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AKKODiS

Thinkers & Makers

A Smart Industry tech magazine, sharing insights and stories from the people that make incredible happen through their ideas & their actions.

Introducing The Seed:
Supercharging Innovation with LLM Based Copilots

Industrial IoT Showstopper: Shaky Wi-Fi on the Factory Floor

The Pain Relief Dosing Device Giving Patients Control

AKKODIS

Make Incredible Happen

Welcome to Thinkers & Makers, the Smart Industry Tech Magazine

Thinkers & Makers encompasses the breadth of our people and how we identify and solve problems at Akkodis. We are Thinkers who go beyond to drive innovation, and Makers who team up with clients and partners to turn those innovations into tangible solutions. Together, we enable a smarter, more sustainable tomorrow. This is the 'Smart' in Smart Industry...and it will be brought to life over and over again in this, and every issue of Thinkers & Makers magazine.

Boundary less Tech.

Jan Gupta
President Akkodis

Welcome to our latest issue of Thinkers & Makers – the Smart Industry tech magazine brought to you by Akkodis.

As a global digital engineering company and Smart Industry leader, Akkodis enables clients to advance in their digital transformation. We are a trusted tech partner that co-creates and pioneers solutions that help to solve major challenges, from accelerating the clean energy transition and green mobility, to improving patient centricity.

Underpinning all of this is our deep domain expertise.

Global Tech Practices

We have seven principal domains of technological expertise: Product & System Development, Validation & Verification, Manufacturing & Operations, Digital & Software, Data Analytics & AI, Cloud, Infrastructure & Security, and Wireless & Connectivity. Our competence in these 'tech practices' is at the core of everything we do.

This issue of Thinkers & Makers highlights examples that uniquely illustrate the depth and breadth of our tech experts' domain expertise, their ability to apply and integrate that knowledge to solve practical challenges for our clients, and their capacity to leverage it across industries and around the world.

You'll discover how our experts in Energy & Cleantech employ AI image segmentation to ensure the safe underground storage of CO_2. You'll also see how they combine expertise in Cloud, Wireless, Digital and Software practices to develop a variety of other solutions needed for the energy transition. Our teams leverage expertise in those same practices to develop a solution that helps safeguard a factory's critical equipment.

You'll read of some incredible solutions in Life Sciences & Healthcare – one where our teams have applied expertise in Product Development and Security practices to create a personalized medication dosing device, and another where the teams have taken drive technology used in the Automotive and Energy sectors to develop prosthesis that 'grows' with the patient. Another example of our cross-industry applications is seen in our 'Green & Bike' story, where our experts have incorporated technologies used in Aerospace and Transportation to develop a tricycle made of sustainable materials and powered by a mechanical battery.

You'll also get a glimpse of how we use tech for 'good'. You'll discover how a 'Hackathon' in the Nordics has helped improve the quality of life for children in Nepal, and how our CARE program helps to ensure that accessibility and inclusion are considered upfront in all projects.

You'll even become acquainted with 'The Seed' – a line-up of highly specialized AI agents that we're using to supercharge our own R&D teams. These agents enable our R&D experts to quickly iterate and explore ideas without getting bogged down in extensive research on topics outside of their own fields.

A Boundaryless Approach

Throughout the pages that follow, you will hear our Thinkers & Makers tell the stories of how these unique solutions came to be – and their passion is palpable. I'm proud of the work they do in a wide range of hi-tech domains, but I'm perhaps even more proud of how they apply and deploy the tech; they are able to exchange their knowledge, opinions and ideas with each other, with our clients and partners, across industries, and around the world. Our Akkodis teams operate within a culture of continuous learning and knowledge transfer across practices and geographies. Because of this, they're able to tap into the expertise of thousands. That said, no single individual, team or organization can bring about the Smart Industry transformation on their own, but it is this boundaryless approach that will move us all forward.

I hope you enjoy this edition of Thinkers & Makers and let's Engineer a Smarter Future Together!

Unlocking Decarbonization Through Digitalization

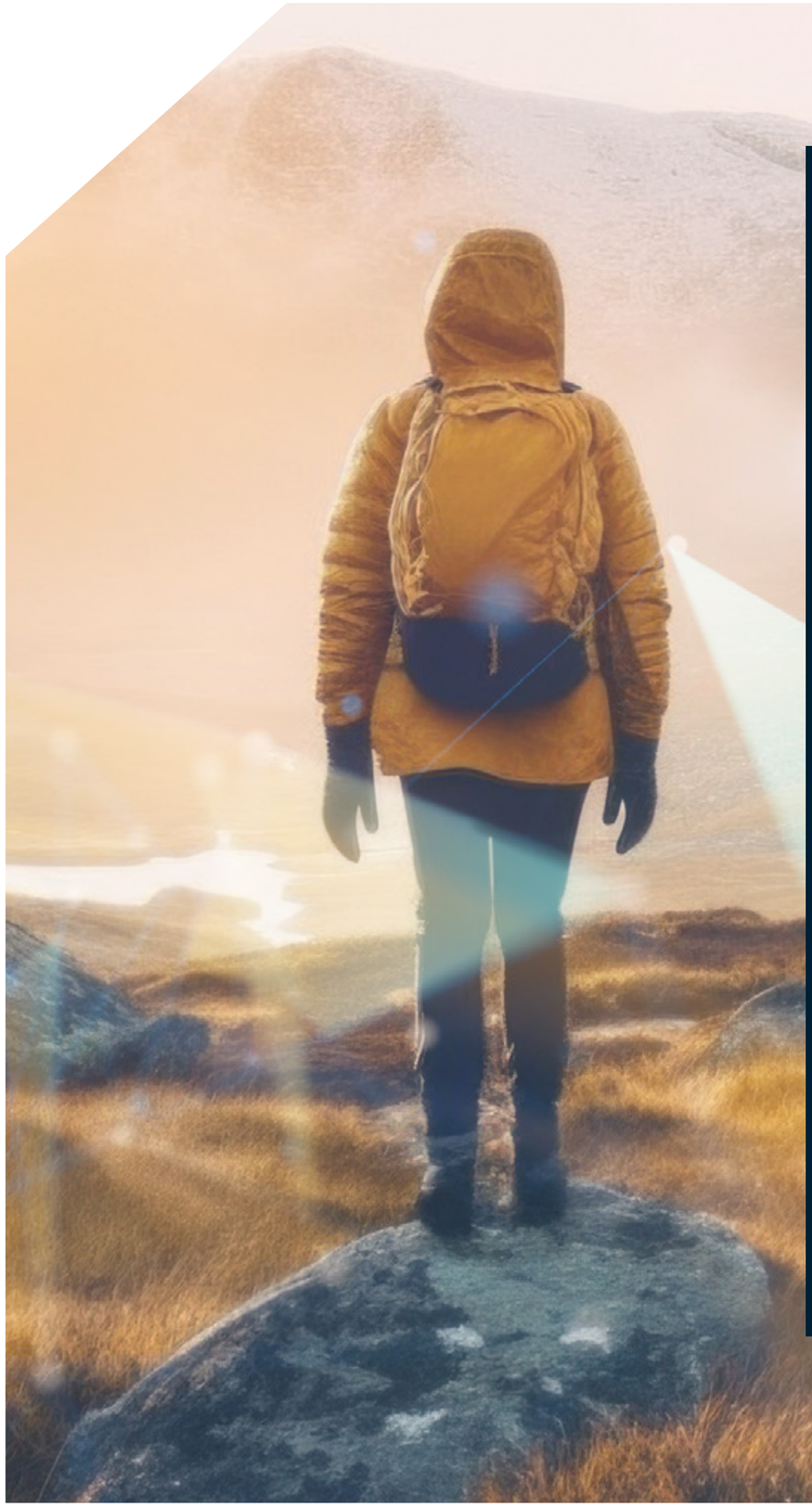
Emerging technologies open up the potential for making use of cleaner, greener energy sources but also provide opportunities to make the fossil fuel and nuclear industries more efficient, safer and less polluting.

Energy is a vital area of focus as global efforts to meet emissions reduction targets gather pace. In 2015, the landmark Paris Agreement to limit climate change to well under 2 degrees below pre-industrial levels and pursue efforts to keep it to 1.5 degrees, defined the scale of the global warming challenge the world is facing.

Since then, attention has increasingly focused on the central role the energy sector will play in that challenge. Energy accounts for around 75% of global greenhouse gas emissions worldwide–so transforming the sector will play a vital part in meeting the overall challenge.

At the latest COP28 conference in Dubai, in 2023, nations hailed “the beginning of the end of the fossil fuel era”. Digitalization will be key to make that a reality, but it won’t happen overnight.

Emerging technologies open up the potential for making use of cleaner, greener energy sources but also provide opportunities to make the fossil fuel and nuclear industries–which are set to be around for many decades, even if countries are committed to finding alternatives–more efficient, safer and less polluting.



Cleantech Focus

Around the world, emerging clean technologies, or cleantechs, that offer ways to power communities without the use of fossil fuels, will be called into play to help the sector reduce its environmental impact.

An important element in this energy transition is the ability to harness the transformative power of technology, and Akkodis engineers and software developers are at the forefront of the green shift, using technological expertise to advance sustainability.

Akkodis is a long-standing partner of the Danish wind industry. Akkodis software engineers are contributing to numerous projects using software to optimize the design and the output of wind turbines, a challenging technology combining large-scale mechanics with hi-tech sensors and software.

It’s not just about the move away from fossil fuels to renewable energy sources, though that will play a vital role, requiring fundamental changes to the electricity grid, which is set to become smarter to accommodate unpredictable and decentralized energy flows, whether from giant offshore wind farms or solar panels on the roofs of individual homes.

