

# ACTIVITY REPORT 2020



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**70**

MILLION EURO  
TURNOVER

**10%**

NEW EMPLOYEES  
(FULL-TIME EQUIVALENTS)

OVER  
**700**  
IN TOTAL



**13**

NEW COVENANT  
PROJECTS



**36**

COMPANIES  
INVOLVED IN  
ICON PROJECTS



**155**

NEW RESEARCH  
PROJECTS  
STARTED

**14%**

GROWTH IN  
MEMBER COMPANIES



## Key Figures 2020

Flanders Make performs high-tech research with and to the benefit of companies. This contributes to product and production innovation for vehicles, machines and factories. In this way, we help companies to be competitive in a globalised market. Here are a few key figures.





**PREFACE  
OF CEO**



Production innovation is a major differentiator and gives a boost to competitiveness.”

— Dirk Torfs, CEO

2020 will for ever be known as the covid-19 year. Nothing was normal, everything was questioned. Drastic measures were taken in the interest of our health. 2020 brought us a lockdown, a reboot of the industry with social distancing, mouth masks and many restrictions, but also opportunities. Innovative, flexible and agile companies respond to these opportunities. We have seen a creative industry that is not afraid of taking firm decisions and acting vigorously. Their digitalisation and organisational efforts of the past few years have paid off. This will be important to overcome the economic downturn quickly. Forward-thinking companies continue to innovate and contribute to a sustainable, digital, social and competitive industry.

Based on an industrially relevant strategy, Flanders Make has in recent years consciously geared its activities to the medium- and long-term needs of companies. This has led to research results with high relevance for the industry. With this purpose in mind, we've built an

agile and flexible organisation that can adapt quickly to changing circumstances, such as for instance the sudden need for a complete switch to teleworking. This also allowed us to quickly find solutions to the new covid needs, both from a medical perspective and in support of the accelerated restart of companies. In this period, we've also integrated the drone cluster EUKA and injected new momentum in it. Despite the difficult circumstances, we've had a successful year.

**Structural and strategic partnerships**

An ever increasing number of companies are finding their way to Flanders Make. We work together on research projects and B2B activities, support their R&D projects and make our test infrastructure available to them. We are also establishing an ever increasing number of structural and strategic partnerships with companies. An integrated, transparent and open internal communication makes cooperation with companies easier, more intensive and broader in scope.

We offer a strong and integrated service package to support innovations and business transformation in companies from all industrial sectors such as the pharmaceutical, food and logistics, medical and chemical industries. We notice that innovation followers are also gradually finding their way to us. This allows us to increase our impact and be more relevant to the industry.

**Infrastructure and communication as drivers**

We will continue to build our infrastructure as a tool for accelerated innovation, including a test environment for motors, a flexible production cell for 'lot size one' production, a high-performance and secure IOT set-up with data storage and analytics for tools such as AI and digital twins, or infrastructure for research into human ergonomics in factories based on technological support, and much more.

Our branding has been clearly strengthened and our communication is based on a balanced combination of channels: print, website, social media, webinars, etc. Our partnerships are also an asset here, as they extend our reach. It is a pity that we could not go through with our annual Symposium, nor with its alternative, the 'Top Technology on Tour' at three locations. But don't worry, we will catch up and are ready to show our famous demonstrators, today already virtually and, as soon as it will again be possible, physically as well.

**What will the future bring?**

Flanders Make remains strongly committed to a combination of product and production innovation. We also encourage companies to focus more on production innovation: technologies such as digital instructions, cobots, data analytics based on hybrid AI, digital twins, IOT, etc. are becoming increasingly important for making a difference.

In recent years, we've built a unique circular innovation ecosystem, creating a major impact. The six core features of this ecosystem are: (1) distinctive, (2) well organised, (3) open, with (4) focus on common goals, (5) shared benefits and (6) shared information. We have the ambition to pursue continued growth with it, because only with more critical mass, we will be able to make our companies stronger.

I am already optimistic: I see a positive dynamic, we work intensively together and we generate impact with our research. This is what we need in order to create prosperity together and realise a prosperous and exciting future for the industry.

**Dirk Torfs**  
CEO

When looking back at 2020, we cannot ignore the corona crisis and its major impact. The pandemic is a magnifying glass clearly identifying the strengths and weaknesses of companies. This crisis tested both the strategic insight and the agility of manufacturing companies. For Flanders Make, the past year was characterised by three key elements. On the one hand, the pandemic disrupted both the supply and demand side of the market. On the other hand, we've seen the strong resilience of our companies and the support offered by Flanders Make in this context. Finally, we highlight the actions that companies in the manufacturing industry are taking to emerge stronger from this crisis.

### Supply and demand

First, the corona crisis disrupted market demand as well as the supply chains. Companies had enormous difficulties with their supply chains and in obtaining critical parts. They solved this, amongst others, by using more local suppliers: something we strongly encourage. At the same time, global demand for investment goods slowed down and lockdowns temporarily disrupted global trade. Fortunately, our governments threw in rapid and generous support through liquidity measures and comprehensive technical unemployment arrangements. Companies reinvented their work organisation, taking imperative sanitary measures to ensure the safety of all employees. Both the companies and the health sector asked Flanders Make to use our technological knowledge and work out new practical solutions.

For instance, together with Fablab Brussels and the industry, we started up a production process for innovative breathing devices to make up for possible shortages in our hospitals, and we developed digital stethoscopes, which lung doctors can use to continuously monitor patients from a remote location.

Flanders Make also helped our companies on an organisational level and in the efficient application of

the corona rules, amongst others using smart camera systems and Bluetooth sensors with pilot lamps. In addition, we worked intensively on newer forms of operator interaction and digital techniques to guide operators remotely. Through a number of iterations, we have been able to create reliable and flexible solutions within a very short period of time.

### Resilience and future prospects

After the first corona wave, we conducted a survey among Flemish manufacturing companies about the consequences of this crisis. This showed that the participating companies would have about 20 percent less turnover in 2020, but also that the decline in employment would be limited. The forecast is that they will have made up for this decline by the end of 2022. Furthermore, half of the surveyed companies will proceed with their scheduled investments in digitalisation; among our member companies, no less than 90 percent will continue to pursue this essential transformation. This is how manufacturing companies are tackling the crisis correctly: they remain optimistic about the future, initiate operational adjustments and remain focused on innovation-driven competitiveness.

Every crisis offers opportunities, so we also wanted to know what lessons our companies learned from the pandemic. According to the survey, a third of the companies want to evaluate its supply chain and make it more robust, for instance by creating additional buffers and engaging local suppliers. Furthermore, they aim to strengthen their operational flexibility by retaining the new work organisation. For office tasks, they are pursuing a mix of remote and on-site working. On a strategic level, more and more companies are realising that thorough digitalisation of their core processes is a must for their survival. In addition, companies and governments are increasingly taking the climate transition into account. As Flanders Make, we also need to make the full-fledged digital industry greener and more circular. The com-



“Digitalisation is not a button you can press, it is a continuous process.”

– Urbain Vandeurzen, Chairman Board of Directors

petitiveness, productivity and growth power of our industry is essential to our economy, prosperity and wellbeing. Our future must be more digital and more sustainable.

### Data and digital culture

Digitalisation is not a button you can press, it is a continuous process making products and processes smarter. We still don't make adequate use of the data from the different operational processes. These data hold the future's gold, as it were. At Flanders Make, we help companies to better interpret these data. This will allow them to adjust their processes or products and to autonomously adapt them to their environment. The next wave in the digital evolution is the holistic use of data: AI and deep learning are no hypes, they are essential for the technological progress of companies.

The biggest bottleneck in all this is the availability of digital and technological talent. We must be able to capitalise on the benefits of digitalisation. With our Make Lab, we visit companies to demonstrate the latest innovations and raise awareness among their operators.

After all, digitalisation increases productivity and job satisfaction. Our new research centre in Kortrijk will serve as a showcase for this. This 'factory of the future', with flexible work cells, will be a world-renowned and leading example of the possibilities of Industry 4.0. It will serve as a major catalyst and an essential training site from 2023 onwards.

Of course, our education system also needs to have digitally competent and motivated teachers, in secondary as well as in higher and academic education. Modern schools must generate the new batch of digital top talents, handling digitalisation like natives. The accelerated introduction of digital learning systems thanks to the pandemic is undoubtedly an asset. Together with Flemish companies, Flanders Make is counting on extremely high-quality education and would very much like to contribute to this!

### Urbain Vandeurzen

Chairman of the Board of Directors of Flanders Make



## Impact of corona crisis on digitalisation

In the summer of 2020, Flanders Make surveyed a hundred companies about the impact of the corona crisis. What was the extent of the damage and how did they cope with the impact? But we did not only hear negative noises, on the contrary. Despite the economic downturn caused by the corona pandemic, three out of four Flemish companies still intend to continue to invest heavily in digitalisation.

Shortly after the first lockdown, in August and September 2020, companies were given the opportunity to give their views on their current situation, needs, future expectations and innovation plans. Our previous market survey in 2019 showed that Flemish companies wanted to allocate 5.8 percent of their budget per year to innovation, which is 20 percent more than the international benchmark. The results of the survey were shared with the government so that they could be used in the preparation of economic recovery plans.

### Investments not on hold

Our post-lockdown survey specifically looked at whether companies remain equally committed to the transition to Industry 4.0. The surveyed companies all indicated that their turnover would drop by just under 20 percent, which means it will take them about two years to recover from this. The **planned investments** will of course be slightly lower than originally anticipated, but they **will remain at a very acceptable level. Half of all companies will continue to invest in digitalisation**, while the other half are mainly larger companies that are less flexible in dealing with the crisis.

### Large versus small

The most striking difference, therefore, lies in the size of the companies. Medium-sized and larger companies estimate their recovery period to be a

lot longer than flexible SMEs. After all, digitalisation is more in the DNA of these small, newer companies. In larger companies, the entire production process feels the collapsed market dynamics, partly due to delays at suppliers. Partly because of this, **a third of the companies already aim to upgrade their supply chain management.** In this way, they hope to be more resilient during the further course of this crisis. Almost **a fifth are even pursuing an entirely local provider network.**

“We need to focus on sustainability, digital transformation and partnerships. When we do so, Flanders as a knowledge region will come out of this crisis stronger.”

— Dirk Torfs, CEO Flanders Make

### Full on digitalisation

In spite of everything, **75 percent of the surveyed companies are still committed to increasing their digitalisation efforts.** When looking solely at our member companies, this figure rises to 90 percent: a positive trend that once again emphasises the importance of innovation. The majority of companies also know that **the creation of a digital work culture is the basis for an efficient transition.** Besides, the corona crisis may also create **opportunities** here, such as **new business models and market objectives** and changes in the **product range.** Approximately half of the surveyed companies are investigating new revenue models, with one in three companies focusing on new sales markets. Good examples of fast innovators are the Leuven-based 3D printing specialist Materialise, which now also designs hands-free door handles, and bicycle clothing company Bioracer, which produces mouth masks. These opportunities also ensure job security. This is a sign that the sector is keeping its knowledge and expertise in-house, so that it can respond quickly to the future relaunch.



## Flanders Make in covid-19 times: Technology from factory to hospital

Driven by its social commitment and its mission to support the competitiveness of the Flemish industry, Flanders Make takes the lead in developing technological contributions to the fight against the COVID-19 pandemic and to the necessary digital transformation of the Flemish industry. Through specific innovations, we make this challenging period more bearable. We introduced our new developments in June 2020 under the approving eye of Flemish minister of Welfare, Family, Public Health and Poverty Reduction Wouter Beke.

In response to acute shortages of respiratory equipment in Italy, as early as 23 March 2020, we released 1 million euro in operating funds for **projects targeting solutions** for the pandemic. The FabLab at the Free University Brussels had already started building a respirator that was not constructed with parts from the medical sector. The **Breathney** is the result of this: an **extremely solid and reliable respirator** that allows for rapid mass production. Flanders Make used its expertise to support this initiative and helped it to quickly evolve from prototype to production-ready product.

### Medical solutions

Furthermore, Flanders Make invested in quite a few other game-changing medical projects. For instance, researchers at FlandersMake@UAntwerp developed a technology that allows doctors to listen to a patient's lungs from a remote location **without direct**

**contact.** This system works with **digitised stethoscopes** that are and remain attached to the patient's body. In addition, each digital stethoscope is connected to a computer in a central room for medical staff, which allows for an optimal follow-up. We offer this solution worldwide as open source, so we can support doctors anywhere in the world.

