expects many AI applications for supply chain planning to be rolled out with a gradually increasing scope. AI might only be used to generate planning recommendations at first. Once it gets good enough, the generated planning might become the implemented planning unless specified otherwise by a human planner. For some tasks, no human planner might eventually be involved at all.

### The human planner

This increasing degree of automation is changing the supply chain environment, leading to a different role for human planners. Organisations need to decide for themselves where planners add the most value. Should they perform all planning tasks themselves? Should they use AI-generated plans as a guideline? Or should they instead only be involved when exceptions

occur? Christina anticipates that more and more companies will move towards a situation where human planners become exception handlers and process improvers, spending much less time on day-to-day operations. She is already starting to see it happen at many companies that she is working with.

A different type of job also requires a different set of skills. So much so in fact, that some argue that traditional supply chain management is dead. Although Christina believes this statement is premature, she does think supply chain management is changing: "In the future people need to understand AI algorithms, and how data can be used in companies, because more and more decisions are being based on data." Exception managers will need to know when algorithms work, and when they don't. Process improvement will require the appearance of new roles, such as the supply chain data analyst. Providing a foundation for



# *“Consequently, humans can add the most value in environments where AI models would miss important information”*

them all will be technical engineers, who create and maintain the necessary IT infrastructure.

### Augmentation in practice

Having the right IT infrastructure in place provides the starting point for improvement. It ensures that data is available to train AI models in the first place, but also allows you to analyse how they are used in practice. Analysing how AI models are used in practice can lead to surprising conclusions. For example, a recent study in which Christina was involved looked at how human planners adjust AI-generated forecasts<sup>2</sup>. They found that large downward adjustments led to considerable improvements in 43% of cases, and to considerable deteriorations in 29% of cases. Large upward adjustments on the other hand only led to considerable improvements in 32% of cases, and

to considerable deteriorations in 52% of cases.

Once such information is known, an organization can take different measures to improve their joint human-AI processes. For instance, it could create a new feedback loop so that planners can improve their future adjustments. Alternatively, it could limit a planner's ability to adjust AI-generated forecasts. If we know that a planner is unlikely to improve a specific forecast, we might not want to show it to them in the first place. This way planners can spend more time on decisions where they add the most value. Put more generally, adjustment information allows a company to analyse how its processes can be optimized.

### Process redesign

In the future, Christina expects that such analysis might often lead to

redefining decision processes. The degree of supply chain automation is certain to increase in the years to come, but AI models can only act on the data they see. A well-defined process lets human decision makers augment AI-generated decisions to ensure all relevant information is considered, but also recognizes and avoids their weaknesses. How exactly this balance can best be achieved for different types of decision processes, however, is still an open research question.

## Christina Imdahl

Christina obtained degrees in mathematics and business administration at the University of Göttingen. She finished a PhD at Kühne Logistics University at Hamburg in 2021, after which she joined TU/e as an assistant professor. Her research focuses on the human element when deploying algorithms in practice, and on how joint human-machine performance can be optimized.



Interested in this topic? You can read and learn more in the following articles:

1. A. Lyall, P. Mercier, and S. Gstettner (2018), The Death of Supply Chain Management. Harvard Business Review.
2. N. Khosrowabadi, K. Hoberg, C. Imdahl (2022) Evaluating Human Behaviour in Response to AI Recommendations for Judgemental Forecasting. European Journal of Operations Research.



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Wij vinden het belangrijk dat jij jezelf kan zijn en het gevoel hebt dat je erbij hoort. En jij jouw unieke vaardigheden verder kan ontwikkelen met behulp van de nieuwste technologie. Om het beste uit jezelf te kunnen halen, is een goede balans belangrijk. Bij ons heerst er geen 9-tot-5-mentaliteit. Je hebt de flexibiliteit om zelf te bepalen waar en wanneer je werkt. En tegelijkertijd succesvol te zijn.