The green shift in the energy industry is also closely linked with the transition into smart industries, with advances in sensor technology, connectivity, data science, IOT, digital twins, advanced analytics and robotics offering opportunities to boost renewables–including by refining and optimizing wind turbines to increase their output.

Time is of the Essence

The much-debated Paris Agreement commitment highlights the urgency of finding ways to limit the rise in global temperatures. Governments around the world are scrambling for solutions and new technologies such as carbon capture and storage may have an important role to play.

Recent advances in Artificial Intelligence and Machine Learning have led to significant improvements in a technique called image segmentation, opening up new opportunities in the carbon capture and storage space. The SCHISM project uses image segmentation, a visual analysis technique that breaks up images into sets of pixels, to allow for more precise analysis of the image's contents, In this case, that means the different layers and structures of underground rocks, although image segmentation can also be used in domains ranging from medical imaging to autonomous vehicles.

The SCHISM team worked on an online platform that uses AI and Deep Learning to speed up the image segmentation process. This has significant potential to help underground studies, which need to be precise, sometimes over huge areas, to model how the stocked CO2 will behave once it is underground and ensure it remains safely stored in the long term.

"Precise geological models of porous rock formations based on segmented image data are essential to monitor and guarantee underground CO_2 sequestration, contributing to the reduction in greenhouse gas emissions," explains Florent Brondolo, Project Manager for Geosciences and AI at Akkodis.

"Previously in geological surveys, that image segmentation phase was a challenge because of imprecise and incomplete data and a time-consuming process, so we came up with the SCHISM project to try to meet that challenge."

Brondolo and his team set out to find a way to create high-precision, rapid image segmentations and a simple image segmentation tool aided by Deep Learning that could be used as and when needed.

Smarter Grid

As energy use and production evolves, the grid also needs to become smarter, as the electricity network is reinvented. Compared to a conventional network connecting large, centralized power plants to energy consumers, the new grid is becoming much more dynamic, to accommodate fluctuating wind and solar energy and integrate different forms of energy storage and energy use. The new smart grid needs to allow electric cars to store energy and sell it back to the grid at times of high demand and low supply, while charging again when the price is lower. It must be able handle the new demand patterns coming from the deep electrification of transportation and industry.

Akkodis has been providing expertise to Leipzig-based SENEC, a leading developer of state-of-the-art, smart, and connected energy storage solutions for homeowners, integrating solar panels, power storage and vehicle charging into one solution. The latest SENEC.Home energy storage box, SENEC.Home 4, can store up to 25,2 kWh. To fulfill its potential, it needs to integrate with other systems and infrastructures, like billing software, installing and maintenance systems, backends, data bases and much more. Since 2019, Akkodis has been developing a large part of the software doing that job, focusing in particular on ensuring scalability.

Akkodis has also developed a demonstrator platform for digital exchanges between energy system market participants for the EU-SysFlex demonstration program, in which a consortium of governments, energy companies, and digital and engineering experts have trialed system operation and flexibility solutions for integrating 50% renewables into an increasingly decentralized pan-European power system by 2030. The platform made use of Estfeed2 secure data exchange infrastructure based on the open-source X-Road project, the backbone of e-Estonia blockchain based government services. An Akkodis data analytics platform provided near real-time visibility, forecasting and simulation of energy system operations.

Further afield, in Australia, a market characterized by high penetration of solar rooftop panels, fast deployment of intermittent renewables and five-minute settlements on the power market, negative prices have become a common problem, threatening the profitability of energy companies.

Industry Shifts

Growing renewable energy generation is having a profound impact on how the energy we generate and consume is managed and transmitted, but also on how the pricing of that energy is set. The whole system needs to adapt.

Akkodis has been working with a leading energy generator and retailer in Australia to build E-Flex, an intelligent Distributed Energy Resources Management solution that reduces exposure to the negative pricing on the balancing market. By leveraging energy usage and wholesale market pricing data, the E-Flex analytics model developed by Akkodis on Microsoft Azure uses advanced Machine Learning to predict negative pricing events for customers' solar power generation. Based on the predicted threshold, it automatically applies its intelligent DER control to switch off customers' solar energy units during negative pricing periods.

Decarbonization is also about minimizing the environmental footprint of traditional sectors, as evidenced by the shift towards electrification of transportation with the growth in popularity of electric cars, or the transition to a greener, smarter industrial sector, in which technology plays a key role in helping people and businesses reduce their energy consumption.

As Akkodis mobilizes its teams of experts across multiple domains to help drive the all-important energy transition, it's clear that there is not just one answer to the net zero challenge. Supporting efforts to reduce energy consumption needs to go alongside the process of optimizing renewables, while revamping conventional energy production is just as important as ensuring new technologies reach their potential. Akkodis engineers, project managers and technical experts are putting their skills to work to ensure progress is made across the board.

Green Skills

The transformation of the energy sector requires tailored knowledge, something Akkodis provides through its skilled workforce of experts in engineering and industrial digitalization. Akkodis has supplied engineering, IT and project management consultants to help Norwegian company Aibel, which builds and maintains platforms and other critical energy infrastructure, with plans for its unmanned gas platform of the future concept.

As well as providing skilled people for client projects, through the Akkodis Academy, clients can also follow training and development programs to re-skill and up-skill employees to meet changing requirements, training over 7,000 people per year.

Spanning the R&D, engineering, and IT sectors and with deep industry knowledge, Akkodis is well placed to help companies digitalize, transform, and innovate, contributing to the transformation of the environmental and energy industry into a Smart Energy Industry in which energy production, distribution, storage and consumption are connected by sophisticated digital tools.

Industrial IoT Showstopper:

Shaky Wi-Fi on the Factory Floor

Connecting production lines and manufacturing equipment using Internet of Things (IoT) technology can bring huge advantages but only if the Wi-Fi connectivity between the machines and the cloud is up to the job.

Wi-Fi prefers the cosy conditions of the average office environment. It is quite comfortable with desks, coffee machines, computers, meeting rooms and filing cabinets. But when faced with the harsh reality of the factory floor, it begins to flounder. The factory floor is full of metal obstacles that can disrupt fragile radio waves and prevent equipment from being reliably connected to the network.

While the Internet of Things (IoT) has the potential to bring huge benefits to manufacturing sites, the risk of outages in the data stream connecting machines and equipment to backend systems means automation, logistics and monitoring systems may not be able to function properly.

One solution could be to strengthen wireless connectivity by installing additional routers, hardware, or mobile network connections. But this comes with a cost, and additional cost is toxic for IoT solutions. Scalability depends heavily on keeping hardware costs in check.

As any factory manager knows, nothing is more important than optimizing OEE Overall Equipment Efficiency–the measure of how well a manufacturing asset is utilized: 100% is the goal.

Less is More

The alternative, choosing a 'less is more' approach, is exactly what a team of Akkodis engineers put in place for a German manufacturing company.

IoT devices have diverse applications across various industries and sectors. Common use cases include smart automation, industrial monitoring and control, transportation and logistics, and energy management. Monitoring plays a crucial role in many of these applications, in which IoT devices are installed near the data source to be monitored.

Akkodis was tasked with developing a device that could record the sound of conveyor belts and sorters and send it to a computing system which would then crunch the data, detect anomalies, and thus predict malfunctions before they occurred. By looking into the future and identifying trouble ahead, a predictive maintenance system can help reduce the downtime of a production line–a manufacturing company's most valuable asset–and save time and money. As any factory manager knows, nothing is more important than optimizing OEE–Overall Equipment Efficiency–the measure of how well a manufacturing asset is utilized: 100% is the goal.

Sound Chip and Microphone

The German manufacturing company needed the IoT listening device to help meet that goal. Akkodis engineers developed a device containing a sound chip, microphone, and light barrier, together with standard microcontroller components such as CPU, RAM, and various interfaces.

The light barrier identifies the start of the conveyor belt/sorter and thus maps the recorded sound data to the corresponding machine part. Measurement data and timestamps are transmitted to a cloud system using the extremely lightweight publish/subscribe IoT messaging protocol MQTT, ideal for connecting remote devices with a small code footprint and minimal network bandwidth. After transmission to the cloud, the data is used to calculate maintenance predictions for the respective parts of the conveyor belt/sorter.

Shrinking the Data

During development, the engineers faced a number of challenges. The recorded raw sound data amounted to several gigabytes per day, all of it essential as the maintenance prediction algorithm relied heavily on receiving as much data as possible, uninterrupted and with minimal loss, to function properly. That meant stable wireless connectivity–and a lot of bandwidth–were essential too, leading to obstacles in the form of price and practicalities.

The cloud system had a message size limit of 4kB, as well as a limit on the number of messages it could receive in a given time frame. To ensure cost-effective scalability, the engineers had to come up with an innovative data transmission approach to deliver sound data reliably to the cloud, even in a demanding environment. The answer was to optimize data compression, manage transmission frequency, and track messages efficiently.

The connectivity solution developed by the Akkodis engineers reduces the amount of data to be transferred. By utilizing Fast Fourier Transformation (FFT) on the recorded sound data and further compressing it, message frequency decreases to one message per device per minute.

The FFT and further compressions are performed exclusively on one core of the IoT device. With only two CPU cores, the second core handles other essential tasks such as managing the Wi-Fi connection, constructing MQTT messages for the cloud system, time synchronization, task supervision, and more.

Traffic Regulations

Shrinking the data was not all that was required. Efficient traffic regulations had to be put in place too. If a sensor disconnects and then attempts to send accumulated data immediately upon reconnection, the risk of triggering another disconnection heightens, with the possibility of a cascade into more connectivity issues for nearby sensors.