The increasing demand for mouth masks caused a global shortage of high-quality protection materials. To tackle this problem, Antwerp University started designing FFP2 and FFP3 mouth masks and setting up an emergency production line for them. Researchers from various Flanders Make core labs used their expertise to advise and support fellow researchers in the development of these mouth masks and in optimising the production organisation. This allowed us to keep production in our own country and to quickly deliver masks that meet the highest quality standards.

### Robots and software

The crisis puts a huge strain on hospitals and medical staff. Robots are a good example of how technology could assist hospitals in the future. By deploying robot applications for the distribution of medication, for instance, we could significantly reduce the workload of medical personnel. For this purpose, the researchers use robots that were developed for assembly applications, but with a few adjustments can independently take care of part of the internal logistics in hospitals.

We then investigated the possibility of replacing the demanding and expensive pill inspection systems in pharmaceutical companies by a cheaper vision system using open source image processing software.

**Without compromising on functionality or quality**, this allows us to reduce the cost and make it **more accessible to smaller players**.

### Social distancing

Besides innovations for the medical sector, Flanders Make also invested in low-threshold Covid-related solutions for companies and organisations. Amongst other things, we developed an **extremely compact and portable device** to help respect the **social distance** between colleagues at the workplace. Based on self-driving vehicle technology, this device with Ultra-Wide Band localisation technology gives an acoustic signal whenever someone is coming too close. The system is flexible, easy to install and does not require fixed infrastructure, it works entirely locally and also respects the privacy of employees. After successful tests, among others at weaving machine manufacturer Picanol, the technology was commercialised worldwide. The technology group Crescent

### Remote assistance, a wealth of applications

Remote assistance, or technology for remote training and support, helps to respect social distancing rules. Operators thus receive remote support for training activities, maintenance tasks or during work. This support is given through **hands-free instructions** on smart glasses, smartphones or tablets. An observer can follow the actions of an operator in real time and have additional instructions appear on smart glasses. The social distance is maintained and training times can be reduced so that the scarce experts can be used more efficiently. Flanders Make refined the technology so that it can be applied on a much wider scale. The project not only aims at professional users, but also at students and patients: it can thus be used in industry, education and the healthcare sector.

secured the licence for its subsidiary Option. As such, Option/Crescent is completing its product range of wireless IoT safety solutions.

Another project was to support research into a **social distancing monitoring system** using cameras. This development consists of a portable computer, a switch and at least two 2D cameras, each recording images from a different viewpoint. Specific software then analyses these images and the system issues warnings per room, increasing both employee awareness and safety. In addition, it provides the opportunity to identify certain **problem areas within the company** and adjust processes. Flanders Make also worked out an infra-red screening system to register temperature increases. In cooperation with thermo-graphic experts, we were able to develop a technique that takes into account the frequency and target of the measurements, as well as the outside temperature and the potential application on a larger scale.

“Every crisis leads to innovation. Flanders must take the lead in innovation during this crisis. Here at Flanders Make, we can see the great results that this can lead to.”

— **Wouter Beke, Flemish minister of Welfare, Family, Public Health and Poverty Reduction**

Finally, we conducted **crowd monitoring** studies, including the use of Bluetooth transmitters and receivers to **accurately measure** the **capacity of buildings**. In a parallel project, Flanders Make also developed an optimisation tool to **automatically maximise the number of possible seats in a room**. The tool thereby takes into account the applicable safety measures and can thus **minimise** the **loss of capacity**.

In short, Flanders Make developed a range of technologies in 2020 that help to curb the spread of the virus and that companies can use to get back to work safely.

## SERVICES SUPPORTING A SUCCESSFUL DIGITAL TRANSFORMATION

Together with companies, we perform pre-competitive research into shared challenges. In addition, companies can also appeal to us for specific research issues. They can call upon our knowledge and services to develop a new concept, validate a solution of their own or perform extensive tests in our high-tech research facilities.



PUNCH POWERTRAIN



“Flanders Make was a reliable partner for the specific support that we required.”

– Ruben Dekeyser, Advanced Technology Engineer  
Punch Powertrain

Customised research and algorithms

Punch Powertrain is an independent developer and manufacturer of transmissions and powertrains for (smart) vehicles. Their energy-efficient systems take into account variable conditions such as driving style and road surface. With this in mind, the company conducted research into driver style adaptation and road type recognition. Flanders Make also works on these contextual data through machine learning and supported Punch Powertrain with parallel research into which type of machine learning would give the best results. Flanders Make immediately shared the results with the developers of Punch Powertrain. This interaction had a synergistic effect for the research, with the parties using each other's knowledge to arrive at a more efficient solution more quickly. Flanders Make thus developed a good set of tools, enabling Punch Powertrain to analyse measurements and parameters faster and more reliably.



RESORTECS

Prototype- & validation partner

Clothes often contain different materials, which makes it difficult to recycle them in one piece. In addition, used garments are difficult to disassemble: most of the stitches and rivets are difficult to remove. Resortecs therefore specialises in the production of fusible sutures. Without altering production processes, used clothes can be easily disassembled in special ovens. Because Flanders Make focuses its research on industrial applications, it is the ideal partner for Resortecs.

“As a start-up, you also learn how to run a business better by working with Flanders Make.”

– William Allouche - Technical Lead  
Resortecs

We helped them to develop and test all concepts by making available experienced engineers as well as prototyping and test facilities. Both teams worked together on creating test schedules, building prototypes and validating the acquired data. In this way, Resortecs obtained unambiguous test results and is currently on the verge of building the most efficient oven for garment recycling.

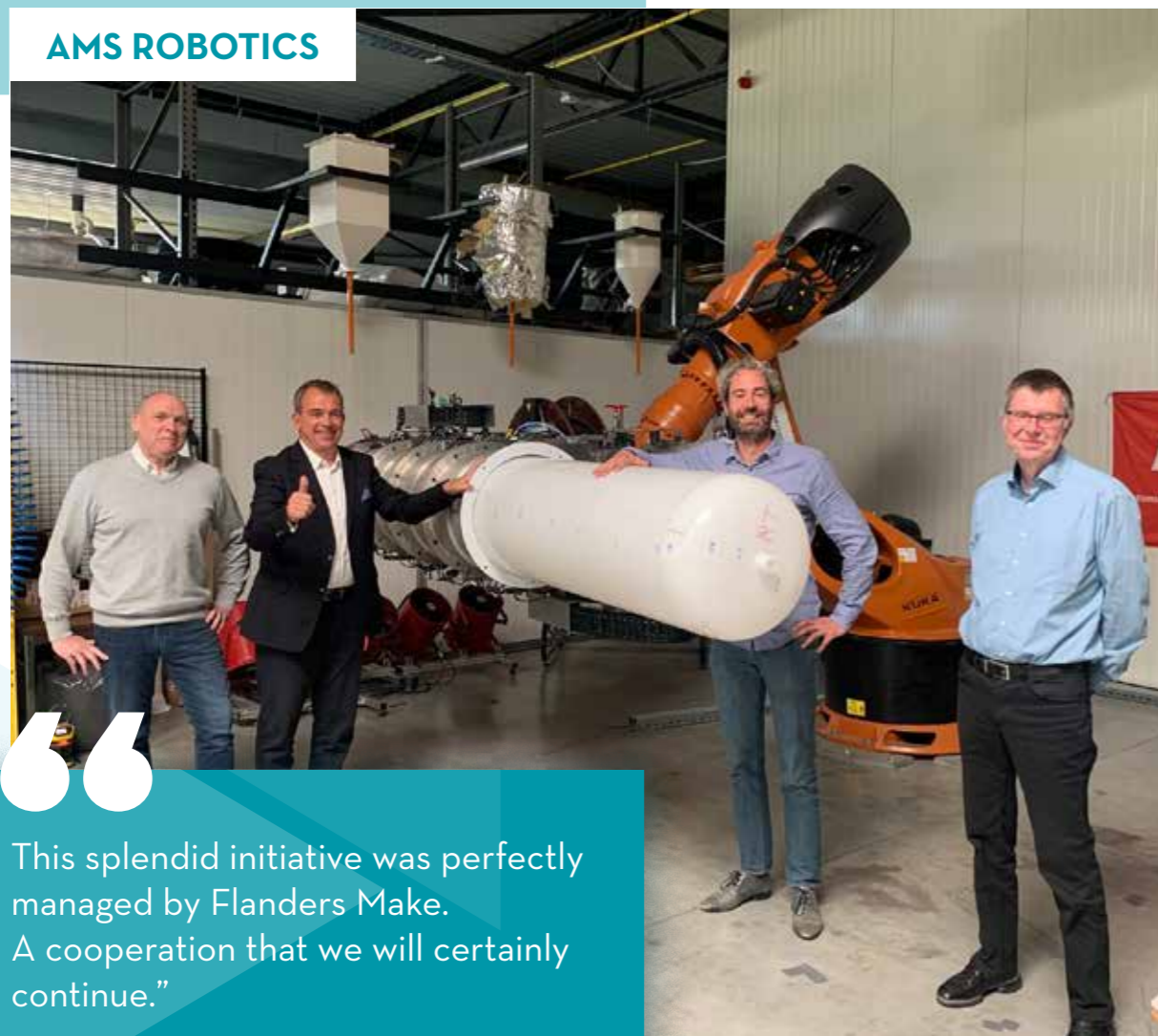


“Thanks to Flanders Make, we now have the knowledge to build this particular oven.”

– William Allouche, Technical Lead Resortecs



AMS ROBOTICS



This splendid initiative was perfectly managed by Flanders Make. A cooperation that we will certainly continue.”

– Johan Potargent, CEO AMS Robotics

Flanders Make facilitates new research network

A group of international companies, universities and research centres in the Maas-Rhine region are pooling their knowledge in 'Light Vehicle 2025': a European project conducting research into lighter-weight materials for the automotive industry. Flanders Make acts as project leader and unites the various companies, including AMS Robotics: a Belgian world leader in automation and robotisation. Flanders Make and AMS Robotics are working closely together on the optimisation of a hydrogen tank for the car of the

future. In order to guarantee lightness, the tank is made from polymers and reinforced with carbon fibre. AMS Robotics developed for this a unique variant of rotational moulding using a robot: a technique that is also making an impact outside the automotive industry. Thanks to the connecting and coordinating role of Flanders Make, the participating partners in Light Vehicle 2025 combine their knowledge to create a virtual technology centre for the automotive technology of the future.

PHARMACEUTICAL INDUSTRY



Thanks to the cooperation with Flanders Make, the pharmaceutical production in Beerse strengthens its pioneering position within the global Johnson & Johnson network in terms of automation and innovation.”

– Isabel Vanlinthout, Senior Manager Supply Chain Strategy & Support Janssen Pharmaceutica

The road to a digital pharmaceutical industry

Pharmaceutical companies in Flanders are betting heavily on digitalisation and emerging technologies such as artificial intelligence, Industrial Internet of Things, smart sensors and digital twins. This allows them to overcome challenges in terms of safety, quality and cost through the use of innovative production processes. Flanders Make supports these leading biotechnical and pharmaceutical companies through knowledge and studies and by making available validation and test infrastructure. Together with Janssen Pharmaceutica, we thus realised a feasibility study for collaborative robots. In this way, the company wants to take over repetitive actions from lab technicians in a flexible way, allowing them to focus on more crucial tasks and to prevent mental and physical overload. We are also working together on augmented reality, assisting operators with digital, hands-free instructions.



Pfizer, in turn, has also asked for our help in automating their packaging line with cobots. Finally, through our Make Lab, we introduced Sanofi employees to digital work instructions, virtual and augmented reality, 3D projections and programming and working with cobots.



AMINOLABS



This study gave us the confidence to invest in cobots.”

– Bert Aerts, Production Manager Aminolabs



From feasibility study to cobots

Aminolabs from Hasselt produces food supplements in powder form, capsules and tablets. Their customers each have their own brand identity, so the production process has to handle a variety of pots, lids and labels. Also the measuring spoons provided for the powdered supplements differ from brand to brand. This makes production very labour-intensive: an operator has to add these spoons manually before screwing down the pot. Aminolabs wanted to automate this diverse process and came into contact with Flanders Make via Voka.

The main challenge? Streamlining this complex process and setting up a feasibility study for cobots. In this process, we examined the physical systems, while Aminolabs analysed the installation options. It was essential that this automation process did not create a contamination risk between the different food supplements within the same filling line.

Flanders Make proved the feasibility by a practical test with different shapes of measuring spoons. In addition, we developed a concept proposal for installing the system on the filling line, including a cost estimate. Aminolabs can now with full confidence go for the most flexible system.

OCTINIUM



The visualisation of electromagnetic waves by Flanders Make hugely facilitated and accelerated our other developments.”