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In February 2022 I was facing a tough decision. Which country do I choose for my exchange semester? I wanted to go far. Do I go for my first choices, Australia or South Korea, with the risk that the Executive Board (CvB) cancels the party? – Since COVID-19 all exchanges outside of Europe had been cancelled, with many students doing their “exchange” locally in Eindhoven or Maastricht. – Or do I choose for a destination within Europe, so that I can go abroad with the blessing of the CvB? That decision was made very quickly.

TEXT Maarten van der Laars DESIGN Marijn Konings



## A year in the happiest country on earth

Outside of Europe I had plans, but where to go within Europe I had not really planned at all. Now I could say that I knew through ESTIEM that the student culture in Finland was at least as active as the one in The Netherlands, that there is an association for anything you can think of, that there are traditions going back ages, that there are lots of activities being organized, and that many Finns are, just like many of the Dutch, direct, honest, trustworthy, and rational – people I like to hang out with. However, I would be lying if I wouldn't mention here that my choice was slightly influenced by this gorgeous, sweet, intelligent lady

from Helsinki that I now get to call my girlfriend. Long story short, it was the cold, dark, Russia-neighboring Finland that ended up higher on the list than sunny Portugal or Italy.

What I did not know was that in Finland I would end up at a university and a degree that has one of the highest entry requirements, one of the most prestigious degrees that is known for its alumni in senior positions in the most successful companies of the country. If you study Industrial Engineering & Management at Aalto University in Helsinki, you're set for life – and

you're treated appropriately. Whenever the Industria of the North, Prodeko “Guild of Industrial Engineering & Management of Aalto University”, organizes a company excursion, it's not uncommon for the excursion to include champagne, cocktails, and a taxi ride to a restaurant followed up by a dinner and drinks all-paid-for by the respective company. I've been invited to go karting or go to a spa all paid by companies. Don't get me wrong, the sandwiches at the lunch lectures in Eindhoven are fantastic, but for all corporate SCOPE-readers: this is how you do it!



Another thing that caught my attention is that, despite it being an exclusive prestigious degree, a gigantic culture shift has taken place. Not only at Prodeko, but in the entire student culture in Finland has progressed. Despite century-old traditions and “hazing” for first-year students, there are no humiliations or institutional sexism, anymore. Students are free to be whoever they want to be, and they come out for it. Back in the days, also in Finland it was not uncommon for students to drink themselves into coma under peer pressure, but this is now really ‘not done’. There is a safe atmosphere where people are free to drink however little or much alcohol they want to drink. If you still end up in the yellow taxi to the hospital, at least it is your own choice! Besides, before any party or event somebody will almost always announce the house rules, that (sexual) harassment or any form of inappropriate behavior is not tolerated, and that there are contact persons in case of any incident. This is something Dutch student culture can learn from.

One of the main highlights of my exchange was a road trip with 15+ other Erasmus students through Finland. We drove through Finnish

nature and spent the nights in lake-side cottages with saunas, hot tubs, and campfires under the most amazing starry skies. Another highlight was a trip to North Lapland. Being pulled through waves of snow on a husky sled, seeing reindeer, the Northern Lights, and snowboarding with  $-28^{\circ}\text{C}$ (!!!) is something I won’t ever forget.

Besides extravagant company visits, unique trips, and politically correct yet memorable parties, I also followed courses in Finland. I mostly chose courses in the field of entrepreneurship, as Helsinki is known for its active startup-scene. Slush, the world’s biggest startup conference and originally founded by Aalto students, is a yearly recurring event in the city. I applied as volunteer for this congress/festival and got to experience the event in person. Another highlight! And it also landed me a job at the startup founded by IEM-colleague Jeroen Sassen “Heimdall Sensor Intelligence”, where I could immediately apply the knowledge and skills I learned in the well-organized courses at Aalto.

After my exchange I planned to write my thesis (somewhere else) abroad. Despite the darkness and the fact that my girlfriend would move with me, I thought 4 months in Finland was too short. I felt that there was still a lot

more to see and discover and decided to look for a thesis in Helsinki. The fact that in Finland, with an IEM background, you receive a decent salary for your thesis may have also played a role in my decision-making. With a limited network in a foreign country it took me a while to find a project. Now I am working on a project with some of Finland’s largest and best-known organizations (Nokia, Aalto and Neste) with the CTO of Telia Finland as my supervisor. I’m not complaining..