Employing continuous transmission with a consistent data quantum sidesteps that risk, stabilizing Wi-Fi connections and drastically reducing the probability of connection losses. The system transmits two messages in succession instead of one, ensuring a uniform data volume and uninterrupted data transmission. After the data stored during the disconnect has been transferred, the transfer rate drops back to one message per second.

Defeating a Showstopper

By thoroughly analyzing the problem at hand, the engineers were able to offer the client an efficient listening device to monitor the condition of manufacturing equipment using secure connectivity through a specially designed algorithm, and a cloud system able to analyze the data and provide reliable maintenance predictions. In other words, an efficient and reliable industrial IoT solution.

Learn about the technologies we use for our solutions

Wireless & Connectivity

Introducing The Seed:

Supercharging Innovation with LLM Based Copilots

Akkodis is designing human in the loop, semi-autonomous expert AI agents to facilitate prototype design. Its R&D project The Seed is pioneering the technology.

Akkodis has planted The Seed – creating fundamentally new opportunities for playing in the world of ideas. Starting out as an innovation project, The Seed is augmenting, enhancing, and supercharging Akkodis' R&D work. It will enable engineers and digital experts to quickly iterate and explore worlds of ideas, without getting bogged down in extensive research on topics outside of their own field of expertise.

The innovation project is led by Dr. Mehdi Mounsif, who heads a team of engineers and researchers working on cutting-edge projects in natural language processing, computer vision, and conversational AI.

> With The Seed we are creating a line-up of highly specialized AI agents, to supercharge our R&D. Because, although a person can have a great idea, he or she could benefit from additional specialist capabilities needed to implement it. Leveraging The Seed we can have these capabilities at our fingertips, making us much more productive than before.

Dr. Mehdi Mounsif
AI Tech Lead at Akkodis

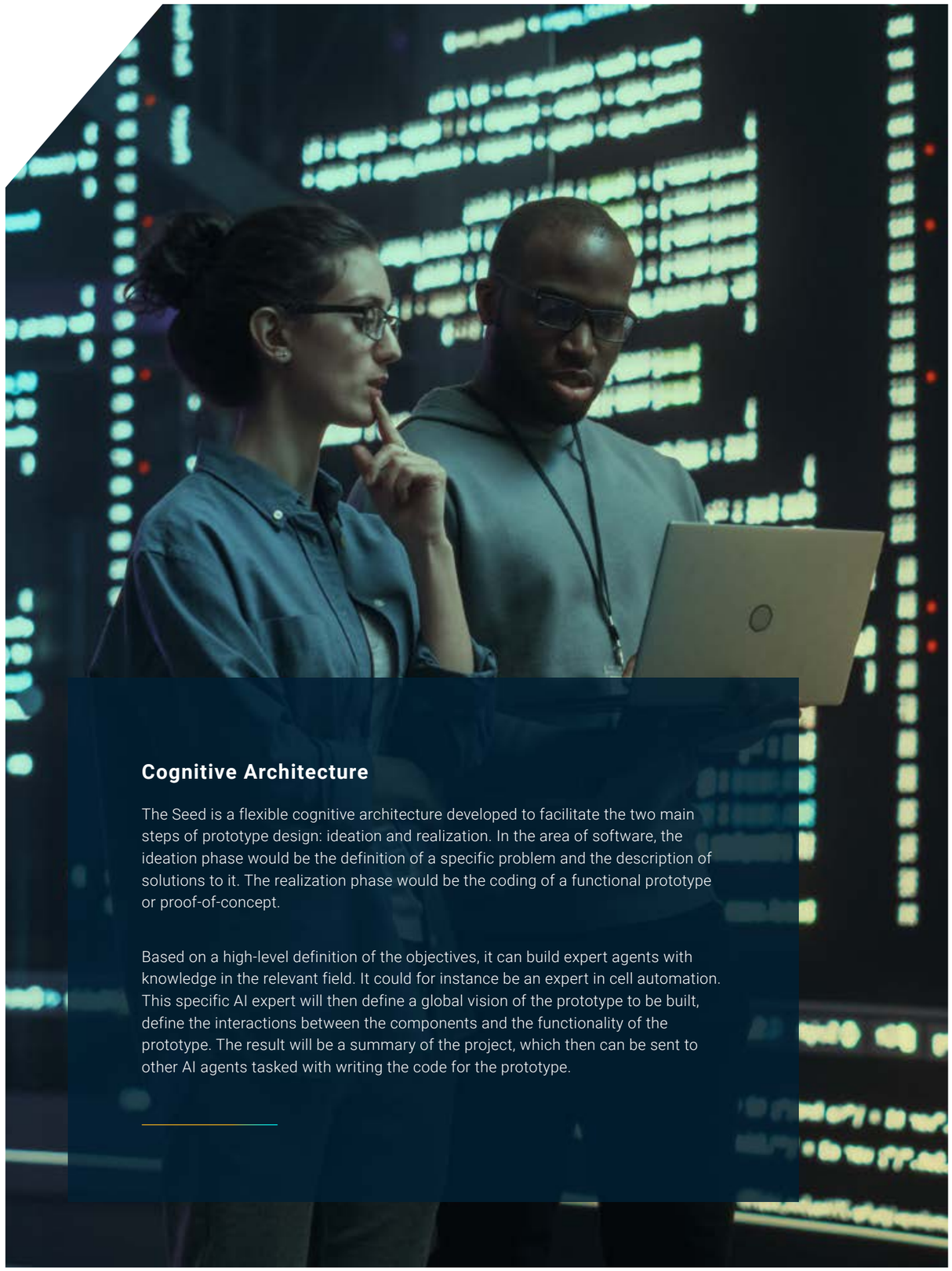
Beyond Chatbots

According to Mounsif, The Seed goes way beyond chatbots and can be understood as a nursery of specialized agents, trained on a tailor-made knowledge base and each with their own area of expertise. Engineers working on a project can utilize the capabilities of these AI agents to supplement their own expertise. The Seed even allows for a group of agents to debate, analyze, and synthesize their collective insights. Thus refined, these insights and suggestions are then presented to the engineering team for validation, fine tuning, and prioritization.

"With The Seed we are creating a line-up of highly specialized AI agents, to supercharge our R&D. Because, although a person can have a great idea, he or she could benefit from additional specialist capabilities needed to implement it. Leveraging The Seed we can have these capabilities at our fingertips, making us much more productive than before."

The Seed will enable Akkodis' R&D teams to approach complex topics that will become heavily relevant in the near future, such as robotics or complex system modelling.

By stepping into this new era of AI-augmented prototype and strategy development, Akkodis is rethinking expertise, combining human knowledge with the ability of AI agents to rapidly synthesize, debate, and propose a conclusion, adding even more depth and speed to its offerings. In this way Akkodis is unfolding the full skills diversity of its engineers and digital experts, allowing for rapid prototyping, and supercharging the exploration of ideas.



Cognitive Architecture

The Seed is a flexible cognitive architecture developed to facilitate the two main steps of prototype design: ideation and realization. In the area of software, the ideation phase would be the definition of a specific problem and the description of solutions to it. The realization phase would be the coding of a functional prototype or proof-of-concept.

Based on a high-level definition of the objectives, it can build expert agents with knowledge in the relevant field. It could for instance be an expert in cell automation. This specific AI expert will then define a global vision of the prototype to be built, define the interactions between the components and the functionality of the prototype. The result will be a summary of the project, which then can be sent to other AI agents tasked with writing the code for the prototype.

Precision Prompts

The approach uses a cascade of precisely engineered prompts leveraging a Large Language Model (LLM) for ideation and brainstorming. Using complex prompting mechanisms and interaction strategies such as self-critique and refinement, the agent framework goes from a high-level vision of a project or task to viewing details from different angles, debating, and applying their various expertise areas to the topic. The result, provided in just a few minutes, serves as a sophisticated decision support service to Akkodis' researchers, improving their work significantly, while at the same time saving time and resources.

According to Mounsif, the goal of The Seed is to create agents to automate tasks and to contribute with expert knowledge outside the scope of the predominant area of expertise of the researchers working on a project. In short, The Seed is a way to orchestrate LLMs so that they can produce actions. Using The Seed, the models are not limited to giving simple text answers but will produce code. This code is then executed so they can use the results to plan the next step of the iteration process.

Orchestration is Key

The key to using LLMs to create specialist AI agents is orchestrating the models. The secret is knowing how to decompose the task given them, to avoid answers that will be too broad and average and therefore useless.

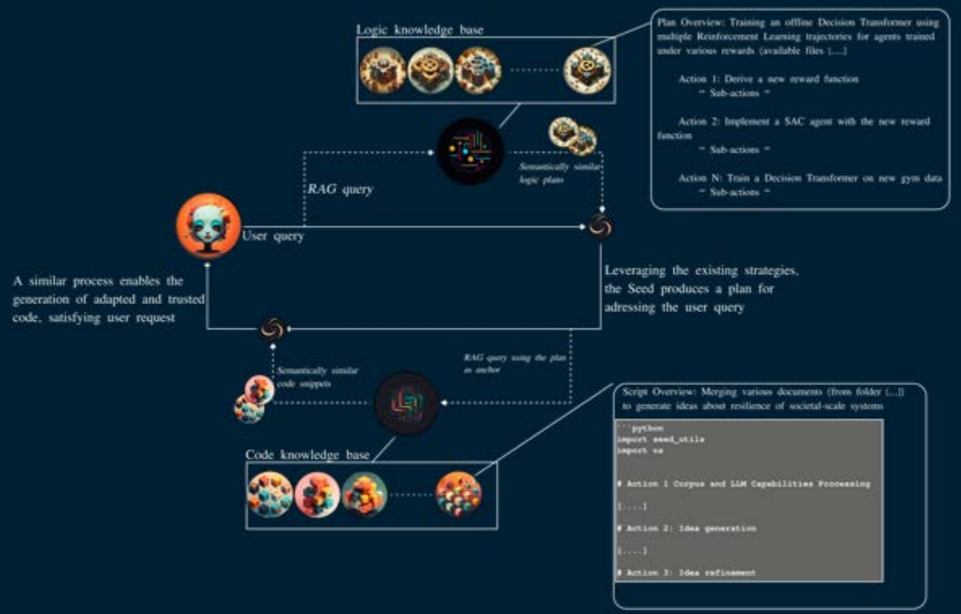
This is often called Prompting, but the architecture of The Seed relies on a technique called Retrieval-Augmented Generation, RAG. RAG is used in natural language processing and combines the power of both retrieval-based models and generative models to enhance the quality and relevance of generated text. The technology also reduces the chances than an LLM will "hallucinate" incorrect or misleading information.