– Jan Anthonis, CTO Octinion

Autonomous robot for picking strawberries

Octinion develops, amongst other things, autonomous vehicles and localisation systems for the agricultural and food industry and has built a robot that can pick strawberries independently. In an industrial environment, everything often has a fixed location, which facilitates automation. In contrast, the working environment when dealing with organic products varies constantly due to the presence of branches, leaves and fruit. Within the scope of the SIT\_control project, Flanders Make and Octinion teamed up for the

development of control techniques so that a robot can process these variables and pick strawberries independently. This cooperation will be continued in another project studying ways to improve the localisation and increase the robot's productivity and intelligence. In 2020, a further digitalisation step for autonomous vehicles was taken through the joint development of a digital twin. This copy allows for more intelligent improvements and a more efficient maintenance of these vehicles.



SUPPORTSQUARE

Algorithm analyses (dis)assembly

The manufacturing industry faces many challenges as a result of the continuous updates to production processes and products. SupportSquare in Ghent assists operators in view of making full use of the potential of technical personnel. It does this through a mix of augmented and virtual reality, digital work instructions, remote visual guidance and virtual in-service training. SupportSquare applies these digital work instructions in its own platform: Passerelle Author. Flanders Make has been working with SupportSquare from the start. We developed a

conclusive algorithm that automatically analyses how to disassemble a product and at the same time examines the assembly. Thanks to the CAD-2DWI algorithm, the work instructions are faster and more accurate, which allows SupportSquare to focus, amongst other things, on increasing uniformity through an ISA standard. That is not the end of the development work: SupportSquare also wants to create data-driven instructions using 3D representations of the work cell, enabling the platform to generate virtual in-service training instructions for operators of its own accord.



“Flanders Make encourages us to define an international standard.”  
 — Ben Mahy, Managing Director SupportSquare

KERV AUTOMOTIVE



“Flanders Make is hugely proactive in sharing knowledge and expertise. And they are following up on our project very closely.”  
 — Arjan Voorbij, CEO Kerv Automotive

Development and testing of tilting vehicle

Start-up Kerv Automotive has been working on the development of a unique tilting vehicle since 2016. It combines the comfort of a car, the driving style of a motorbike and the feel of an aeroplane. For example, the Kerv's cabin tilts along in the curves just like a motorbike. So there is a strong piece of technology under the bonnet. Kerv Automotive is aiming for a launch in 2023. In addition to the current internal combustion engine version, the focus is also on the development of an electric variant. From the moment Kerv Automotive contacted Flanders Make, our account managers acted proactively and closely followed the development of this unique car. Our engineers helped, among others, with the installation of the highly specific electronic components. In addition, the



Kerv vehicle is being extensively tested at our site in Lommel. In view of the upcoming production, the company also wants to prototype the electric powertrain in cooperation with Flanders Make. Finally, Kerv plans to carry out additional tests and analyses, supported by our knowledge and facilities.





## CNHi investigates the feasibility of autonomous agricultural machinery

A tractor that drives across a field without a driver and starts working there on its own? It may still sound as science fiction, but it will be a reality within a few years' time. Flanders Make developed the first self-driving tractor in our country that can take over all kinds of tasks from farmers. Highly accurate GPS infrastructure, AI, sensors, cameras and scanners ensure that the 'agribot' can operate in harsh conditions. The tractor also recognises objects and knows how to carefully handle transport goods, which enables it to perform all kinds of repetitive tasks. Such innovations help farmers to work more efficiently and in a more sustainable manner and to overcome labour shortages in the sector.

“Autonomous agricultural vehicles increase production as they can work day and night. They can also tackle labour shortages and take over annoying, monotonous tasks from farmers.”

— Chris Ganseman, Technical Project Manager Flanders Make

In a similar way, we are developing smart fork-lift trucks that scan the environment and calculate new motion routes, away from obstacles. Self-driving is easier to implement in agriculture and industry due

to the lower speeds, more predictable environments and a lower number of peripheral objects.

Finally, we ensure that each vehicle is multifunctional. The devices must be flexible to be efficient. In both agriculture and industry, we are evolving towards a situation where the operator steers these autonomous vehicles using an interface on his PC or tablet. Different machines will also work together in a flexible way, such as a drone and a tractor sharing information to analyse a field and then spray it more efficiently.

Agricultural machine manufacturer CNHi knocked on Flanders Make's door for support in autonomising their machines. We used our open research platform to collect ten terabytes of field data in only three weeks. This will allow CNHi to assess the feasibility of autonomous operations in the agricultural sector. This project not only provided them with essential technological components, knowledge and expertise, it also forms an important basis for the roadmap of autonomous operations for their machinery.

## Procter & Gamble optimises business decisions with a simulation model for inventory management

Developer of hygiene, care and cleaning products Procter & Gamble (P&G) wanted to thoroughly investigate the long-term impact of its stock levels. With this, the company hoped to improve the alignment of its inventory management with its production facilities and market demand. Flanders Make developed a licence-free simulation model, in which we extensively analysed the existing stock through modelling and validation. Based on the results, we defined several cause-effect scenarios.

“Thanks to this study in inventory management, we can avoid a cost impact of more than five million dollars a year.”

— Andre Convents, Open Innovation Specialist Procter & Gamble

P&G uses this simulation package to examine the inventory data of 700 products in view of optimising lead times, minimum order quantities and forecast

quality. In this way, P&G can test different scenarios with suppliers and anticipate them. This model also allows the company to validate stock adjustments by taking into account investments in new production units. The innovative company can thus perfectly assess the financial consequences and substantiate important business decisions.



## Social distancing solutions

From the start of the corona crisis, Flanders Make responded very quickly and developed technologies to help companies restart safely. Our research centre focused, amongst other things, on a social distancing alarm. Through targeted investments and efficient collaborations between researchers, Flanders Make succeeded in building a prototype after only a few weeks.

“Thanks to this social distancing alarm, we now have the right safety solution for every customer.”

— Alain Van den Broeck, CEO Option/Crescent

This alarm warns the wearer within a second if he or she needs to keep more distance from a colleague. Our researchers used Ultra-Wide Band or UWB technology, which comes from self-driving vehicles, among other things. With this wireless technology, you can accurately record the distance in all directions. The system is flexible, easy to install and does not require fixed infrastructure, it works entirely locally and also respects the privacy of employees. After successful tests, among others at weaving machine manufacturer Picanol, the technology was commercialised worldwide. The technology group Crescent secured the worldwide licence for this development. The group combines its technology company Option with IT player 2invision, Dutch integrator SAIT and public lighting-OEM Innolumis. As such, Option/Crescent is completing its product range of wireless IoT safety solutions.

## Highly reliable robotic assembly



At Atlas Copco, a manufacturer of innovative industrial machines, the manual assembly of an air compressor required a lot of time and resources. Together with robot supplier KUKA, the company looked for ways to automate this process.

“This innovation is very important for Atlas Copco Wilrijk. It enables us to remain competitive on an international level and tap into new markets.

– Karel Vennens, Team Leader Manufacturing Processes Atlas Copco

When analysing the assembly process, they came across a specific challenge: in the automated process, the robot would have to perform a peg-in-a-hole manipulation. This delicate operation was too complex and unreliable to automate on an industrial scale. Flanders Make searched for a robust solution through a

feasibility study. In our Make Lab, we built an assembly cell that repeatedly performed the specific peg-in-a-hole movement. After numerous tests, the research team developed reliable technology and software that had already successfully performed the operation over 500 times. The failure rate thus fell from 15 to less than 1 percent. Atlas Copco implemented the solution on an industrial scale in their factory and has been using the technology and software without any problems for a long time now. The company is currently investigating options to extend this automation to larger product variants.

“With our technology, we transformed a demanding manual assembly operation into an elegant automated work cell.”

– Asad Tirmizi, Robotics Researcher Flanders Make

## Simulation tool eliminates need for physical tests

The production quality of gears has a significant influence on the vibration behaviour of gear transmissions. If a production process causes significant deviations from the ideal gear geometry, the transmission errors and thus also the noise of a gearbox will increase.

“Time-consuming physical tests are a thing of the past thanks to Flanders Make’s well thought-out simulation model.”

– Yannick Meerten, Team Leader R&D VCST

Gear manufacturer VCST from Sint-Truiden wanted to drastically reduce the adverse effects of these deviations, but optimisation of the production process through physical testing took a lot of time and resources. Flanders Make therefore developed a flexible tooth contact model that predicts transmission errors in a gear, taking into account both elastic deformation and oil damping. The model is based on analytical calculations for gear stiffness and damping forces, and is also able to take measurements of the actual gear flank geometry into account, which makes it suitable for diagnostic purposes. VCST uses this model to study the impact of production parameters on the performance of gear transmissions, without having to carry out extensive physical tests. The model thus enables VCST to significantly speed up the overall design process of new gears.



## Optimisation of production processes at Bekaert

Flanders Make helped steel wire manufacturer Bekaert to optimise some of its production processes. We developed, for instance, algorithms for processing sensor signals as well as the corresponding hardware architecture, which enabled automatic and objective product quality checks. These checks used to be done manually by experts. The technology was a win-win for Bekaert: it freed up experts for other tasks and the repetitive automatic procedure improved the process. There were no more erroneous measurements due to human manipulation and the absolute accuracy improved.

We also contributed to the optimisation of a crucial partial process for the production of high-quality steel wire, implementing a learning control system that could dynamically adjust state variables and production parameters. This improved product quality and gave Bekaert an advantage over its competitors.





## Optimal efficiency through tools and methodologies

DANA is a global player in the field of drives and sustainable drive systems. Flanders Make researched and developed numerous tools and platforms together with DANA. DANA uses them to validate the feasibility of its latest innovations and fine-tune its products for optimal efficiency and robustness.

### PHYSIDOR portal

Flanders Make developed Physidor: an intranet tool that guides the development team during product development to include reliability as a factor in the lifecycle. Physidor is based on physics-of-failure (PoF);

the science of understanding causes of failure. The portal describes each component with a certain PoF factor and also offers process guidelines, a qualification programme and a modelling tool for time-dependent failure risks. DANA uses this intranet portal to make the right decisions during the design process by selecting the components with the highest reliability. All engineers at DANA have access to the PoF methodology and the relevant use cases. Through this portal, the company also shares best practices with its international subsidiaries. As a result, each of their Electronic Control Units (ECU) is designed in a highly reliable manner.

### Central Variability Modelling (CVM)

Besides tools, our engineers also develop methodologies, which at DANA resulted in 'central variability modelling' and 'Simulink family modelling'. Both contain a set of methods that explain how companies can improve the development and validation process of software variants for controllers. These methodologies also make it easier to develop test models. To validate our research, we applied the methods to the control mechanisms of windscreen wipers. DANA is currently using the developed methods in the validation process for the software on its controllers: it allows the company to perform tests semi-automatically and build better test models.

### Optimal cooling for compact electric motors

Flanders Make also developed advanced direct oil cooling methods for the electric motor of integrated powertrains. It was important for DANA's customers that drives were both more powerful and more compact, which led to significant challenges in terms of cooling methods. Today's electric motors are often still cooled with air or water. With a more compact drive, this would no longer suffice. Flanders Make & DANA performed experimental tests to validate new more direct cooling methods where fluids are led directly to the heat source, thus improving motor cooling. In addition, Flanders Make also developed MotorCAD models and model calibration rules for this, which DANA now uses for a more accurate,

faster and more cost-efficient design process. With this, the company developed a prototype of a drive in which the same oil both lubricates and cools. DANA is now better positioned in the market as our tools enable it to do what its competitors cannot do yet.

“We are developing ground-breaking cooling systems and, thanks to the developed models and model calibration rules, are able to gain an advantage over our competitors.”

– Steven Vanhee, System Engineer DANA

### Modular simulation framework for evaluation of conceptual powertrains

Finally, Flanders Make designed a Matlab model library for drive components, consisting of object-oriented subsystems. Each component is scalable and can be combined to realise systems that are compatible with our Dynamic Programming-based design synthesis (CDS). DANA applied this methodology in a proprietary design framework to optimally simulate and visualise the behaviour of its drive components. DANA uses this library both to calculate and simulate the dimensions of the components and to optimise the existing systems with drive simulations. DANA also uses this tool to come up with new drive concepts and to evaluate the application of drives by its customers. Thanks to this approach, DANA is able to design drive systems in a structured way and to compare them optimally with minimum effort.