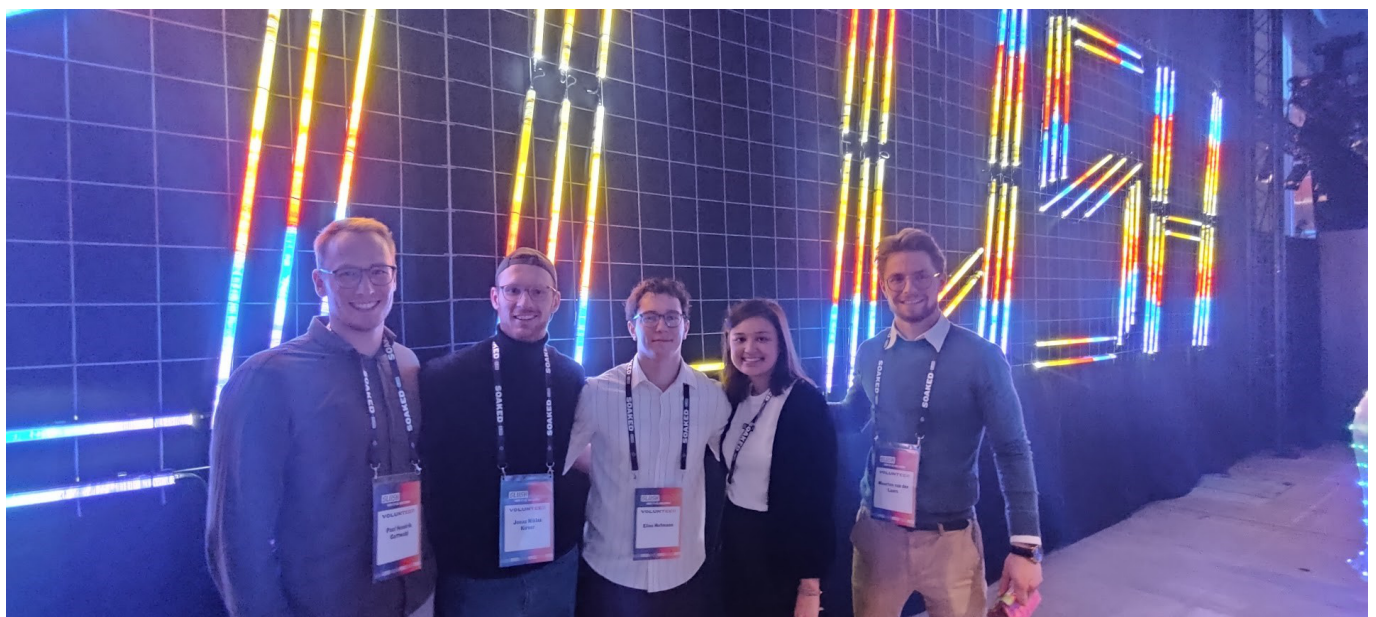
1.5 Years ago, I had no idea that I would be writing this article on a sunny terrace in Finland, but here I am. I am happy that I was flexible and that I ended up here. I got to know the Nordics better. I have gained an appreciation for the lifestyle here and learned how we have become disconnected from nature in the Netherlands. Besides, it is great that things are well organized, the public transport in Helsinki has won several awards, I can chat with a doctor in an app to get a prescription, and I eat a government-subsidized, high-quality and nutritious meal almost every day at the university for €2.70.



Yes, Finland is dark and cold. Especially in the winter months. The difference between winter and summer is literally like night and day. In winter people hibernate – there's little people on the street, there's less events, and people smile a lot less. And rightly so. A weekly sauna moment is the light at the end of the tunnel. And that in the happiest country on the planet.