Initially, the model requires a base of knowledge, for instance using RAG, it will find the most similar examples to what task it has been given. The model then uses those as a referential to advance. It can be fed with research papers or previous conversations, and when asked a question, it looks for similarities, cross referencing it with the small pieces in the corpus that are closest to the query. Those can be retrieved so that they give context to the answer, which makes the LLM much more precise and useful. RAG is a very powerful technique, especially when combining the LLM with private data or niche data.

Logic and Code

One key feature of The Seed is doing RAG not on conventional, text-based information, but on logic and on code. According to Mounsif, this methodology is different from for instance the AI powered programming assistant Github Copilot. While applications like Copilot can assist developers in writing code, what Mounsif wants is for the AI agents to be able to produce code by themselves with limited supervision.

Mounsif has set up The Seed to answer in code when asked a question. To do that, the query first goes into a specific database, where he has set out a number of logical parameters. The database contains examples of how he has previously decomposed similar questions and broken them into pieces. The AI agent then uses the expert knowledge provided by Mounsif, to come up with an answer to his new question. It is not looking for specific information on the internet but looking for the logic behind.



A Sample Pipeline within the Seed

As an example, Mounsif wants the model to download a research paper, read it and process it. When given this task, the agent is able to know that it has to produce code, download the paper and put it in a folder. It does that automatically. It knows how to produce the code and to execute the code to get the paper downloaded. Then it takes the next step and finds out what to do with the paper. It says, “OK, I have to parse it and then figure out an answer to the initial question”. This logic is extracted from the small knowledge base containing plans that tell the model, how to perform a specific task. Then the model, by combining several examples, produces a new example adapted to the current context.

Another key feature of The Seed is its ability to quickly learn from its users and to extend its knowledge bases to provide automated workflow in an extremely wide range of tasks, such as domain-specific logic, specialized code, research support, communication via reports and slides, and much more.

Furthermore, The Seed is being extended beyond the capabilities mentioned above. In the future The Seed may even be able to connect with the latest academic research and integrate it into the insights and suggestions it produces.

Mounsif concludes: "With The Seed we are not only creating a line-up of highly specialized AI agents, to supercharge our R&D. The expansion of The Seed is also a direct response to our strategic direction, which is firmly rooted in meticulously curated scientific and technical roadmaps. These roadmaps have been instrumental in identifying the key domains and areas that will be pivotal in the future., such as robotics, resilience of societal-scale systems, bioengineering through simulation and modelling.

By nurturing the Seed's features, we plan to engage in and significantly contribute to these crucial fields, thus enabling us to adapt and tackle societal challenges with innovative solutions and foresight."

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Showing
We CARE

Consider Accessibility as a Requirement

Digital technologies are changing every aspect of how we live and they offer opportunities to improve accessibility for people with disabilities, both online and in their everyday lives.

Worldwide, an estimated

1.3 billion people

experience significant disability. According to World Health Organization (WHO) statistics that equates to one in six of the world's population. They still face barriers in everyday life and online, considering only a fraction of websites and other digital tools are fully accessible.

Akkodis engineering and software experts are exploring the potential for emerging technologies to increase inclusivity.

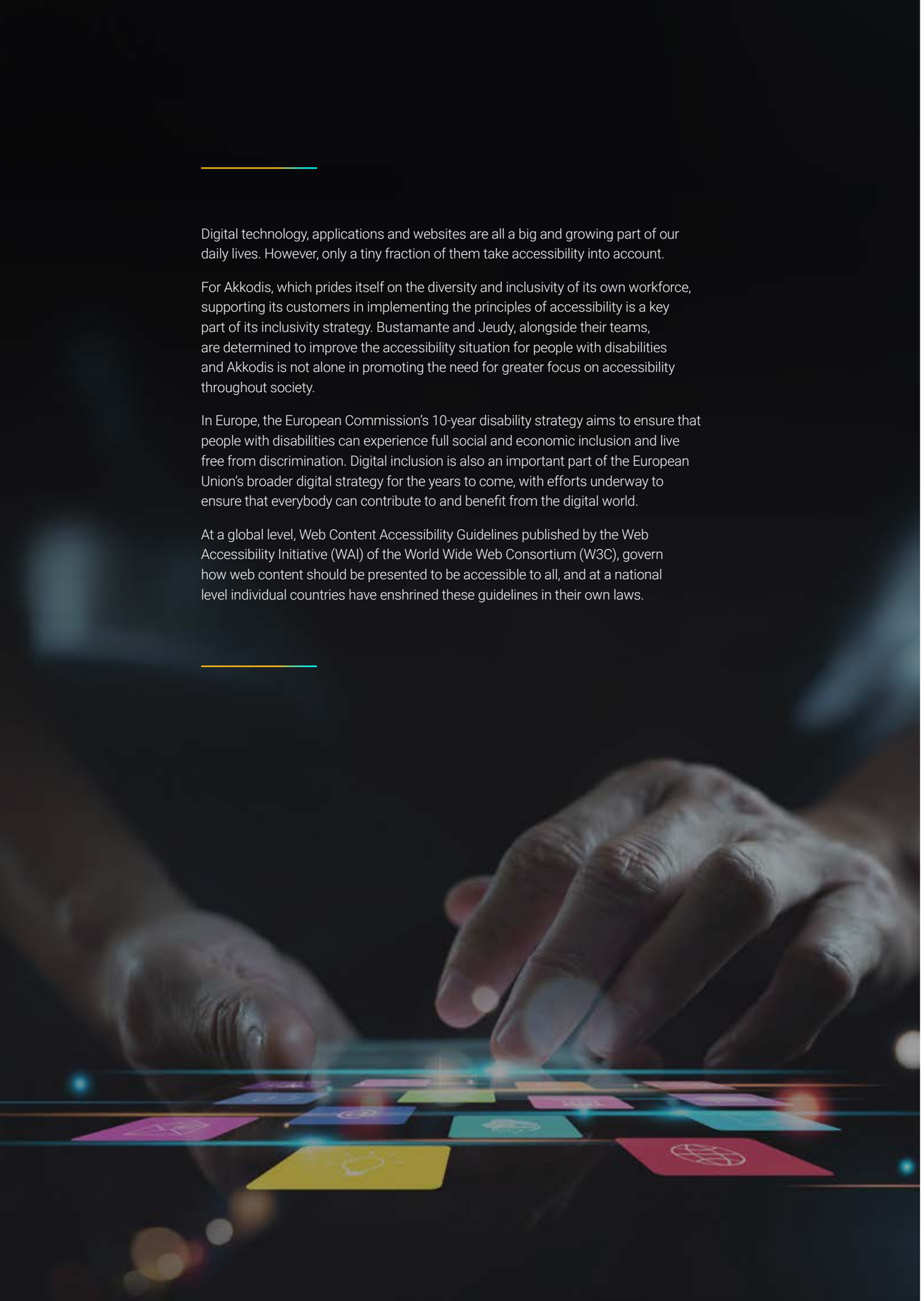
Through three main axes–universal design, digital accessibility and innovation for inclusion–Akkodis aims to drive forward progress on accessibility, making sure it's an important consideration in all new projects whether digital or offline.

CARE-ing About Accessibility

"A few months ago we launched a dedicated program related to accessibility called CARE: Consider Accessibility as a Requirement," explains Mathieu Jeudy, Innovation Delivery Manager for Smart Mobility & Accessibility at Akkodis. "Our mindset is one of 'universal design'. The ambition here is to make our clients and also the business managers at Akkodis aware of the importance of accessibility, and consider it right from the start when defining a new product, whether digital or physical."

Designing a product with accessibility in mind from the start makes it much easier and more efficient to ensure that product is truly accessible.

> "It's a bit like accessibility in a building," says Kevin Bustamante, Digital Accessibility Specialist at Akkodis. "At the design phase for a new building nowadays, you plan lifts, accessible toilets and so on. The architect should take accessibility into account from the beginning–adding these elements in once the building exists would be more complicated and costly. When you're designing a website or an app, it should be the same process.



Digital technology, applications and websites are all a big and growing part of our daily lives. However, only a tiny fraction of them take accessibility into account.

For Akkodis, which prides itself on the diversity and inclusivity of its own workforce, supporting its customers in implementing the principles of accessibility is a key part of its inclusivity strategy. Bustamante and Jeudy, alongside their teams, are determined to improve the accessibility situation for people with disabilities and Akkodis is not alone in promoting the need for greater focus on accessibility throughout society.

In Europe, the European Commission's 10-year disability strategy aims to ensure that people with disabilities can experience full social and economic inclusion and live free from discrimination. Digital inclusion is also an important part of the European Union's broader digital strategy for the years to come, with efforts underway to ensure that everybody can contribute to and benefit from the digital world.