## Data exchange in operator support



With its Human Interface Mate (HIM) software platform, Arkite supports operators in a production environment using augmented reality. FlandersMake@UGent developed a generic semantic model for assembly information based on ISA-95, which was then adopted by Arkite. The model allows to define and store assembly work instructions and notes in a modular and structured way. Its implementation brings more structure to Arkite's databases. As a result, the databases now contain more data fields and Arkite

has been able to define a clear data processing strategy. With the ISA-95 export, the company can exchange procedures from other projects in a standardised and more automated manner.

In addition, the API offers a very flexible and real-time exchange format for third-party devices, e.g. tablets. Thanks to this model, the HIM will become more adaptive and dynamic. It also facilitates both data exchange with research facilities and the

“Data exchange is much more efficient when using this model of Flanders Make”

– Gert Claes, Product Manager Arkite

integration of new research results. Finally, it can also import complete instruction sets from other sources, which greatly reduces the configuration effort for the HIM.





Society will gradually realise that drones are a useful tool to make our living environment more efficient.”

— Petra Van Mulders - Drone Cluster Manager EUKA & Project Leader Flanders Make

Photograph:  
Droneport

**Petra Van Mulders**

Drone Cluster Manager EUKA & Project Leader Flanders Make

Progress, discoveries and developments go hand in hand. Also in 2020, Flanders Make anticipated the latest trends with novelties in test and validation infrastructure. Here, you can read about the most striking and prominent structural changes that we realised in 2020.

## Flemish Drone Federation EUKA joins Flanders Make

### The sky is not the limit

EUKA vzw, also known as the Flemish Drone Federation, transferred its activities to Flanders Make as of 1 January 2020. The 300 active members of EUKA are companies and knowledge institutions as well as independent drone pilots. After three years of operations as a cluster sponsored by VLAIO, EUKA vzw found a new strategic partner in Flanders Make. For Flanders Make, this is a huge asset: the impact of drones on daily life and in industry is growing noticeably. In turn, EUKA aims to accelerate, broaden and deepen the new drone economy by acting as a catalyst for connecting businesses, governments and knowledge institutions. In order to streamline the coordination of this new structure, Petra Van Mulders joined the ranks as Drone Cluster Manager EUKA and Project Leader at Flanders Make. Petra's background as a particle physicist at CERN in Switzerland contrasts sharply with the Belgian airspace. "I'm going from a world where I had to let things clash to a world where I'm not allowed to clash at all anymore", Petra says enthusiastically. "The world of drones has enormous potential to make processes more efficient and to gather more detailed information. For Flanders Make, it is the perfect way to extend its extensive expertise in moving or sailing vehicles to flying devices."

### Technology boost

"EUKA, as a sector federation, already had a wide network of companies, end-users and developers, but it lacked one major element: the ability to conduct its own research. Flanders Make allows us to address all challenges around automation, localisation, navigation, control systems, validation, environmental perception and work functions. In addition, we can finally focus on a combination of devices, such as connecting moving and flying vehicles. On the one hand, EUKA brings ideas for research and development projects with drones. On the other hand, EUKA is also prospecting for companies that want to participate in Flanders Make projects involving drones. Through this interaction, Flanders Make and EUKA can optimally anticipate the needs of the sector and, using laboratory research and test infrastructure, execute development projects at the request of companies. We are, as it were, building the long-awaited bridge between research, drone service providers and end users in different sectors."

### Stimulating innovation

EUKA wants to stimulate innovation as much as possible, which is why they are also active at Droneport, located at the old military airport in Sint-Truiden. "Here







we can use all the facilities of an airport: Droneport is an incubator where companies can temporarily set up base to conduct research. You have everything at hand here: a control tower, a runway and much more. We also carry out airspace tests and drone demonstrations. We do this not only in Sint-Truiden: we also show the possibilities of drones to farmers, the construction and logistics sector and the (manufacturing) industry. It is important that society understands that drones are useful tools that make our living environment more efficient. For example, a drone can deliver an AED defibrillator to a hard-to-reach location at lightning speed and thus save lives."

**Future**

"There are dozens of innovative drone companies in Flanders that offer added value to our society with their services or products. We discuss these innovations, for example, during our Droneport cafés: network sessions (note: online because of corona) in which some of the leading drone companies present their organisation or cutting-edge cases. Drones are extremely useful, so we continue to increase awareness in all manners possible; people often still react suspiciously to standard inspections by professional pilots. Give it some time, autonomous drones, like autonomous driving cars, will be self-evident in five or ten years. At Flanders Make, we can now finally translate the knowledge and technology for everything that drives autonomously to everything that flies autonomously."



**6<sup>th</sup> NeTWork**

One of the most ambitious and innovative projects is the 6<sup>th</sup> NeTWork, in which hardware and software developer DroneMatrix wants to roll out an industrial Internet of Things network together with drone traffic service provider SkeyDrone and telecommunications operator Proximus. Through this integrated platform, drones fly over Belgium in a controlled and secure environment for specific missions. The 6<sup>th</sup> NeTWork will have installations with drones at fixed locations, including transmission towers and a regulated airspace. DroneMatrix provides a drone-in-a-box for this: a remotely activated drone that flies autonomously to the desired location. There, it can analyse traffic situations, map out crowds and lend a third eye to emergency services. In time, this network could also serve to inspect wind turbines, cooling towers and more.

**Your own workshop at Flanders Make**

Through its infrastructure-as-a-service, Flanders Make enables companies to have access to high-tech research infrastructure. This allows them to assess, validate and demonstrate new products and processes. Gregory Pinte, R&D Manager at Flanders Make, explains: "It is a huge investment for companies to provide the knowledge and test equipment for this themselves. That is why we offer specialised test and validation infrastructure all over Flanders, where both SMEs and major players can optimise their products in real conditions. In addition, they receive guidance and support from our experienced researchers. They take charge of the innovation project and help the company to develop and market new products more efficiently."

**BUSINESS CASE: PICKIT**



Pickit in Leuven has been pursuing its world-wide ambition to give robots eyes for several years. Thanks to proprietary software, Pickit's 3D cameras connect seamlessly with familiar industrial robots. The company already worked together with Flanders Make on their innovative software ideas, but recently called on our infrastructure-as-a-service to develop its own robot gripper. The company was working on a process where robots have to grab objects from bins and thereby transformed a dumb, pre-programmed robot into an intelligent machine. They first considered renting a warehouse but soon found out that this would involve a considerable investment in both equipment and knowledge. Moreover, it would take several months of lead time to set up the whole process.

Flanders Make's test and validation infrastructure allowed Pickit to test and optimise this gripper, under the guidance of experienced engineers. Pickit got an industrial robot at its disposal and tested all possible bin picking scenarios on it, leading to in reliable success rates. As a result, the company was able to combine its plug-in solutions into one single marketable product: camera, software and robot gripper, all perfectly geared to one another. Pickit is now carrying out further tests itself, with our experts supporting them for a new add-on for the robot as well as assistance and knowledge in safety matters.

“Flanders Make offered us a workshop with industrial robot, including expertise to make the robot operational.”

— Bert Willaert, CTO Pickit





## The innovations of 2020

### According to R&D Manager Gregory Pinte

Flanders Make focused also in 2020 on technological innovations in product and production processes. More than ever, the focus is on open, collaborative innovation for Industry 4.0 and on helping all industries in their digital transformation. Our research led to some game-changing developments and we invested in several new infrastructures.

### SELF-DRIVING TRACTORS AND FORK-LIFT TRUCKS

We're expanding our research into autonomous vehicles towards the agricultural and logistic sector. Flanders Make has open test facilities where companies can test their technology and components under development in realistic ambient conditions. Our test platform for automatic off-road vehicles consists of a tractor and a connected open control platform. Within this platform, we can test the autonomy of agricultural vehicles through technology components such as AI.



### MEASURING INSTRUMENTS FOR LOCALISATION OF NOISE SOURCES



With this set of instruments, we can identify the cause of noise pollution in mecha(tr)onic systems or industrial set-ups. We have an acoustic camera and one- and three-dimensional intensity probes that allow us to map the emitted sound intensity in three dimensions. After having identified the dominant noise sources, we can then propose or help to develop appropriate measures to efficiently reduce noise pollution.

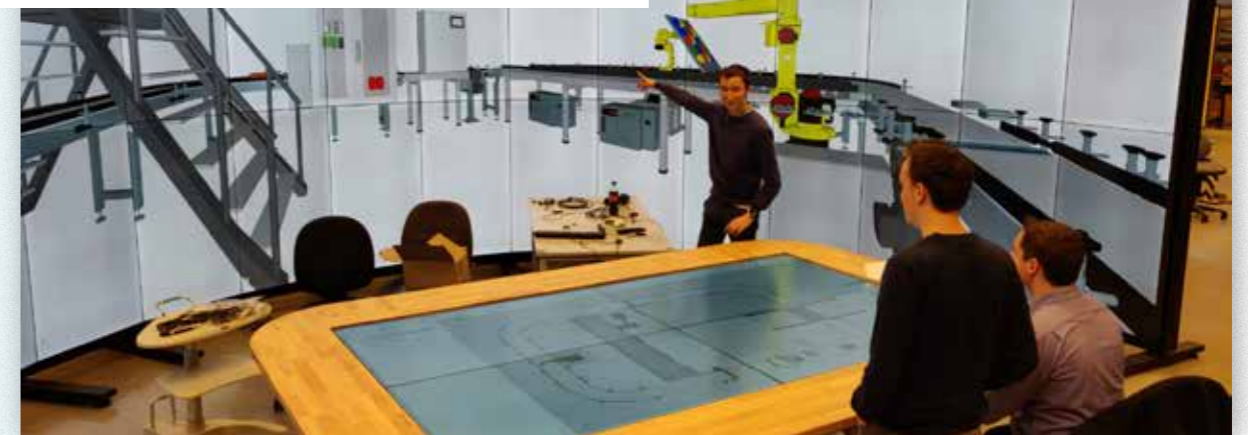
### MORE EFFICIENT DRIVING COMFORT



Flanders Make has two innovative vehicle platforms to support research into vehicle dynamics. Both vehicle platforms are based on a Range Rover Evoque chassis: one vehicle is validated for autonomy and the other is even fully electrified. Using these vehicle platforms, our researchers developed a unique solution: the combination of electric in-wheel motors and active suspension, which dramatically increases driving comfort, vehicle control and the safety of car drivers. The active suspension includes a fully automatic and intelligent shock absorber system that protects drivers from heavy blows when driving. Through

ride blending, the suspension and drive train are optimally synchronised: an important step towards the autonomous vehicles of the future. The current tests are performed both through the use of virtual models and by test runs on test tracks.

### DIGITAL TWIN CONTROL ROOM



The Digital Twin Control Room is a ground-breaking co-creation room in which we interactively facilitate both the design of production systems and decision-making using digital tools, tailored to each company. This control room consists of a curved half-circle video wall, in which powerful software provides real-time 3D visualisations. Using an interactive conference table with touch screen, we test virtual production environments or machines. This allows us to simulate potential production scenarios and evaluate their performance.

The possibilities are endless: design and evaluation of new workstations or internal logistics flows, but also stock planning and optimisation

**“We offer companies high-tech test and validation infrastructure in our facilities spread across Flanders.”**

– Gregory Pinte, R&D Manager  
Flanders Make

or even validation tests for automation projects. The room can therefore also be used for sales talks and operator training. Currently, we support four different engineering tools: Flexsim, Siemens Plant Simulation, Siemens Mechatronic Concept Design and Visual Components. Support for other emulation and simulation software packages is also possible.



## AUTONOMOUS GUIDED VEHICLES (AGV'S)



Autonomous logistics are essential in the factories of the future. The Flanders Make research team works mainly in Leuven on the cooperation between machines and mobile robots. For this purpose, it develops localisation methods that achieve a high degree of accuracy with assisting cameras. We are also testing autonomous mobile robots, which are used, among other things, to test the loading capacities of machines. An application of this is in progress at a large industrial player where we are testing how to automatically supply and remove full coils. At a later stage, we also want to connect the full coils to the production equipment, aiming for extreme precision.

## EXPANSION OF OUR SITES



R&D Manager Gregory Pinte is eagerly looking forward to the new test infrastructure in Kortrijk, but also emphasises the added value of the sites in Lommel and Leuven. "The building in Leuven is currently being used at maximum capacity. All labs are filled with test set-ups and new facilities. Here, we work together with leading players such as Picanol, Materialise and Vandewiele. The Flemish machine building sector is thus represented with top technology that we are constantly continuing to develop.

Our teams are also looking forward to the renovations at our research centre in Lommel. It will be a leading co-creation site, including meeting rooms and renovated offices. All infrastructure of the existing labs will be updated: this will be the place of choice for high-quality research into autonomous vehicles.