In summer, the days in Finland are endless and people go out - from terraces to festivals or they go out to one of the many summer cottages scattered throughout the country. There is 1 summer house for every 10 Finns. Finland is a huge country and it is the most normal thing in the world that your family has a second summer house ('mökki' or 'cottage') in the middle-of-nowhere, at a lake (your own lake), or on an island (your own island). I can see why people are happy here. People like to retreat to nature, alone or with friends, to pick berries or mushrooms, to go boating, to swim or to fish, to sit around campfires, to stargaze, and to get drunk in wood-fired saunas. Activities in Finland are often accompanied by copious amounts of spirits, something they consciously like to choose for themselves. No need for peer pressure!

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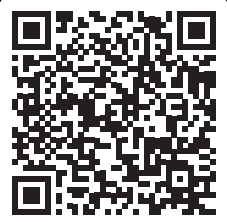


# VOOR IEDEREEN DE LEUKSTE (BIJ)BAAN!



## IEDERE DAG DE LEUKSTE BOODSCHAP

We doen er alles aan om onze klanten een glimlach te bezorgen. En van boodschappen doen een feestje te maken. Hang jij met ons de slingers op? Als medewerker bij Jumbo krijg je ook een leuk extraatje: **10% korting** op je boodschappen. Van bijbaan tot loopbaan: jouw droombaan vind je bij Jumbo.



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Who doesn't love a week long party? But a weeklong general assembly? How on earth could that be any good? Well, by combining the two apparently! This past April I got to go the ESTIEM council meeting in Porto as a delegate. Contrary to what you might expect from a GA, it ended up being a hectic, eventful and above all memorable week. Between exploring Porto, meeting fellow IE students from all over Europe and attending the GA, where do I even start?

**TEXT** Sjouke Duinstra **DESIGN** Marijn Konings



## A memorable week in Porto

Perhaps it makes the most sense to start back in Eindhoven. Previously, I'd gone on an exchange to Bucharest. This was a very nice holiday, exploring a different city along with both fellow Eindhoven and foreign IE students. However, I didn't even know it really was my first ESTIEM event, as I had no clue what ESTIEM even was. As I ended up finding out, ESTIEM organises all kinds of events all across Europe. So, when presented with the opportunity to go to Porto (at an absolute bargain price I might add), I thought why not? So, that's how it

went. Along with 13 other Industria members we made the trip to Porto. Aside from exploring Porto and hanging out with some locals, I just expected a fun and pretty relaxed week. This could not have been further from the truth, as I ended up clocking in an average of around 3,5 hours of sleep per night. However, I wouldn't have wanted it any other way. As in the end, it felt like a month long holiday was crammed into just six days.

The first night started at the main

stage of the entire week: the university campus. For the night activities, this main stage was the local IE student bar. On that first night, we were treated to a number of traditional Portuguese acts. As for the rest of the night, well, what would you do in a room full of people from all over Europe? Have you ever had a beer with someone from Finland before? How about someone from Hungary, or Romania? Well you're in luck, cause they're all here! It was really cool to meet people who, despite from all over Europe, are still



industrial engineering students just like all of us. And with well over 300 people present, it's virtually impossible not to make some new friends throughout the week

Technically speaking, the night activities throughout the week were optional, but where's the fun in working hard if this hard work isn't rewarded? Virtually every night was spent partying at the local IE bar. Additionally, ESTIEM events have some classic recurring activities. The week always ends with a gala dinner, but the real classic is the International Night. Here every country is represented by their classic foods and drinks. For example, the Belgians brought their finest collection of beers. Every Balkan country brings their own kind of pálinka, which tastes exactly how you would expect Balkan liquor to taste. The real star of the show was the Finnish Minttu, which is strong liquor that tastes like peppermint. I really recommend trying this sometime as there is nothing quite like it.

Since that Thursday was actually the 27th of April, we also ended up celebrating two important birthdays in Porto. Sure enough it was the king's birthday, but it was also the birthday of another king within Industria and ESTIEM. None other than the vice-president of finance and Eindhoven's own Max Sturkenboom! In honour of him we spent this day dressed in our best orange outfit

complete with all the tacky SoLow items you would see on Kingsday. In addition, everyone at the GA, and I mean everyone, got decorated with traditional small Dutch flags on their face. Thus, despite being 2000 kilometres away from home, Kingsday was still celebrated the right way.