At a global level, Web Content Accessibility Guidelines published by the Web Accessibility Initiative (WAI) of the World Wide Web Consortium (W3C), govern how web content should be presented to be accessible to all, and at a national level individual countries have enshrined these guidelines in their own laws.

European statistics show that almost

90% of people access the internet every week.

But while the digital transformation of society opens up myriad opportunities,

only an estimated 10-20% of all websites are fully accessible.

Digital Accessibility

If you've tried to catch a train, go to a concert or pick up a parcel without using a mobile phone app, QR code or digital ticket in the past few years, you'll be familiar with the extent to which digital technologies are permeating more and more parts of society.

European statistics show that almost 90% of people access the internet every week. But while the digital transformation of society opens up myriad opportunities, only a fraction of all websites–an estimated 10-20%–are accessible to people with disabilities. In an increasingly digital world, that lack of online accessibility creates barriers for people with disabilities.

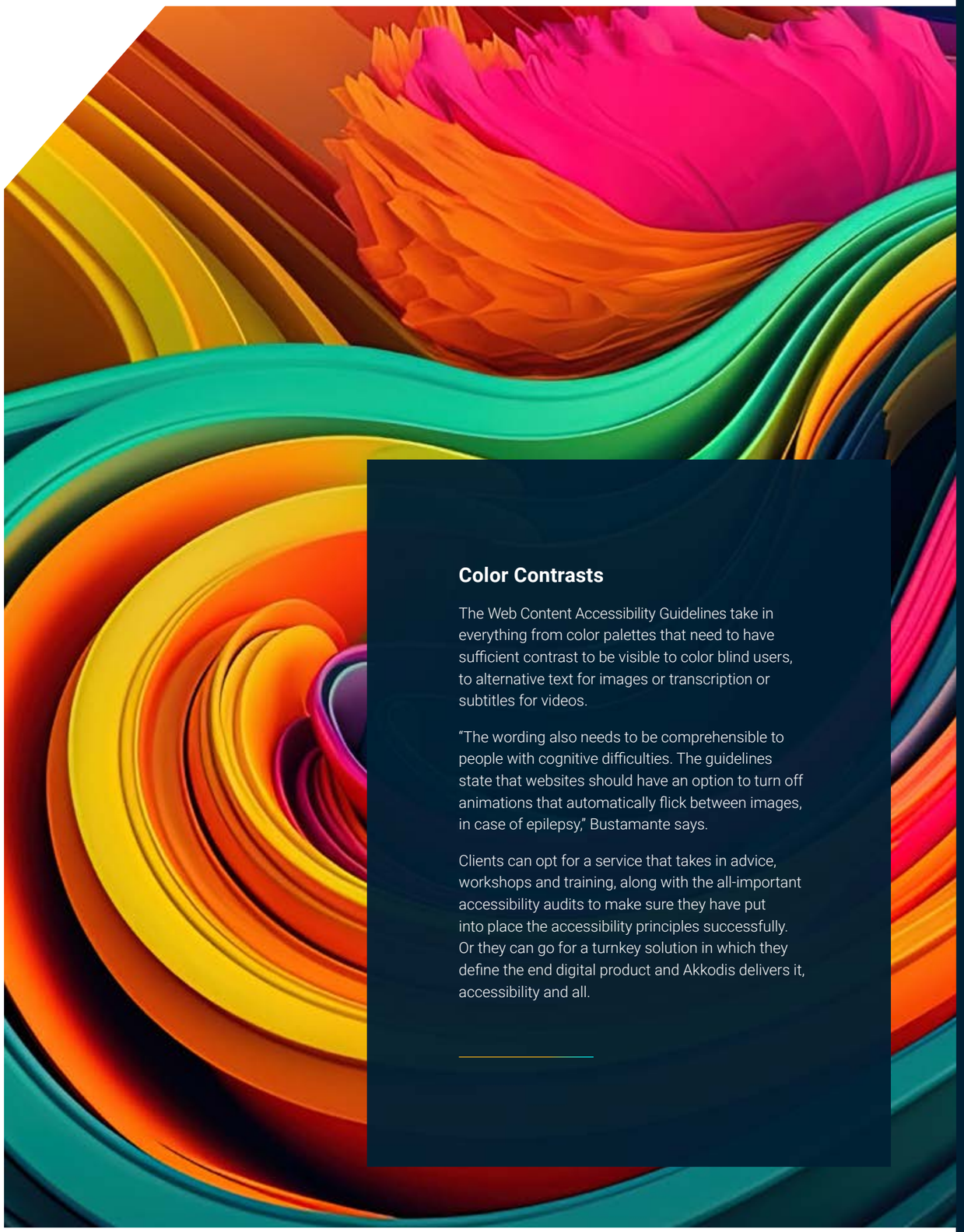
Raising Awareness

"I think companies are realizing that this is important and that they should do something," Jeudy says. "So that's why one of our axes is about making clients aware of the accessibility issue."

Apart from being the right thing to do, thinking about accessibility from the start makes business sense: it's much easier, and more cost-effective, to respect accessibility guidelines from the design phase of a website or app. Making an existing website accessible involves a lengthy analysis of exactly which pages are not accessible, before the changes can be made.

"Companies are wising up to that need to make their websites and apps accessible to everyone, by respecting accessibility rules based on international guidelines," explains Bustamante.

"I work with designers, developers, engineers and project managers to make the digital solutions we develop for our clients accessible to people with disabilities and to older people," he says.



Color Contrasts

The Web Content Accessibility Guidelines take in everything from color palettes that need to have sufficient contrast to be visible to color blind users, to alternative text for images or transcription or subtitles for videos.

“The wording also needs to be comprehensible to people with cognitive difficulties. The guidelines state that websites should have an option to turn off animations that automatically flick between images, in case of epilepsy,” Bustamante says.

Clients can opt for a service that takes in advice, workshops and training, along with the all-important accessibility audits to make sure they have put into place the accessibility principles successfully. Or they can go for a turnkey solution in which they define the end digital product and Akkodis delivers it, accessibility and all.

Working Together

Being able to work closely with Akkodis research colleagues and other branches of the wider group is important for Akkodis digital accessibility, Bustamante says.

“Akkodis Research can take a step back, brainstorm and imagine how to come up with a solution.”

One good example came through an online CV generator product developed by sister company Adecco. “A visually impaired person could use it but would need someone to check their CV looked OK. I went to the head of digital at Adecco and suggested making the CV generator accessible, so people with disabilities could generate their own CV autonomously. She said ‘great, let’s go’, so we went to Akkodis Research and talked to them about integrating AI into the product to add new functionalities. We worked together to find a solution. It’s in use in France now and we’re going to deploy it globally.”

Learn about our
Research & Innovation

Q&A

How did the CARE program come about?

Kevin Bustamante: With more and more digital technologies everywhere, in everyday life–even in household appliances such as coffee machines or vacuum cleaners–accessibility is a real challenge for people with disabilities. Mathieu and I decided to come up with universal design guidelines aimed at making these objects accessible. In the short- and medium-term our objective is to get everyone round the table to develop design rules that we can apply to these types of objects.

How much demand is there for digital accessibility services? Is it growing?

Mathieu Jeudy: Digital accessibility is an important part of how we support our clients. We can make recommendations and share our knowhow. For now, only a small proportion of applications and websites respect accessibility guidelines so there is plenty of work to be done.

Kevin Bustamante: Accessibility isn't a new subject but it's true that we have been talking about it a lot more in recent years in the digital world. That's partly because the population is ageing, which is making digital accessibility an even more important requirement. But accessibility is a process and there is still work to do. For example, internally we work with our commercial teams so that they understand that part of our duty is to make sure our customers are aware of the need for accessibility. There's an ethical dimension in selling this kind of solution, it's not like selling a basic engineering services solution.

Kevin Bustamante

Digital Accessibility Specialist

Does your research work influence the digital accessibility services you offer clients, and vice versa?

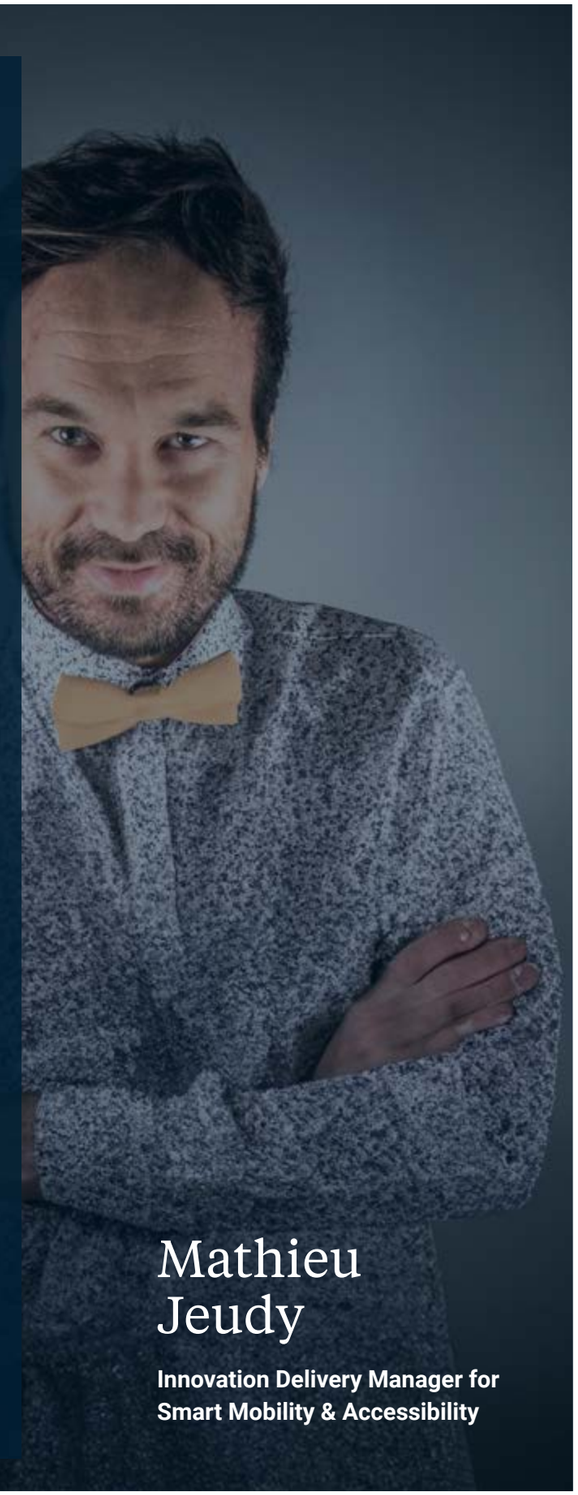
Mathieu Jeudy: Yes, there are two sides to what we do. As part of the CARE program, we're working on universal design and innovation for inclusion. We also offer our clients digital accessibility services. The two approaches feed into each other. With one client, we were talking about what they needed and what training we could offer, and they mentioned that text transcription of videos took time. That observation eventually led to the launch of a project, in conjunction with Akkodis Research, to use AI to make video and audio accessible.