Finally, we are all very much looking forward to the new site in Kortrijk, where we will build a world-renowned training and knowledge centre with several flexible work cells. From the end of 2022, companies will be able to train here in the latest production processes and shop floor innovations towards Industry 4.0: unique in the world!

# LONG-TERM PARTNERSHIPS

Flanders Make works together with companies, knowledge institutions and other research organisations. Under the impulse of the Flemish Government, we join forces in one single innovation ecosystem. This significantly narrows the gap between theory and concrete applications matching the actual needs of companies.

Flanders Make continuously expands its infrastructure to optimally anticipate the demands of the industry. We enable companies to test both vehicles and machines in relevant conditions. In this way, we optimise production processes, implement the latest innovations and help to efficiently facilitate the transition to Industry 4.0. Check out all our facilities on <https://www.flandersmake.be/en/testing-validation>

# Our members' network

## Antwerp

- Achilles Design
- Agfa-Graphics
- Alberts
- Atlas Copco Airpower
- Avery Dennison
- Daf Trucks Vlaanderen
- Exmore
- Grammer Electronics
- Gumption
- Janssen Pharmaceutica
- PearlChain
- Reynaers Aluminium
- Scanbie
- Signify
- Soudal
- University of Antwerp
- Van Hool
- Voxdale

## Limburg

- AMS Belgium
- Arcomet Service
- Arkite
- Aversa
- Bewel
- Bosal Emission Control Systems
- Buseloc
- Cegeka
- Dentsply Implants
- Esma
- E-Trucks Europe
- Fixar
- Ford Lommel Proving Ground
- Hela
- Jabil Circuit Belgium
- Kerv Automotive
- Laser Cladding Venture
- Maex Precision-Production
- Meam
- Melotte
- Oerlikon Balzers Coating Benelux
- Pixelvision
- Provan
- Punch Powertrain
- Sabca Limburg
- Tenneco Automotive Europe
- University of Hasselt
- Vansichen Lineairtechniek
- VCST Industrial Products
- Vintiv
- ZF Windpower Antwerp

## East Flanders

- Automotion
- Azumuta
- D. Cloostermans-Huwaert
- Defawes
- Dynamic Dimensions
- Inverto
- Knapp Benelux
- Niko
- Objective International
- Ocas
- Pedeo
- Premium Sound Solutions
- Proceedix
- Recticel
- Skyhaus
- SupportSquare
- Gent University
- Van Hoecke Automation
- Volvo Car Gent
- Volvo Group Belgium
- Yazzoom

## Flemish Brabant

- 3D systems
- ABB
- Agoria
- Asco Industries
- Audi Brussels
- Camco Technologies
- Capvidia
- Comate
- CommScope Connectivity Belgium
- Elnor Motors
- Flexible Robotic Solutions
- I-Care
- Intermodalics
- Ivex
- Kapernikov
- KU Leuven
- Laborelec
- Leuven Air Bearings
- Materialise
- National Instruments
- Nikon Metrology
- Noesis Solutions
- Octinion
- Optidrive
- Powerdale
- Procter & Gamble Services
- RHEA System
- Robert Bosch Produktie
- Siemens
- Siemens Industry Software
- Siemens Mobility
- Sirris
- Terumo Europe
- The Kobi Company
- Toyota nv
- Transport & Mobility Leuven
- Vision ++
- Free University Brussels
- Xenics

## West Flanders

- Addax Motors
- Barco
- Bekaert
- Bombardier Transportation Belgium
- CNHi
- Constructie Lambrecht
- Cronos aan de Leie
- Daikin Europe
- DANA Belgium
- Deceuninck
- Delaware
- dotOcean
- e-BO Enterprises
- Flagstone
- Indigi
- International Car Operators
- Konfidi
- Logflow
- LVD Company
- Magnax
- Mariasteen
- NiniX Technologies
- Picanol
- Savaco
- TE Connectivity
- Televic Rail
- Tremec
- Unilin
- Vandewiele
- Vaskon
- VDL Bus Roeselare
- Vero Duco
- Vintecc
- Vitalo Industries
- Waak Sociale Werkplaats



“Through the European innovation hubs, the strongest developments from other regions come within reach.”

— Ger van den Kerkhof, Senior Accountmanager EU Affairs Flanders Make

In Europe, 99% of the industrial landscape consists of SMEs. Yet only a fifth of these companies are digitalised at a higher level. The European Commission wants to boost this number and therefore organised a closed call for a network of European Digital Innovation Hubs (DIHs). In March 2021, Flanders Make submitted its project proposal, together with partners Voka, LSEC, Howest, PXL and BPHOT and with the support of Imec and Sirris.

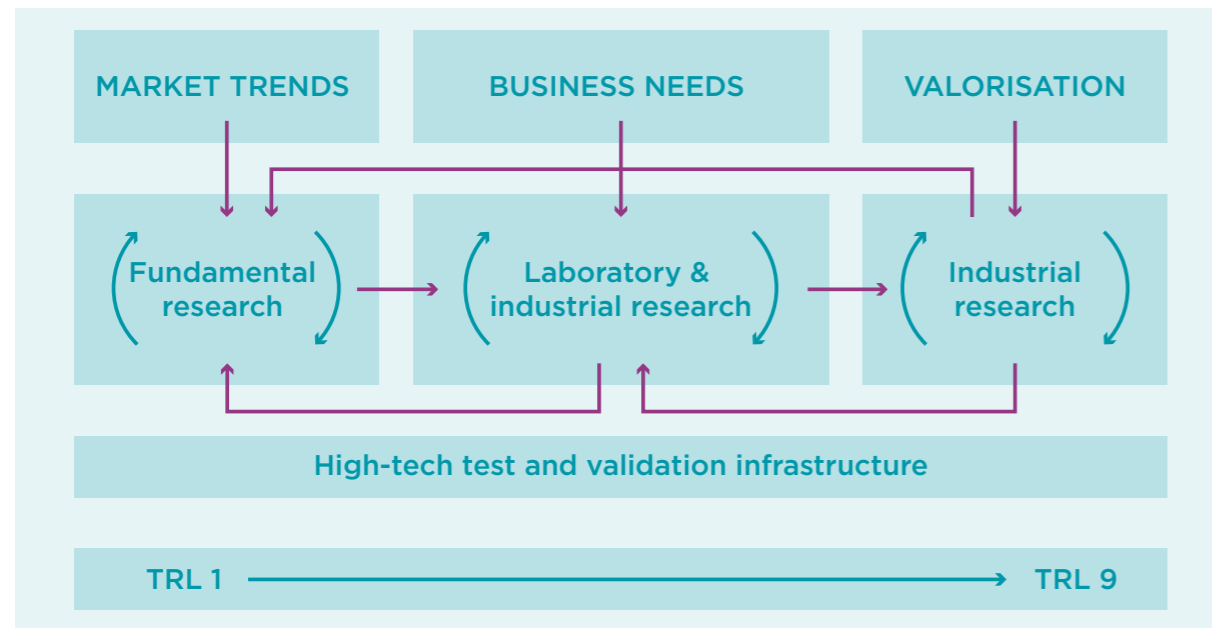
These DIHs are clusters of organisations that act as one-stop shops. These hubs provide four services:

- **Providing test infrastructure** to test new products and processes.
- **Offering a package of training** courses on digitalisation, with primary focus on AI, machine learning, high-performance computing and cyber security.
- Supporting companies in **finding the necessary investments**.
- **Bringing together end users** with potential suppliers and innovators so as to **develop new digital products or processes**.

As a technological partner and provider of R&D services, Flanders Make wants to use this hub to stimulate digital transformation in all Flemish SMEs through a wide range of services. Our project proposal therefore focuses firmly on Industry 4.0, building on the existing network of member companies and (international) partners. The benefits are immense: through knowledge exchange with other hubs in the European Union, **we increase the potential of our manufacturing companies**. This will bring innovations from other regions within easier reach. Moreover, this membership also generates additional European subsidies. Finally, we aim at valorising our knowledge on an international level.



# Circular innovation ecosystem? A word of explanation.



Flanders Make's operations result in a circular innovation ecosystem in which we systematically build knowledge and technology on all TRL (Technology Readiness Level) levels. This ecosystem contributes directly or indirectly to product and production process innovation, on the one hand, and to increasing the competence of the employees of participating companies and researchers, on the other.

At Flanders Make, we align our strategy with the short-, medium- and long-term needs of companies, identifying research topics on the basis of market trends and the needs of these companies. The research is then re-valorised in industry across sectors, locally and internationally. Our high-tech infrastructure for testing and validating products and production technologies helps companies to innovate. It enables companies to use our test environments without investing heavily in such equipment themselves, and they are also guided by our experienced researchers.

The challenges of companies thus lead to ICON (Interdisciplinary Cooperative Research) projects, R&D

(Research & Development) and B2B assignments. This generates solutions that, in turn, lead to new projects, be it fundamental research, SBO research or ICONs. In this way, we systematically build up knowledge and technology and create a circular innovation ecosystem.

This structured approach ensures:

- a stimulating dynamic between research instruments, results, core labs and competence clusters;
- a connection between research and this ecosystem.

### Bridging the 'Valley of Death'

Much research or new technology has difficulty reaching industry and therefore falls prey to the so-called 'Valley of Death'. Companies usually do not know which research institution they can best turn to for their own situation. Universities, for their part, are conducting intensive research into new technologies, but there is often a considerable gap that is difficult to bridge between the academic world and concrete industrial applications. The business and academic

worlds also speak their own language, so that the two worlds do not understand one another or do not seek rapprochement. At the start of Flanders Make in 2014, one of the goals was to tackle this 'Valley of Death' and close the gap between both worlds.

The creation of an ecosystem or value chain is central to us. It brings together all the relevant actors needed to make 'research for innovation' possible.

The creation of an ecosystem or value chain is central to us. It brings together all the relevant actors needed to make 'research for innovation' possible. Flanders Make acts as translator and removes all barriers to connect these different actors. The research results and cooperation allow for the transfer of knowledge. This creates an interaction: companies can radically improve their products and production processes, and researchers can put new knowledge and methodologies into practice in a very targeted way

### What is the role of Flanders Make?

Flanders Make acts as the hub in this ecosystem, together with the following essential partners:

1. Large and small innovative companies from different sectors.
2. Our academic partners, the research departments of all Flemish universities.
3. The researchers of the Flanders Make co-creation centres, which adapt the maturity of the research from usable in a lab environment to usable in an industrially relevant environment.
4. The government facilitating our activities through a covenant.

How does Flanders Make create added value for the manufacturing industry? Firstly, an industrially relevant strategy is defined and implemented by the circular innovation ecosystem as described earlier. All research and infrastructure projects, with the exception of fundamental research, will be evaluated on their scientific and industrial relevance and on their

contribution to the implementation of the industrially relevant strategy. This gives direction to the research and increases its applicability. By starting from the needs of companies and using the industrially relevant strategy as a guideline, we automatically connect with the industry and thus actively contribute to increasing the competitiveness of these companies.

Secondly, it is important to note that Flanders Make's activities are based on a pull mechanism rather than a push mechanism. Research starts on the basis of industrial needs. In each case, we examine what results are already available and what additional challenges may arise. In this way, our research will maximally result in industrial innovations that contribute to the further development of the economy and the prosperity of the region. Besides this, we also focus on the potential wider use of the results in view of generating maximum impact.

### Does this ecosystem also work like this in practice?

We thought it would be useful to check, after five years, whether the intended effect was also being achieved in practice. We investigated this on the basis of a volume analysis of our activities in 2019 at the different TRL levels. For practical reasons, the research figures (turnover of project operation) were grouped into four categories:

- **FR** – fundamental research
- **TRL2-4** – strategic basic research
- **TRL5-7** – cooperative research with industry
- **DISS** – broad dissemination: translation of results to innovation followers and other interested parties

The results are shown in Figure 1.