Sadly, the party never ends is a lie. The motto at the Council Meeting is 'work hard, play hard', which means there's no playing hard at night without some hard work during the day. So after a quick rest at the hotel, the morning would usually start at 08:00 with the GA sessions. The agenda was chockful, but the day always started with an attendance check. In order to set the tone properly, each local group introduces themselves by singing a song. Although, singing might be overstating it. Think more along the lines of the Eindhoven song. Yes that one with barely any lyrics. Hardly counts as singing does it? As for the rest of the GA sessions it was actually really interesting. Seeing what it takes to run such a large continent wide organization is very impressive. You might expect it to be quite the overload of information for someone who didn't even know ESTIEM existed a couple of months ago, but this really wasn't the case. The structure of the agenda was really good, in the sense that every agenda item seemed to be a logical follow up to what had been discussed

previously. And I would be lying if I said the rounds of classic voting with voting sheets wasn't kind of cool.

One thing I haven't mentioned up to now was the city of Porto itself. The weather was as good as you expect Porto's weather to be. This meant there was plenty of time to spend lunch breaks and evenings in the park. Throughout the week there were several moments where we had time to go out into the city. The city centre is absolutely gorgeous, but the difference in elevation throughout the city means exploring it is quite a workout. If there's one thing I can recommend visiting it's the FC Porto stadium, as the surrounding area has an amazing view of the city.

The final day of the GA ended up being the most interesting. On this day, the elections for not only the department leaders took place, but also those for the new board. After presenting their applications throughout the week, this must have been one nerve-wracking Sunday for them. After the results of the voting was revealed the new president-elect gave the closing speech, and so the Council Meeting came to an end. Having had the chance to talk to some of the new board members throughout the week, I hope I can catch up with them and all of the other lovely people I met, this fall at the Council Meeting in Budapest!



# Alumnia Board Update

Things are changing faster than ever in the digital world we are living in nowadays. While lots of companies are still finding out what the data Industry 4.0 can bring them, Industry 5.0 is already around the corner. This will open new doors for Industrial Engineers who are thriving on change and improvement. With this in mind, we are continuously looking with a critical eye at the Alumnia Association.

Over the last 29 years, we have been sending out the SCOPE on paper to your front door. While the SCOPE on paper still feels like something special every quarter, it is time for a change. In a time where the impact of climate change is one of the main issues we are facing as humankind, it feels strange to share the SCOPE by default on paper. Therefore, the **SCOPE goes digital!**

The SCOPE will remain available on paper for our members who prefer the paper version over the digital version. If you would like to keep receiving the SCOPE on paper, please send an email to [alumnia@tue.nl](mailto:alumnia@tue.nl) or scan the QR code below. Thank you in advance for your collaboration and please don't hesitate to contact us in case of questions!

Having said that, let's discuss another thing that we did differently this year. On the 9th of March, we organized the very first Alumnia x Industria drink. During the drink we could connect with the members of Industria while enjoying some free beers and snacks. The full Villa proved that this try-out was a great new concept for the Master Activity.

Besides the Alumnia x Industria drink, we had another event on the calendar in March. On the 29th the yearly TBKx event took place in the wonderful Domusdela. The evening was a big success and therefore fully in line with the theme of this year: **"Success stories: behind every success is an even better story"**. We would like to thank the Industria committee for their effort!

Next up on the agenda: the Social Drink. The Social Drink will take place on the 15th of September, hope to see you all there!

On behalf of the Alumnia Board,

**Harm van Duijnhoven**

*Chairman Alumnia*



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## Upcoming activities:

Social Drink - 15 september  
Alumnia Thesis Awards - 15 november



# Alumni Speaking

In 'Alumni speaking', each SCOPE two members of alumnia association Alumnia are interviewed. They talk about their careers, current activities and the relationship with their studies.