Do the internal values at Akkodis help drive home the message that inclusivity is vital?

Kevin Bustamante: I think so, we're a company in which human values are celebrated, not just a digital company. Our domain is the digital world, so making use of the digital to help the human makes sense and is one of our strengths. On our internal handicap diversity policy, I think we're ahead. We're all convinced about the need for inclusivity and accessibility but the challenge is working every day to make sure these ideas and processes are made a reality.

How do you ensure you respect the principles of universal design?

Mathieu Jeudy: When we design a product, we always start with workshops and define personas that could find the product relevant, so those workshops can include people with disabilities. We talk to people to identify the needs of each persona, and how to address those needs.



Mathieu Jeudy

Innovation Delivery Manager for Smart Mobility & Accessibility

Showing We CARE

Innovating for Inclusivity:

3 Akkodis Research projects, with very different approaches and aims, make use of a wide range of technologies, and show how the company's expertise has the potential to help improve everyday life for people with disabilities.

1

ELOCA

The ELOCA app translates sign language, using a speech synthesizer. The app uses gesture recognition from a camera input, and artificial intelligence to transform the gestures into audible text.

"We noticed that some people had difficulty conversing with other people because of speech or language problems. We wanted to help people understand them even if they don't know sign language," Jeudy says. "We built ELOCA from scratch, defining and developing the features."

While the app can already translate some American sign language into audible text, work is underway on integrating French sign language.

The users of the app will help it expand its scope, Jeudy says. "We will provide users with a platform which they can record gestures, to train our AI algorithms." Akkodis is working on a proof of concept for the ELOCA technology, a first step before possible commercialization, which would probably be in partnership with another company.

2

BionicoHand

Technologies are moving fast in the world of prosthetics. In contrast to the aesthetic prostheses that simply offer a natural appearance without much functionality, myoelectric prostheses are powered by electrical signals sent via electrodes placed on the skin. They allow a person with a missing limb to control the movement of their prosthesis and regain autonomy in daily life. But there are obstacles to wider adoption: myoelectric prostheses are often expensive and heavy, making them hard to use.

Akkodis has been working with My Human Kit, an association that is the brainchild of a young man, Nicolas Huchet, whose journey to becoming a prosthetics expert began with frustration at the limitations of his own low-tech prosthesis. Huchet teamed up with a group of technology enthusiasts to try to create an affordable, user-friendly open source prosthetic hand as an alternative to the basic prosthesis he was using, the start of a decade-long journey that led to the launch of the BionicoHand project. The project brought together different partners to make the myoelectric prosthesis a reality–and a reality that is designed with input from amputees to be affordable, easy to charge and repair and user friendly. It uses innovative technologies such as 3D printing and including an opposable thumb mechanism with electronic components, sensors, motorization and battery.

Akkodis got involved as a skills sponsor, offering its technological expertise to help drive forward developments on the prosthetic hand's battery system. The next step for Akkodis will be providing support on the challenge of making the prosthesis lighter and therefore more comfortable for users.

3

ABILEO

Akkodis worked with Auticiel, a French company that specializes in using technology to increase inclusivity for adults and children with disabilities, on the ABILEO project.

In the workplace, Auticiel's tablet-based applications help people with cognitive difficulties gain autonomy in their daily tasks and learn new skills, improving their employment prospects.

The ABILEO app, which is now being tested near Lyon, France, at the Jacques Chavent center, an 'ESAT'–an establishment that provides work and training to people with disabilities.

The facility includes a training center as well as a cafeteria where workers from local businesses come for lunch. People with disabilities staff the canteen and can also undergo training for qualifications in the training center, setting them up to be able to find jobs elsewhere. The tablet-based app helps the ESAT workers learn new everyday tasks and master skills that increase their employability, as well as develop their autonomy at work and facilitate communication between the workers and their supervisors.

The Pain Relief Dosing Device Giving Patients Control

An innovative new device for administering pain relief, developed from the ground up by Akkodis engineers specialized in medical technology, can not only empower patients but also ease the workload of hospital staff.

A German medical technology company came up with the idea of giving patients control over their own pain medication by way of a specially designed nasal spray. While the concept sounds simple, it was difficult to make it a reality.

Andreas Ries and his 35 colleagues at Akkodis' department for Medical Engineering and Mechatronics took up the challenge of helping the company get its device off the drawing board and into the hands of patients. The team, based in Mannheim and Oldenburg, Germany, specializes in combining hardware, software, mechanics and deep domain knowledge to develop medical devices and is ISO 13485 certified to work in that strictly regulated domain.

"We are the ones they call to do projects nobody has done before," says Ries, head of the team, which is made up of hardware and software developers, project managers, electronics and mechanics engineers, as well as quality management experts.

> We are the ones they call to do projects nobody has done before.

Designed from the Ground up

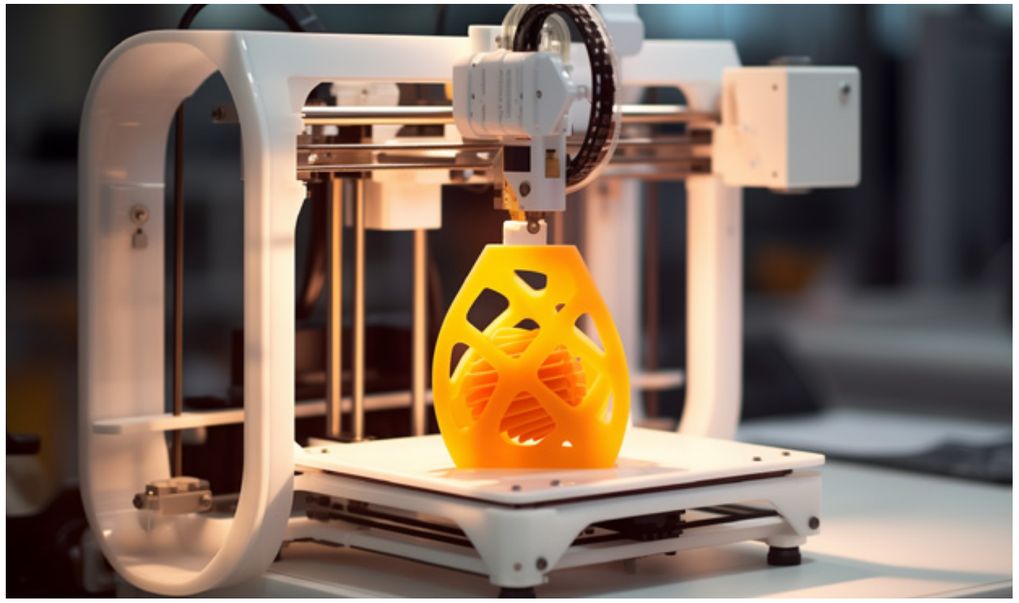
The medical company approached Ries and his team to develop a dosage system for the nasal spray containing pain relief medicine. The device had to fulfill a number of requirements. It needed to be manually operated, reusable, safe, and user-friendly, both for the patients managing their own pain medicine and for hospital staff to hand out. It also had to be designed in a way that would make malfunction, misuse and overdosage impossible. Needless to say, it also had to comply with all rules and regulations in the domain.

"We designed the device from the ground up, with extra care going into the manual operation," Ries says. "We designed the mechanics in such a way that even elderly and sick people have enough grip power to release a dose and the size of the device accommodates large as well as small hands."

To ensure that the device can only be used by the patient for whom the painkiller has been prescribed, the team added a Radio Frequency Identification (RFID) wristband containing a chip which communicates via Near Field Communication (NFC) with the device. "The chip authenticates the user and eliminates any misuse by others," Ries says. "The spray flask containing the medicine can only be accessed by hospital staff, and dosage is limited to a set time interval adjusted to the patient's needs."

The device, of which hundreds have now been made for clinical studies, is a self-contained system not accessible from outside. It is equipped with two microprocessors, and has redundant electronics eliminating any malfunctions. As it does not transmit, there is no risk of affecting other devices, for instance a pacemaker.

> We have thorough quality management people on board. They are indispensable, because obviously, quality, documentation, and traceability are extremely important in this domain.



Medical Machinery

While the technical attributes of the device are carefully calibrated, they proved in the end to be the most straightforward part of the project, Ries says.

“It was a huge job to fulfill all the rules and regulations for such a device, and to document the entire development process in great detail. Fortunately, we have thorough quality management people on board. They are indispensable, because obviously, quality, documentation, and traceability are extremely important in this domain.”