Figure 1 shows a high level of activity at the TRL5-7 level, i.e. cooperation with companies to convert research into innovations. There is also research at the lower TRL-2-4 level, preparatory research that can be transferred to companies. Ideally, we should be able to use these research results for multiple applications, thus creating a multiplier effect. In addition, we perform fundamental research: free, exploratory and preparatory research in view of building a pipeline for use at higher maturity levels. A higher maturity level also requires a proportionally greater effort, i.e. rev-

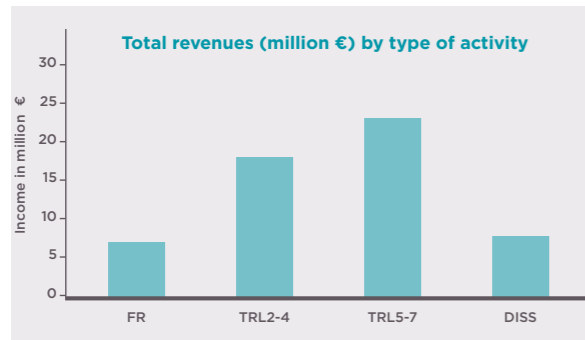


Figure 1: Circular innovation ecosystem and turnover by type of activity

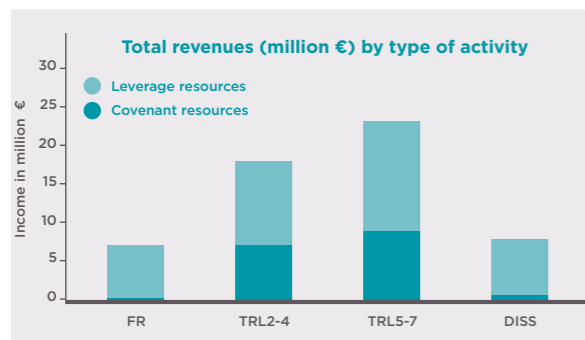


Figure 2: Circular innovation ecosystem and turnover by type of activity and financing through the covenant with the government and other financing sources

enues generated by research hours. Finally, we also pay attention to the further diffusion of the research results achieved from innovation leaders to innovation followers.

### Leverage resources

The government explicitly expects that the covenant funds are supplemented by at least the same volume of financial resources, raised from other sources. Figure 2 shows the leverage resources: revenues generated from industry, through Europe or other competitive research funding channels.

Figure 2 shows that the leverage resources exceed the covenant resources. This is a healthy situation where we use the covenant funds for 'de-risking' research and thereby create the opportunity to generate research projects and build infrastructure for implementing the research centre's strategy.

The aim is also to further strengthen our dissemination activities. To this end, a number of projects have already been worked out and approved, such as COOCK projects in which (basic) research results are accelerated through the introduction of technology or knowledge to a large group of companies, participation in digital innovation hubs (EU Trinity, DIHHELP, DIHWORLD, DIH Photonics), interregional projects (Cotemaco, Fokus, etc.), participation as a partner in the VOKA ERDF project (low-threshold digital experimentation facilities in the five Flemish provinces), SmartFactoryEU and the preselection for the European DIH Industry 4.0.

In 2020, 7 COOKS have been set up:

1. Vision in the manufacturing industry
2. Circular bonding
3. Connected Manufacturing
4. Condition-based Maintenance
5. Digital work instructions
6. COVID - Optimisation of number of seats
7. COVID - Remote Operator Support

We therefore expect that the turnover of the DISS activities will increase in future as shown in Figure 3.

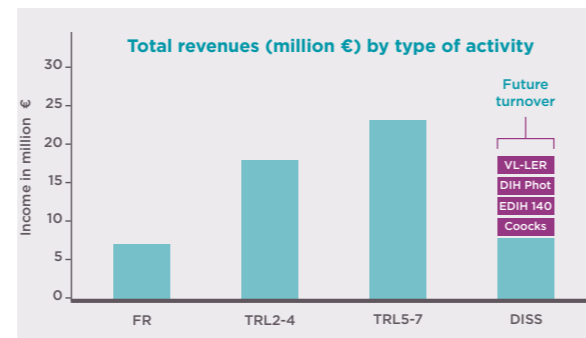


Figure 3: Circular innovation ecosystem and turnover by type of activity (evolution)

## The sustainable impact of efficient production



Yet, according to him, Flanders Make does more than this. "SDG 8 is, amongst other things, about workable work: here, we also play a role with innovations for operators, such as digital instructions through augmented reality. Furthermore, thanks to this technological progress, industrial production is also becoming more sustainable, which is in line with SDG 12. In addition, more efficient production is also better for the climate, thus addressing SDG 13. This includes our developments in the field of electric and hybrid drives for vehicles. Finally, we are paying a significant contribution to SDG 17, thanks to all the partnerships we are establishing in the industry."

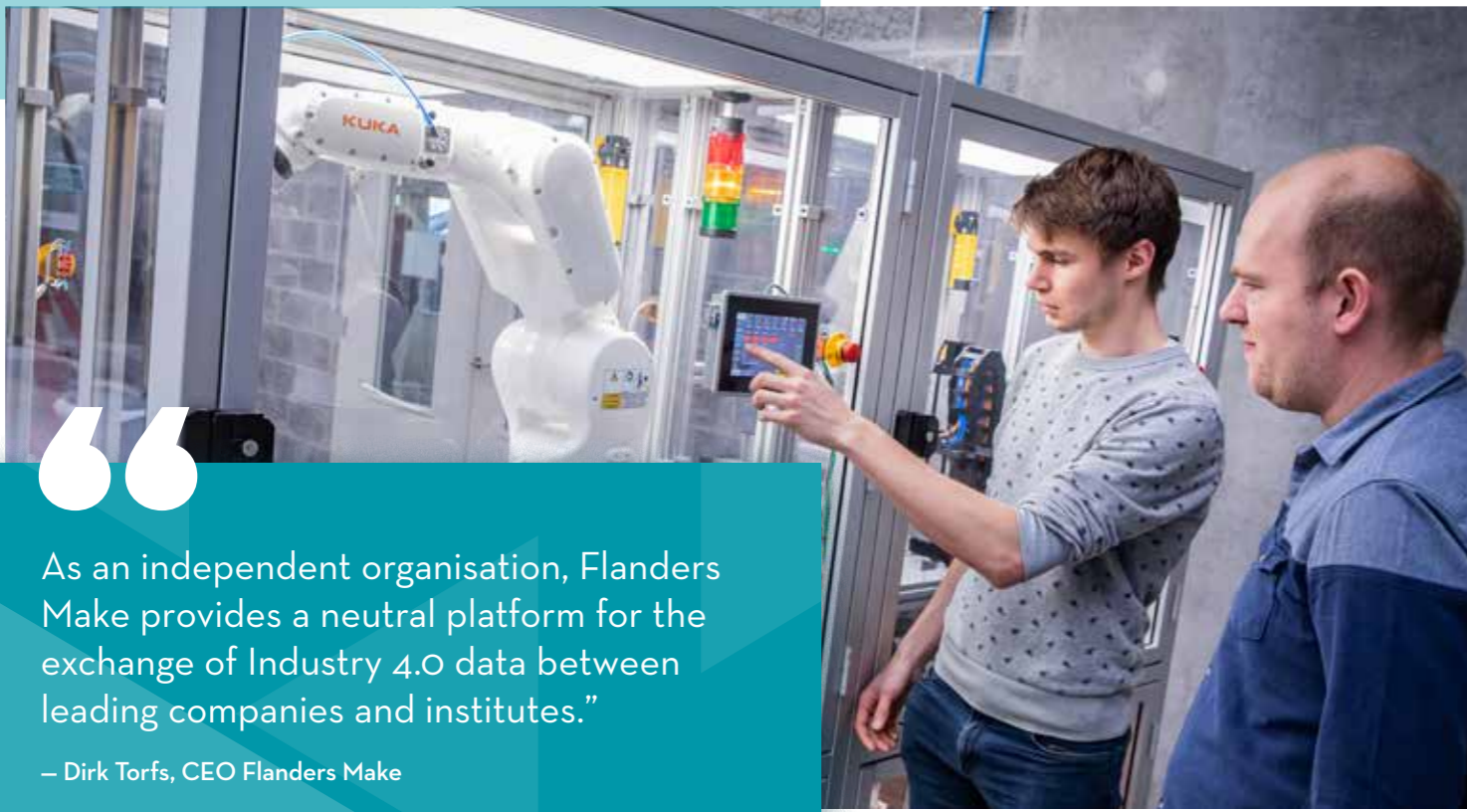
“The pandemic is allowing many companies to use their creativity to come up with more sustainable solutions, benefiting both our industry and the planet.”

In 2015, the United Nations drew up a list of seventeen Sustainable Development Goals or SDGs, ranging from poverty reduction and equal opportunities to better education and sustainable energy. Flanders Make helps to realise these goals by stimulating innovation in companies.

According to our CEO, Dirk Torfs, the most logical impact of Flanders Make situates itself in SDG 9: industrial innovations. "Using our high-tech test and validation infrastructure, companies can fine-tune their products and production processes. This makes heavy investments in infrastructure unnecessary and provides an answer to the ever-increasing drive for innovation."

And yet there is always room for improvement, concludes our CEO. "There is a lot of potential in more efficient disassembly methods, improving and accelerating the disassembly and reuse of products and production technology. It is crucial to consider the potential disassembly for later reuse in the early stages of the design process. This kind of sustainability challenges will become increasingly important for both our operation and companies. Because of the corona crisis, for example, manufacturers are already opting more for local suppliers: much more environmentally friendly in terms of impact. As such, the pandemic is allowing many companies to use their creativity to come up with more sustainable solutions, benefiting both our industry and the planet."





As an independent organisation, Flanders Make provides a neutral platform for the exchange of Industry 4.0 data between leading companies and institutes.”

– Dirk Torfs, CEO Flanders Make

## SmartFactory

Our current factories are mostly geared to mass production: large quantities of the same products. However, ever more customers expect customised products within short delivery terms. In SmartFactory Benelux, Flanders Make joins forces with companies to provide answers to these challenges of production companies within the Benelux. These partners carry out research and development projects focussing on Industry 4.0 and the factory of the future.

Flanders Make creates the perfect framework for this. Because we are an independent organisation, we can offer a neutral platform for exchanges between leading companies and institutes in connection with Industry 4.0.

A larger umbrella organisation under the name of SmartFactory EU was established at the end of 2019, together with partners BrainPort Industries from Eindhoven and SmartFactory DE from Kaiserslautern.

### Purpose

It is essential that our factories transform into flexible, smart and digital workplaces. The focus of the SmartFactory initiative is entirely on smart manufacturing

and Industry 4.0. According to our CEO, Dirk Torfs, SmartFactory works in two ways. “On the one hand, we want to establish partnerships working on smart manufacturing technologies between European R&D centres. On the other hand, we are launching joint research projects, entirely focussing on Industry 4.0.”

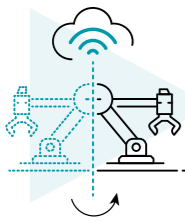
### Process

“The SmartFactory demonstration projects contain a varied mix of brainstorming sessions, development of a vision for Industry 4.0 and implementation of the results. The SmartFactory partners built a mobile production unit as demonstrator that, thanks to state-of-the-art innovations, is able to make made-to-measure mass products. The intention is to show these techniques to the general public, for example at trade fairs such as the Hannover Messe. In addition, the strength of this project lies in the application of increased automation and AI. Finally, we also want to identify the bottlenecks in production through a data analysis of the production processes, after which we will optimise the production flow through extensive digitalisation.”

## BUILDING ON THE ROAD TO INNOVATION

To help the very diverse range of manufacturing companies in their innovation efforts, Flanders Make has subdivided its high-tech research in four dedicated competence clusters. Every cluster focuses its research on specific domains.

## COMPETENCE CLUSTER



### Design & Optimisation

The competence cluster Design & Optimisation focuses on innovations that support designers during the design process. As products become increasingly complex, it is essential for this cluster to develop methods and tools that help to optimise design choices. The correct implementation of digital trends is key to this.

“Through multidisciplinary design methods, we help to optimise the design process without losing time.”

— Paola Campestrini, cluster manager Design & Optimisation

Nowadays, integration problems mainly arise during the final phase of the design process. According to cluster manager Paola Campestrini, it is more crucial than ever to eliminate these problems. “In our society, most products and applications are mechatronic: they consist of a mix of different hardware and software. Different departments often work separately on the design of individual pieces of technology, which sometimes leads to problems being identified too late in the design chain. In addition, there is an ever-increasing need for lifecycle designs: we want to incorporate future-proof functionalities into a design that is, amongst other things, easy to assemble. This makes a reliable design process extremely complex.”

“So, we need more frequent and better communication between engineers from different disciplines: both the mechanical or control and software engineers in the design phase, and the process engineers in production. Before the corona crisis, there was still an informal flow of information on the shop floor, but that does not suffice. To really avoid integration problems, we have to list all influences and effects of design choices in the different disciplines on the final behaviour of the mechatronic product. It is best to map this as early as possible in the design process. That is why we are focusing more on techniques such as ontological models and virtual co-simulation. In this way, we can optimally capture these cross-disciplinary influences on system performance.”