TEXT Bram Bongaerts & Maurits Akkerman DESIGN Marijn Konings

## Bram Bongaerts

### What has your career been like so far?

The first 3 years of my career I was a supply chain engineer and planner at Organon. I learned a great deal on supply chain design and implementation in that period. In 2008 I joined EyeOn, a then ~25 person consulting company. I have had the luck to be able to develop the Life Sciences industry practice with one of the managing partners. EyeOn has grown a lot and I am very proud of being the driver of our internationalization and the lead of the now largest industry team. My team serves multinational pharmaceutical, med tech and (biotech) startups with supply chain consulting, data science, services and planning tool design & implementation.

### What makes you happy in your work?

Working with my own team, with very diverse people at different companies and being autonomous and independent in doing so. I try to nourish these values in my team of over 20 people in 5 countries. Seeing the team grow gives a lot of satisfaction.

### What was the most important moment in your career and why?

Looking back the most influential was my time at Organon and especially the last couple of months before I changed to EyeOn. During that time, Organon was just taken over by another company and in that tumultuous time I came to the realization that I wanted to stay in a high performing supply chain management environment, in a company or team with a strong vision. That was and is EyeOn.

### Which function/job did you dream of while being a student, and how and why did that change over time?

To be honest I did not have a specific job in mind. I was mostly attracted to planning jobs larger international companies. I did not fathom I would join a specialist consulting company, let alone stay there for such a long time. I also never imagined becoming a manager of a team. Instead, I anticipated I would become an independent at some stage.

### What career advice would you give your younger self with the knowledge you have now?

Take action earlier in your career to learn about your own drivers, values and pitfalls as it relates to work. Instead of trying to address your pitfalls, try and find a job that matches your values and in which you can flourish.

**Old question:** What career advice would you give your younger self with the knowledge you have now?

### New question:

Generation 'Z' is joining the workforce. They are digital natives and it is said they approach work differently and strive for meaningful work and push for sustainability. How do you think Gen Z will change your work?

### Why:

Even though I personally don't like to generalize, there are many data points that signal the change. I am very curious if others see the same and how they think this will impact their work.



### Bram Bongaerts

Age: 42  
Graduation year: 2004  
Role: EyeOn - Practice Lead Life Sciences



### Rogier Berben SCOPE 3, 2023

Plant Manager Tilburg at  
Agristo NV



### Peter Schram SCOPE 1, 2023

Found and advisor of  
breakthrough advisory



## Maurits Akkerman

### What has your career been like so far?

During my master's degree, I always enjoyed programming and critical thinking to utilize data in problem-solving. This interest led me to pursue a career involving data analysis. I discussed my options with many friends who were already working, and that's when I discovered Bright Cape.

I felt that it was a great environment with young and ambitious colleagues, where I would have the freedom to decide my development path. Since I was unsure about the exact direction I wanted to take, these aspects were more important to me than the industry or specific job description. Considering these factors, I knew that Bright Cape would be a perfect fit for me.

Once I started working there, I worked on a project involving process mining and realized that this was the field I wanted to pursue. It offers the perfect combination of interacting with businesses and presenting data in an understandable manner, while relying on objective and data-driven reasoning. Since then, I have completed multiple assignments for large corporations and am enthusiastic about continuing to assist companies in enhancing their processes and reducing inefficiencies through process mining.

### Which course would you add to the IE curriculum to setup students for success?

Learning how to prepare data for a specific purpose is critical and thus, a course on data preparation would be my recommendation. While we may

learn extensively about optimization models and algorithms, we often neglect other aspects such as where the data originates, how to handle file structures that are not Excel, and managing imperfect data. Having an understanding of how to prepare data for a particular purpose is essential for generating valuable insights.

### Where do you get the most energy from during and after your work?

The first is showcasing the power of data through process mining. Creating a visual representation of a complex process often leads to a unique moment of recognition, even for individuals who have worked with that process for years. Witnessing their excitement and recognition of the possibilities of this technique to help identify and optimize their processes is truly exciting.

Secondly, the conversations with my colleagues at Bright Cape. Whether it is about fun activities like weekend plans or vacations, or about the latest technique or model developed at one of our customers.