The pain relief solution is far from the only project Ries and his team are working on. Using their combined expertise in hardware, software, and mechanics, the team is contributing to the development of a prosthesis that grows with the patient. In the past, children suffering from bone cancer faced multiple operations to get a new prosthesis fitting their height. Now, prosthetic devices can grow with the patient. Ries is developing a new type of drive technology, powered by inductive energy transfer, enabling doctors to adjust the prosthesis to the growth of their patient, without invasive surgery.

The Team is also developing completely new electronics for lung ventilators, laboratory equipment for in vitro diagnostics, and much more. Being part of a large company operating in a wide range of hi-tech domains helps them keep their knowledge up to date, giving them the opportunity to learn from colleagues working in sectors that are more agile than their own.

“The medical device market moves more slowly than automotive or consumer electronics. There’s a new car model every year, while a heart-lung machine can be on the market for 30 years unchanged. But when customers come to us to help them develop new products, they can rest assured that they get access to state-of-the-art technologies,” Ries says.

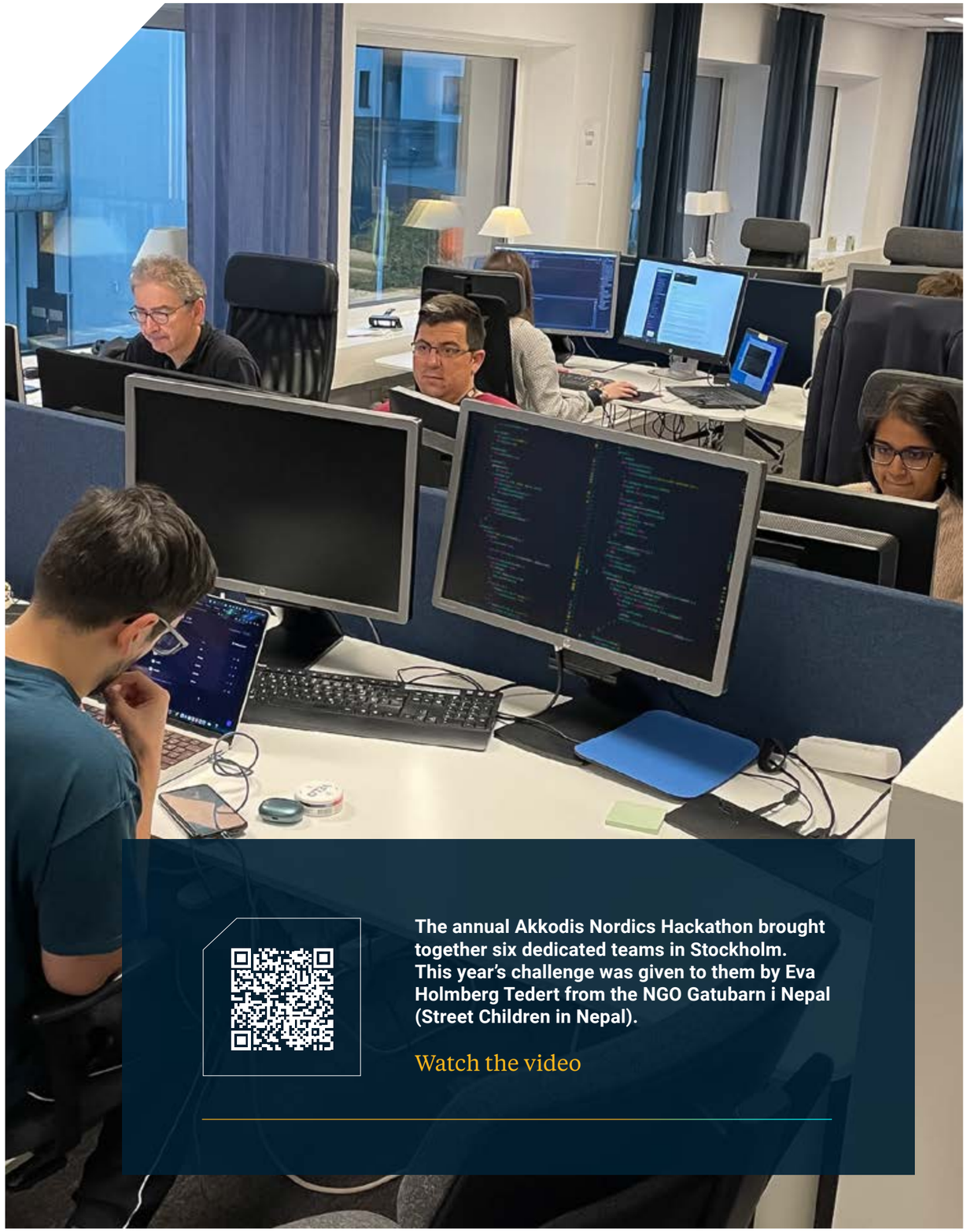
“Our advantage comes from being part of a large company with strong internal knowledge transfer and a well-established culture of continuing education and staff development,” he says. “We may be a small unit and functioning to some extent as a company within the company, for certification reasons. But when it comes to knowledge, we tap into the expertise of thousands of colleagues.”

Get in touch with our
Life Sciences & Healthcare Experts

Hacking Ways To Help

Street Children In Nepal

Akkodis teams put their tech skills to good use in the annual Nordics Hackathon, with the ambitious goal of improving the lives of street children in Nepal.



The annual Akkodis Nordics Hackathon brought together six dedicated teams in Stockholm. This year's challenge was given to them by Eva Holmberg Tedert from the NGO Gatubarn i Nepal (Street Children in Nepal).

Watch the video

How can technology change the lives of some of the world's poorest children? At the annual Akkodis Nordics Hackathon, Akkodis tech experts from across the Nordics and Germany set out to come up with some answers.

Akkodis has been supporting the Gatubarn i Nepal (Street Children in Nepal) NGO for many years, through its Enabling the Young initiative, and dedicating the Hackathon to finding new ways to help this important NGO was the next logical step.

Eva Holmberg Tedert founded Gatubarn i Nepal in 2010, to help the thousands of homeless children in Katmandu and elsewhere in Nepal. Among other projects, the NGO supports three child help and care centers and finances the education of local health assistants, engineers, and teachers. It also assists local initiatives to combat human trafficking.

Holmberg Tedert was there in Stockholm to blow the starting whistle for the Hackathon, which took place in October 2023 at the Akkodis site in Stockholm.

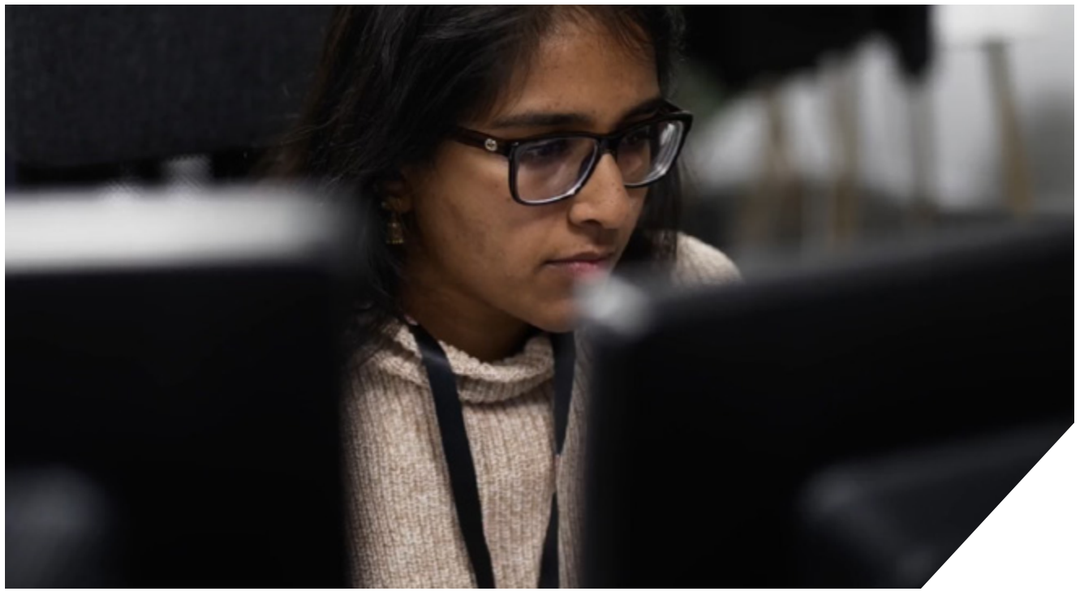
"Please put your great technology skills to use to develop digital solutions to combat poverty, reduce trafficking, and enhance the lives of children in Nepal," Holmberg Tedert told the six teams, before sending them off to their computers to begin an all-nighter. "You have 24 hours!"

Six teams from the Nordics and Germany – Team Stockholm A, Team Stockholm B, Team Ingolstadt, Team Munich, Team Leipzig and Team Hannover – took up the challenge.

Holmberg Tedert urged the 28 participants to think local, coming up with solutions that could be implemented by a small NGO run primarily by volunteers, and in a country where access to high-speed connectivity and complex technology cannot be taken for granted.

"Eva did a fantastic presentation of their work, it was really captivating," says Madeleine Mellström from Akkodis Sweden, who organized the event with her colleague Maja Jonsson.

The six projects presented to the Hackathon jury after 24 intense and creative hours were as diverse as they were innovative.



The 6 Projects had very Diverse Focus Areas

1 | Help Me Study
Team Ingolstadt

The five young developers from Team Ingolstadt designed an app named “Help Me Study”, with which Nepalese school children can practice their English pronunciation. “The children learn English in school, but only written, not spoken English,” explains team member Moritz Reindl. “With the new app they can use their mobile phone as a training tool for pronunciation, somewhat similar to the well-known Duolingo app.”