### Optimisations: within and beyond the mechatronic world

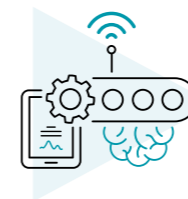
“Our cluster continuously develops new tools and methodologies to test the impact of the designers’ choices on the integration. This allows us to identify causes and update the design process. There is an additional challenge here: these tools receive a data flow from various sources, which requires optimal data management. In the ever-growing digital world, we must work towards innovative processes that process all field data as efficiently, uniformly and accessibly as possible.”

“A nice spin-off of our optimisation projects is related to the corona crisis. We’ve developed tools that analyse seating options in restaurants and large indoor spaces. This optimisation is done completely offline: we calculate the maximum utilisation based on the available surface area and the size and quantity of tables or chairs. Then our tool draws a ground plan with a general set-up: a good example of how we can also apply our innovative calculations outside the mechatronic world.”

### Efficiency is key

“The design process is also becoming more complex due to the growing trend towards mass customisation and the subsequent exponential growth in the number of product variants. We want to manage this growing product family in a cost- and time-efficient manner. Therefore, we offer support to standardise components between the different variants as much as possible, as well as to streamline the assembly process. Together with the Flexible Assembly cluster and six companies, we want to start working on better work instructions for assembly operators and workstations very soon. The aim of the project is to efficiently generate digital work instructions automatically and at the right workstation for the variant that is being assembled at that moment in time. Efficiency remains our focus and is hugely important for achieving mass customisation in a sustainable manner.”

## COMPETENCE CLUSTER



### Decision & Control

For the Decision & Control cluster, the focus is on innovations in localisation, navigation, adaptive controls and decision support.

“We need more data to eliminate faults and bugs in AI. This will result in reliable algorithms.”

— Andrei Bartic, cluster manager Decision & Control

“The industry is producing more data than ever before. In this cluster, everything revolves around the interpretation of the obtained data within the right context and maximum utilisation of expert knowledge”, explains cluster manager Andrei Bartic. “In our cluster, we focus on three pillars: localisation and navigation for autonomous vehicles, adaptive robust control for mechatronic systems and decision support for operators of industrial production facilities. In all these research fields, automated, adaptive and robust data interpretation is central. We look at whether we have the right data, how we should interpret them and whether there is a difference with previous data.”

### Localisation and navigation

Localisation and navigation techniques are essential in building autonomous vehicles, such as automated mobile robots and autonomous drones. “Thanks to Ultra-Wide Band or UWB radio waves, we can locate places with poor GPS coverage, for instance inside a building or between high structures. SLAM (Simultaneous Localisation And Mapping) is another revolutionary technology that requires no additional infrastructure. However, it is very challenging to make this technology reliable in dynamic industrial environments. In the next step, we want to make localisation more robust by combining different localisation technologies and adding semantics. Using AI techniques, we use fixed elements in

the environment as reliable landmarks such as walls, fixtures and beams. In this way, autonomous vehicles navigate robustly in dynamic environments such as a warehouse, production hall or greenhouse.”

### The enormous potential of AI

Integration with AI technology is also crucial for the adaptive control of mechatronic systems. “AI promises better performances despite greater complexity. Current AI techniques, such as reinforcement learning, are too expensive for industrial applications in terms of hardware resources and training effort. One of our main research goals is to reduce the learning effort of these systems. Our expertise in modelling mechatronic systems will play an important role in this. Furthermore, AI techniques need to be tested and validated under strict industrial conditions. How this is to be achieved is still being studied. Nevertheless, there is huge potential in AI technology that we are not yet fully exploiting.”

### Operator support

For the cluster, there is still a lot of work to be done around decision support for operators. “In intelligent operations and maintenance, AI and digital twins support an operator in his or her decisions. In an interconnected world, companies have the means to learn more about the functioning of the mechatronic systems that they develop or use. Two major obstacles stand in the way of the widespread use of these technologies: the availability of both metadata and ground truth. So, above all, we need to acquire data and interpret them in their proper context. In addition to the measurements themselves, this requires knowledge of the operator’s environment and interaction with the operator. Therefore, we also prioritise reliable advice for operators. We do this by giving them transparent and clear arguments for the proposed actions.”



## COMPETENCE CLUSTER



### Flexible Assembly

The competence cluster Flexible Assembly performs research to support assembly and manufacturing companies on their path to digitalisation and customised production.

“The main challenge for companies like this is to switch to more flexible and cost-efficient assembly systems”, explains cluster manager (a.i.) Tom Munters. “This will enable customised production in small series without higher costs, which – in turn – will allow companies to respond more quickly to changing needs but also to crisis situations. Higher margins can be achieved by offering more unique and even individualised products. We examine how we can reduce the time required for introducing a new product variant into the production system and for converting the assembly line. It is important that an assembly plant can respond quickly to changes in volume and product mix without affecting costs, quality and/or performance. In a customised production context, we aim to establish the system requirements for the next generation of assembly systems, taking into account the industrial needs of the respective companies. For this, we will generate and validate innovative assembly concepts, architectures and models.”

“More customised production requires modular and flexible production lines”

– Tom Munters, cluster manager Flexible Assembly

“The Flexible Assembly cluster works together with companies from various sectors, we mainly work out solutions for assembly plants but also for manufacturing companies. We also work closely together with technology companies to develop these solutions. Currently, most of these assembly plants are not yet sufficiently flexible to manufacture customised products. The flexibility that is available is entirely based on the competences of their operators, so we’re still a long way off from real-time adaptive systems. We follow a value chain approach, linking the needs of assembly plants to technology solution providers and

integrators. This cluster acts as a guide for manufacturing companies in Flanders and assists them in their evolution towards digitalisation and Industry 4.0.”

“With our research, we first want to increase the flexibility of assembly systems by making these systems easily adaptable. In the next step, the systems automatically adapt themselves. For this, they rely on their own data and take into account other systems as well as the environment. Our research is aimed at constantly increasing this adaptability and making it more effective. Both companies that assemble everything manually and companies with a semi- or fully automatic production system will benefit from our research. We also strive for maximum modularity with modular models, robot skills and work instructions in view of combining these results later on into larger entities. This exchangeable, modular approach helps companies to manage the complexity of customised production. Also interoperability plays an important part: by connecting all systems with each other, they will mutually exchange information and become more intelligent. In the future, digital twins will also become crucial. This digital, virtual copy of a real workplace setting allows to already conduct simulations in the design phase, even before an actual mock-up has been made. In a next stage, this will also allow to automatically anticipate unexpected operational issues.” The introduction of planned or unplanned changes can also be easily validated digitally.”

“Finally, let us not forget the operators: they are an important link in dealing with this increased flexibility in a qualitative manner, but they also need more support as a result (think, for instance, of customised work instructions). With our research, we try to offer optimum support to operators, a/o by automating routine tasks and actions to the maximum extent possible. As such, the operators’ strengths are better used as we can deploy them for tasks that best meet their skills.” Think for example of their insights on quality, managing unplanned changes on the production floor or using their experience to train systems.”

## COMPETENCE CLUSTER



### Motion Products

Moving parts in machines and vehicles: that is the domain of work of the Motion Products cluster. Improving drive systems and the switch to a fully electric fleet are only two of our motives. In a mobile world, this cluster also strives for increased efficiency by digitally assisting transmissions and motors.

“Only by focussing on electric drives, we can tackle our mobility problem in a sustainable and cost-efficient way.”

– Patrick Debal, cluster manager Motion Products

The Motion Products cluster focuses on companies that are active in the development and production of machine and vehicle drives. According to cluster manager Patrick Debal, the cluster has a long-term vision as guideline. “We are committed to improving cost efficiency and sustainability. Thanks to our research, we will in ten years’ time have an electric drive that will work twice as well at the same cost. In other words, efficiency will increase considerably. The cluster also works hard on supporting mass customisation. We want to replace the mechanical couplings between movements by individual electric drives: this will make the step to customisation easier.”

#### Circular mobility

Within the circular mobility domain, a lot will happen in the long run. “Considering the general trend and the many specialisations, a mobility service model could become reality within ten years: people will purchase mobility instead of vehicles. We contribute to greening our society with vehicles or machines that in such circular system will be used more. In addition, the machines themselves are becoming

more and more sustainable: with lower consumption and a longer lifespan, also the costs are falling. Then there is the increasing demand for customisation: we are working on a rapid design process for machine and vehicle variants that are tailored to the customer’s needs. This includes flexible machines: they will enable manufacturers to accelerate the conversion of a production line according to the specific needs of customers.”

#### Cost-effective

The cluster performs research into the integration of four key technologies: component improvement, AI, design optimisation and digital twins. “At component level, our research into electric vehicles has led to a constant flow of improvements: new types of batteries, more efficient motors with less permanent magnetic material, a new generation of transistors for power electronics, and so on.

Our research in AI starts in the competence cluster Decision & Control. We develop their results further and apply them to drive systems. Thanks to this technology, our robots are working more and more autonomously and we are saving time by combining different movements.”

As for design optimisation, this cluster builds on the research performed by our competence cluster Design & Optimisation. “More customisation requires faster adjustments to the design, so we also focus on digital and partly automated design methods. We are also conducting in-depth research into digital twins, which helps us to provide a digital representation of any physical object. By running the digital twin in parallel with a machine, we can better monitor the operation of that machine. A better understanding of the operation, in turn, reduces wear and maintenance and increases cost efficiency.”

# Companies per competence cluster

## Decision & Control (26)

3D Systems  
Atlas Copco  
Bekaert  
CNHi  
D. Cloostermans-Huwaert  
Daikin  
DANA  
dotOcean  
I-Care

Intermodalics  
Janssen Pharmaceutica  
Laser Cladding Venture  
Maintenance Partners  
National Instruments  
Nikon  
Octinion  
Picanol  
Punch Powertrain

Siemens Industrie Software  
Televic  
Tenneco  
The Kobi Company  
Vandewiele  
VCST  
Yazzoom  
ZF Wind Power

## Design & Optimisation (18)

Atlas Copco  
Barco  
Bosal  
CNHi  
D. Cloostermans-Huwaert  
Daikin

DANA  
Grammer Electronic  
Noesis  
Picanol  
Punch Powertrain  
Recticel

Reynaers Aluminium  
Tenneco  
Siemens Industrie Software  
Vandewiele  
Van Hoecke Automation  
Voxdale

## Motion Products (15)

Atlas Copco  
CNHi  
DANA  
D. Cloostermans-Huwaert  
E-Trucks

Inverto  
Leuven Air Bearings  
National Instruments  
Picanol  
Powerdale

Punch Powertrain  
Siemens Industrie Software  
Tenneco  
Vandewiele  
VDL

## Flexible Assembly (27)

ABB  
Achilles Design  
Arkite  
Atlas Copco  
Barco  
Bekaert  
CNHi  
Daikin  
DANA

D. Cloostermans-Huwaert  
eBO-Enterprises  
Flexible Robotic Solutions  
Janssen Pharmaceutica  
Mariasteen  
Niko  
Picanol  
Reynaers Aluminium  
Sabca

SupportSquare  
Tenneco  
Terumo  
Procter & Gamble Services  
Vandewiele  
Van Hoecke Automation  
Vitalo  
Waak Sociale Werkplaats  
ZF Wind Power

# ORGANISATION

Flanders Make is the research centre for the industry and its digital or Industry 4.0 challenges. We stimulate innovation, both in SMEs and large companies, through excellent research in the field of mechatronics, methods for developing products and technology to make them. The results are applicable to a wide range of companies that often face similar technological challenges. Together, they can innovate better and faster. We also take this approach across national borders. We set up international innovation partnerships and participate in European research projects. Flanders Make consists of three co-creation centres (in Lommel, Leuven and Kortrijk), the Flemish drone federation EUKA in Sint-Truiden and labs at the five Flemish universities.





## Our people speak the language of the industry.

Flanders Make continued to grow internally in 2020 in order to respond to the technological needs of Belgian companies. In the past year, we have especially seen an increase in industrial profiles, which helps us to identify the challenges of companies even better.

The organisation shows a healthy, stable growth. In 2020, we saw a ten percent increase in the number of full-time equivalents. Our brand awareness is growing among both industrial companies and research institutions. As a result, we received noticeably more applications from experienced engineers and researchers from various fields, ranging from AI specialists to powertrain experts. This diversity generates a lot of new ideas, which benefits our core business.

### Building bridges

In terms of profiles, we've achieved over the years the optimum balance between industrial experience and

research experience (from universities or other research institutions, for instance). About sixty percent of our researchers have industrial experience, which makes for an ideal mix. In fact, Flanders Make acts as the bridge between basic research and the application of these research results in industry. Our people must therefore have sufficient knowledge of the needs of the industry: it is essential that they know what is going on and where the priorities lie.