Outside of work, mainly through working out, and of course, seeing friends.

### What aspect of business life were you most surprised by after starting your first job?

Experience doesn't necessarily mean someone knows everything about their job. Even professionals with over two decades of experience learn new things every day and are not afraid to ask for advice when they are uncertain about

something. Secondly, networking and building strong relationships with the right people is even more important than I thought for getting things done in large organizations. It's not always about what you know but who you know and who trusts you. Building connections is essential for success in a corporate environment.

### What advice would you give current students?

Enjoy your time at university and don't worry if you don't have a concrete career plan. Start your career at a company that offers a good working environment and aligns with your general interests. As you develop in your role, take the opportunity to explore different areas and tasks within the company to find out what you are most passionate about and pursue those interests.

**Old question:** What aspect of business life were you most surprised by after starting your first job?

**New question:** How does your background in Industrial Engineering help you in your work?

**Why:** It's good to look back and recognize what your education has brought you and which lessons you still apply in your daily work. For me, having the ability to understand a business challenge from a high-level before diving into the details and figuring out how data can support in solving that challenge is the main lesson.



### Maurits Akkerman

Age: 27

Graduation year: 2020

Role: Senior Process Mining Consultant at Bright Cape



### Jeffrey Mussche SCOPE 3, 2023

Industrial Engineer &  
Data Scientist



### Maarten van Asseldonk SCOPE 1, 2023

Co-founder at Konekti

# Breaking Boundaries

And just like that, my board year is coming to an end. It is insane how fast this year went. I have experienced and learned so many things. I visited interesting companies in Dublin, saw (the few) beautiful buildings in Sofia with the IRP board, went skiing in France, learned more about the culture in Bucharest, went to Kraków with the Tappers, and had an amazing weekend in Germany last weekend at Industria weekend. And these activities were just the ones in a foreign country, but also here in the Netherlands, we have done so many fun and interesting activities. Besides that, a board year provided me with many fun activities, a board year has also provided me with many opportunities to learn, grow, and forge

lifelong friendships. I have gained so many experiences throughout this year, and it was amazing to contribute to the association in this way. Soft skills are something which you do not really learn by just doing your courses; however, it is of such high importance to have developed soft skills for all jobs. Teamwork, patience, time management, communication, responsibility, decision making are just some examples of soft skills I improved during this year. I am so grateful for this year and look forward to what lies ahead in the future!

**Farah Schepens**

*Educational Officer*



# Takeaways from a Board Year



A board year offers a unique opportunity for personal growth and development. As the academic year is coming to an end, I can reflect on what I have learned and experienced. I would like to start by saying what an amazing experience it has been to be so closely involved in the association. Being a board member gives you the opportunity to help the association to a new level, but most importantly, it allows you to get to know so many new people, make new connections, and have an incredible year full of activities, trips, and networking. Collaborating and empathizing with fellow board members and stakeholders expanded my perspectives and highlighted the potential that lies in uniting diverse voices towards a common goal. These connections become the foundation for future partnerships, lifelong friendships, and professional networks.

A significant lesson I learned early on, is the art of letting go sometimes. I can be a little bit of a control freak, but when you are guiding a committee they have to learn how to respond to sudden

changes and figure out issues themselves first. Over time, I learned to trust others and their capabilities, and to first take a deep breath before reacting stressed or taking over. Letting go not only relieved my burden but also nurtured an environment that thrives on shared successes and the development of new skills, and this is a lesson I will treasure. Lastly, navigating diverse audiences with varying professionalism levels improved my ability to adapt communication effectively. Tailoring your message, language, and approach to suit the needs of different individuals are valuable elements that can be of use in my further life.

This will be my last time writing a column for the SCOPE, but armed with wisdom and experience, I am prepared for the next chapter, equipped with a profound understanding of leadership, collaboration, and the power of human connections

**Rosan Kolff**

*Chairman*



# NEWS UPDATE<sup>!</sup>

## SCOPE GOES DIGITAL

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