### Over 1000 years of experience

The sum total of all the years of industrial experience of our employees is more than one thousand years: an unbeatable number. We also work on team spirit: the feeling of working together. Many projects run simultaneously, which makes the job versatile, you learn quickly and everyone's network broadens. There is constant exposure to different applications, technologies and sectors. In this way, we create broader support among our personnel: people with industrial

experience learn from the more research-oriented employees and vice versa. Everyone works together on the same mission and creates added value for the Flemish industry through technological development. All this creates at Flanders Make a very pleasant work atmosphere as well as a sense of togetherness.

### Work atmosphere

We do everything to make our people feel at home at Flanders Make, even during lockdown periods. Thanks to our flexible organisation, we were able to switch to teleworking quickly. In some cases it is more difficult, because - obviously - not everyone has a robot or machine in the garden. Fortunately, our laboratories are very spacious so that sufficient distance can be maintained and we limit the number of people who may be present at the same time. We also had to train newcomers physically, but here too we took the correct precautions. There have been no infections at our workplace, which is also thanks to our own social-distancing alarms that help to respect distance. Furthermore, we are very active in resilience moments: informal online activities. Think of weekly phone calls, coffee moments, sports sessions, online yoga and cafeteria, newsletters and much more. Those are the moments when we connect everyone from a distance.

### Future

There is a need for more digital natives in our society. Through our FabLabs, we are going to focus more on supporting STEM projects in schools, particularly aiming at young students and introducing them to technology. In addition, our own steady growth also requires more guiding members of staff. We focus on technical project leaders and business developers who think more broadly and will build an ecosystem of contacts. Finally, every year, one in ten employees is promoted: those who show potential can therefore grow quickly. From this vision, we are armed for the imminent digital future.





# Board of Directors



## At the back, from left to right

- Carine Smolders (up to 04/2020)
- Eric Sleenckx (up to 04/2020)
- Ignace Lemahieu
- André Bouffieux
- Inge Stoop
- Erwin Dewallef
- Koenraad Debackere
- Paul Snauwaert
- Herman Derache
- Jochen Vincke

## At the front, from left to right

- Geert Ostyn
- Sonia Van Ballaert
- Urbain Vandeurzen
- Sylvia Lenaerts
- Dirk Torfs

## Are missing on the picture:

- Katrien Wyckaert
- Leo Van de Loock
- Andy Pieters (as from 05/2020)
- Wim Verelst (as from 05/2020)

# Advisory Board

## Industrial advisory board

Miguel Dhaens	Tenneco, Driv
Carl Eeckhout	Televic
Goedele Heylen	Ramen Engels nv
Marnix Lannoije	Cargobull Telematics
Koen Maertens	Maertec, Duco
Dominique Maes	Vandewiele
Jos Pinte	ex-Agoria
Koen Reybrouck	Reycon
Paul Snauwaert	CNHi
Frans Van Giel	ex-Beaulieu
Herman Vanderauweraer	Siemens Industry Software
Bart Vanderschueren	Materialise
Hans Vandesande	Atlas Copco
Eric Verhelst	ex-TE Connectivity
Piet Wauters	ASML

## Observer industry

Geert Ostyn	Picanol
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## Scientific advisory board

Thilo Bein	Fraunhofer, Germany
Russel Harris	Leeds University, England
Johann Hoffelner	Linz Center of Mechatronics, Austria
Werner Kraus	Fraunhofer, Germany
Minna Lanz	Tampere University of Technology, Finland
Felix Martinez	Ikerlan, Spain
Dimitris Mavrikos	EIT Manufacturing
Anne-Lise Høg Lejre	Danish Technological Institute, Denmark
Chris Gerada	University of Nottingham, England
Jochen Deuse	TU Dortmund University, Germany

## Observer universities

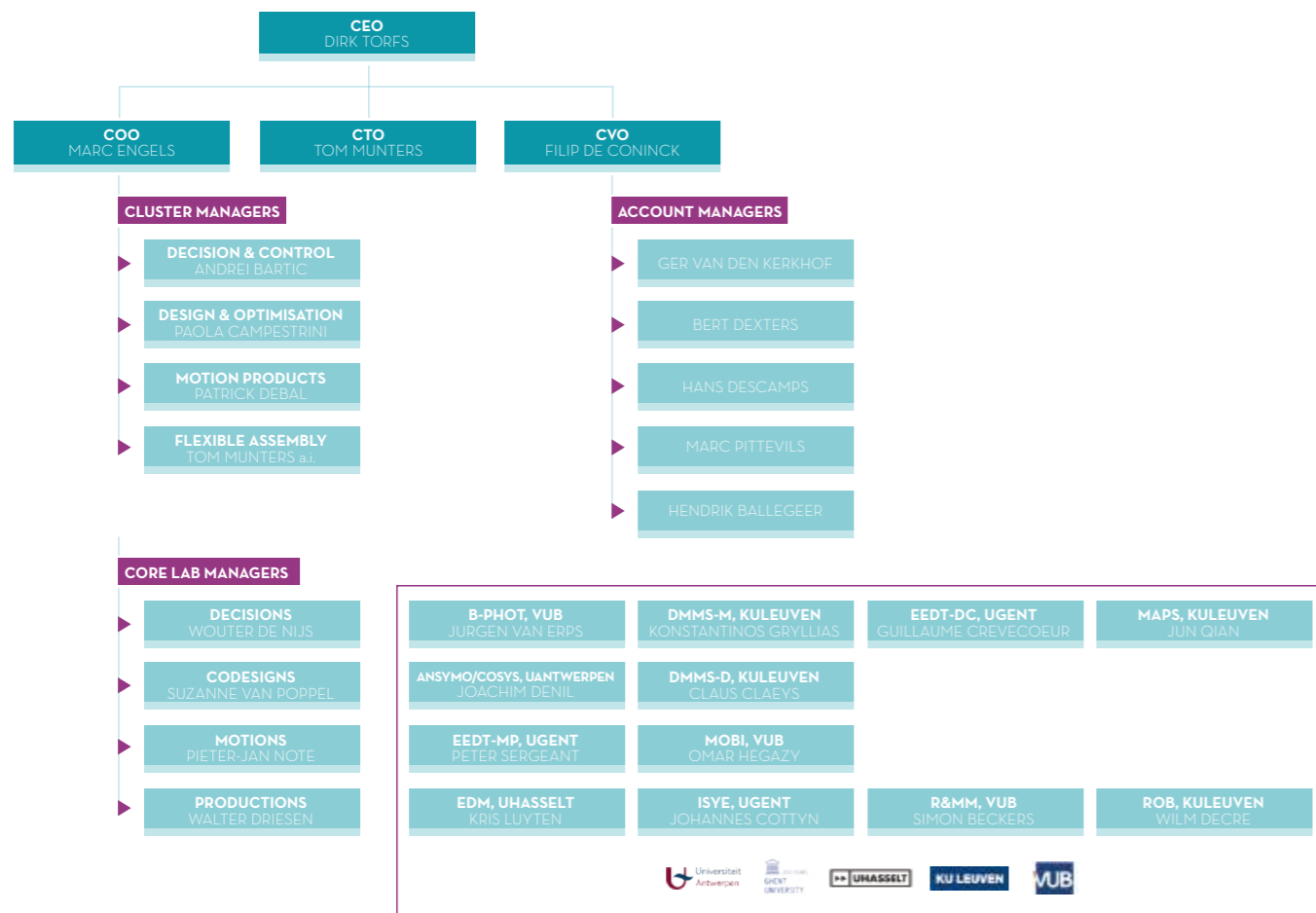
Hugo Thienpont	VUB
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## Central office

Dirk Torfs	Flanders Make
Marc Engels	Flanders Make
Filip De Coninck	Flanders Make
Tom Munters	Flanders Make

## Observer government

Leo Van de Loock	VLAIO
Erwin Dewallef	EWI





# Flanders Make

3 co-creation centres, the Flemish drone federation  
EUKA and the labs of 5 Flemish universities



**70 MLN**  
EURO TURNOVER

**700**  
SPECIALISED RESEARCHERS

## FINANCIAL REPORT



### New building in Kortrijk

“In 2021, we will start the construction of our highly innovative co-creation centre in Kortrijk. The plans have been refined in recent months. We’ve never stopped to further develop the infrastructure either. Through seven flexibly connected assembly cells, we are turning this co-creation centre into the cutting edge of innovative assembly techniques. Products from, among others, machine builders Vandewiele and Atlas Copco will be assembled here in a test phase. The building in Kortrijk will thus become a real factory-for-the-future, thanks to the presence of the latest innovations in robotics, AI and human-machine interaction. Engineers and companies can train themselves in the latest technologies in this experience lab before implementing them in their own companies. The opening is scheduled for the third quarter of 2022.”



– Dirk Torfs, CEO



## Balance and year results

<b>ASSETS</b>	<b>102.839.605 €</b>	<b>REVENUES</b>	<b>21.931.740 €</b>
<b>Fixed assets</b>	<b>10.566.889 €</b>	<b>Turnover</b>	<b>20.233.083 €</b>
Intangible assets	165.316 €	FM covenant	13.537.605 €
Tangible assets	8.440.209 €	FM non-covenant	6.457.460 €
Financial assets	1.961.364 €	Membership fees & other	238.018 €
<b>Current assets</b>	<b>92.272.715 €</b>	<b>Other revenues</b>	<b>1.698.657 €</b>
Stocks and orders	17.482.466 €	<b>COSTS</b>	<b>22.160.207 €</b>
Accounts receivable within maximum 1 year	13.964.935 €	Salaries, social security charges and pensions	15.059.417 €
Liquid assets	60.161.290 €	Operating costs	7.072.334 €
Regularisation accounts	664.025 €	Other costs	28.455 €
<b>LIABILITIES</b>	<b>102.839.605 €</b>	<b>OPERATING RESULT</b>	<b>-228.467 €</b>
<b>Capital and reserves</b>	<b>18.643.025 €</b>	<b>Financial &amp; extraordinary result</b>	<b>- 8.984 €</b>
<b>Provisions</b>	<b>21.212 €</b>	<b>Use of reserves</b>	<b>492.883 €</b>
<b>Debts</b>	<b>84.175.367 €</b>	<b>RESULT OF FINANCIAL YEAR</b>	<b>255.433 €</b>
Debts falling due within maximum 1 year	38.451.886 €		
Regularisation accounts	45.723.482 €		

Flanders Make books a negative operating result for the financial year 2020. This result includes costs (€492,883) of specific research for which we have set aside reserves in the past. After using these historical reserves, we end 2020 with a positive result of €255,433.

## KPI 2020

	TOTAL 2019	TOTAL Q4 2020	TARGET 2020	TARGET ANNUAL GROWTH	GROWTH 2020 VS. 2019	% TARGET 2020
KPI 1.1 Publications	223	243	160	5%	9,0%	152%
KPI 1.1 Open access publications	136	161	128	11%	18,4%	126%
KPI 1.2 Conferences	285	247	210	4%	-13,3%	118%
KPI 1.3 EU participation	11.883 k€	13.807 k€	3.600 k€	9%	16,2%	384%
KPI 2.1 Tech. capacity utilisation	21	16	15	35%	-23,8%	108%
KPI 2.2a Reach among direct target group	47	47	39			144%
KPI 2.2b Whereof SME	22	22	13			169%
KPI 2.3 Industrial revenues	9.782 k€	8.993 k€	4.500 k€	8%	-8,1%	200%
KPI 2.4a Industrial reach	339	249	88		-26,5%	283%
KPI 2.4b Whereof SME	130	73	29		-44,2%	250%
KPI 3.1 Leverage						
Leverage income	44.633 k€	47.820 k€	28.260 k€	26%	7,1%	169%
Leverage	4,1	4,2	1,9	19%	2,4%	221%
KPI 3.2 Industrial leverage	7.561 k€	7.477 k€	2.250 k€	8%	-1,1%	332%
KPI 3.3 Strategic partnerships	5	5	2			250%
KPI 4.1 Cross-initiative projects	10	9	2	41%	-10%	450%
KPI 4.2 Dissemination range	144	491	31	12%		
KPI 4.3 Joint publications	36	37	21	4%	2,8%	176%
KPI Basic subsidy cooperation projects.	3	2			-33,3%	
KPI Extra patent	4	6			50,0%	





The background features several overlapping triangles in various shades of teal and light blue. A prominent dark teal triangle is located in the lower-left quadrant, while a large light blue triangle is in the upper-right. Other smaller triangles are scattered throughout the page, creating a dynamic, abstract composition.

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