Help Me Study also has a “Help Me” functionality, as human trafficking and child prostitution is a huge issue in Nepal. Children can push the “Help Me” button if approached by criminals, sending an alert to local police.

2 | Professions Guidebook
Team Stockholm 1

Donations were at the center of the app developed by the Stockholm-based team of five programmers–but donations of knowledge, not money.

“Education is extremely important, and getting access to it is not easy in Nepal,” explains software developer Charlie Kotro. “For a child, it is difficult to even find information about what you can become when you grow up. Our idea was to create a database to which people can upload information about different professions, to inspire the children to decide what their future education could be.”

Given the unreliable connectivity in Nepal, the team went for a mobile app, through which users can download information when they have internet access, for reading later.

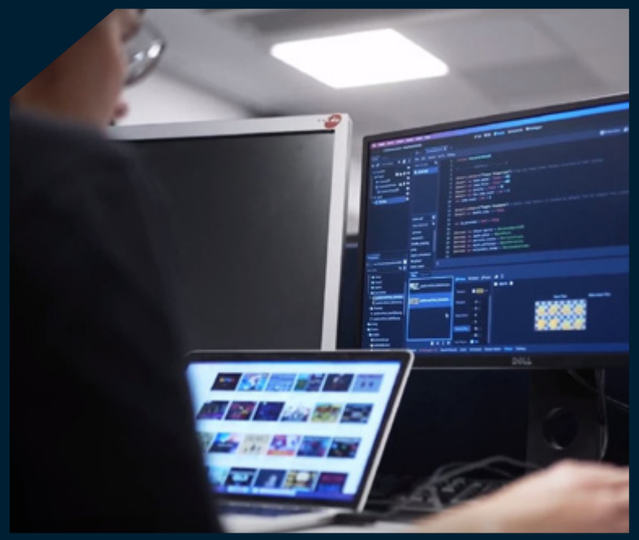
3 | The Street Children in Nepal Game
Team Munich

The team from Munich also chose to develop a mobile phone app, but with an altogether different focus. Their mobile game is designed for people in developed countries to raise awareness about Gatubarn i Nepal and attract donations to its work.

“We developed a small game showing the conditions many children live in,” says Vithya Jeyachandran from the Munich team.

“Online we found a 2D game engine and a number of readymade design elements and put them together to create a game, in which a Nepalese child is given a task. If the player completes the task he or she goes to the next level.”

The game consists of three levels. In the first, the child overcomes a number of challenges on their way to school, the next focuses on human trafficking and abuse, and the third level concentrates on the dangers around water supply and poor water quality.



4 | NGO Collaboration Platform
Team Leipzig

The Leipzig team took a different approach. They looked at ways to improve internal collaboration inside the Gatubarn i Nepal organization, as well as with other NGOs. They designed an open source-based, networked management portal to optimize communication and collaboration, including functionality for social media post generation, resource management and accounting.

5 | Learning the Basics of Programming
Team Stockholm 2

The second Stockholm-based team chose to focus on education as well, and programming in particular, developing a gaming-based concept through which Nepalese teachers and schoolchildren can learn the basics of programming.

Digital Art Gallery for the Unseen

The challenges we tried to fix can be summarized by these questions:

How can we improve the status quo?

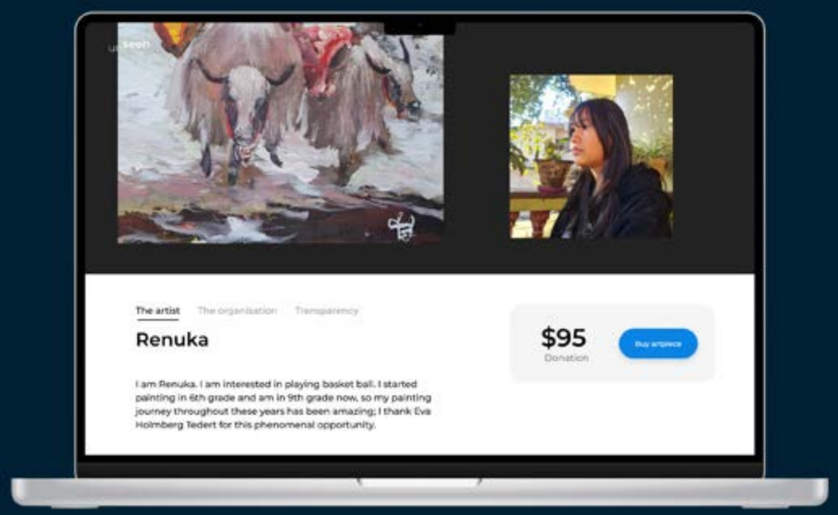
What do you think of these pictures?

How can we make the art more accessible?

These are the people behind them. Would you have guessed it?

The Solution:

A website where individuals can purchase artworks created by the children in Nepal. The proceeds from these sales will contribute to funding the NGO.



The Akkodis Nordics Hackathon Winner

After 24 hours, at 10 in the morning on the 27th of October, the Hackathon jury arrived to see the six teams' presentations and to select a winner.

The jury, consisting of Eva Holmberg Tedert from Gatubarn i Nepal, and Johan Jacobsson, Jonas Tillander and Niclas Fredriksson from Akkodis Sweden decided on the Team Hannover project named "Digital Art Gallery for the Unseen".

6 | Digital Art Gallery for the Unseen
Team Hannover

Inspired by an art exhibition in Kathmandu in March 2023, showing artwork by children supported by the NGO, Team Hannover chose to create a digital platform. At the original exhibition, visitors and tourists could view and purchase the images. They could also be purchased through social media via direct message.

To make the artwork produced by the children more visible and accessible, the team decided to create a website where people can see and buy the images, with the proceeds going to the children and to the organization.

"We wanted to build a platform to promote the children and their creativity, while finding new ways to generate donations," explains team leader Stephan Bogansky.

"In the beginning, our idea was rather huge. But, after talking to Eva, we decided to scale it down, to make it work within the scope of a small NGO, and to create something that would be useable in the short term, while allowing it to be expanded along the way."

We took a few open source building blocks to develop the web application, which in short is a small content management system. It has a backend where you can upload the artwork and allow customers to buy it. The system is designed with simplicity and ease-of-use in mind, to enable it to be run by volunteers.

Manageability and easy implementation were two important factors in the jury's choice of the Team Hannover project as a winner, Holmberg Tedert says.

"Many of the children we are working with have a creative streak. The Digital Art Gallery For The Unseen is an obvious way to promote their work, and in a format that is feasible for us. We can quite easily launch such a website, and I believe it has the potential to make a significant difference in our work."

> It has been a real pleasure to witness the energy and dedication of the six Hackathon teams. I am deeply impressed by what they achieved in just 24 hours. Their energy was just incredible, and on behalf of Gatubarn I Nepal I would like to express my gratitude for their incredible work and commitment.

Eva Holmberg Tedert,
Founder Street Children in Nepal

Team Hannover is now looking at how to develop the project further into a finished product for the NGO to implement.

Reinventing The Wheel:

How Green&Bike Is Making Cycling (Even More) Sustainable

Bicycles, in one form or another, may have been around for more than two hundred years, but that doesn't mean there's no room for innovation.

With the drive to cut greenhouse gas emissions, air pollution in cities and the importance of physical activity for health all in the spotlight around the world, cycling is growing in popularity. According to European Union statistics 14.7 million bicycles were produced in the region in 2022, up 29% compared to a decade earlier.

While pedal-powered two-wheeled (or three-wheeled) transport is already an environmentally-responsible way to travel compared to many other modes of transport, the Green&Bike project set out to prove that even here, with the right design, processes and materials, there is room for improvement.

"We wanted to show how far we could go with environmentally-friendly design," says Mykyta Kostiuk, who has been Green&Bike's project manager since 2021, based at Akkodis's Marignane site near Marseille in southern France.

Flexible Transport

The Green&Bike vehicle is a tricycle designed to be sturdy, accessible (no driver's license is required) and versatile: it can be used as a personal mode of transport as well as to transport passengers or goods. It's more flexible–and much greener–than a car, but provides greater protection and comfort than a standard bicycle, making it a viable replacement for a car in many scenarios.

"Bicycles are already fairly green but we wanted to show we could go even further. That was our design philosophy; all the technical choices were made with sustainability as a priority," Kostiuk says.

For the Green&Bike team, that drive for even greater sustainability meant going back to the drawing board and adopting a 'cradle-to-grave' mindset, not just choosing materials that are manufactured from sustainable sources in an environmentally-friendly way, but ones that can be recycled or left to biodegrade naturally at the end of the bicycle's life.

French Flax

The work is taking place in France and using as many local components and materials as possible is an important part of ensuring the green credentials of the project. The team considered the CO2 impact of transporting the materials, which is why the Green&Bike concept makes use of recycled polymers as well as flax fiber and bamboo-based composite materials that undergo a hi-tech process to be transformed into light but strong materials suitable to replace the metals generally used for a bicycle's frame. Flax and bamboo are abundantly available in France.

Replacing the lithium-ion battery that usually powers electric bikes was a tougher challenge, but one that the Green&Bike experts have successfully managed.

Kostiuk describes their solution as a "mechanical battery", a technology Akkodis is in the process of patenting.

Wind-Up Battery

"Replacing the lithium-ion batteries is the most complex thing but it is important because a lithium battery is very polluting and we don't know how to recycle them. We had to completely rethink the energy source," Kostiuk says.

> The battery represents a modern-day return to a tried-and-tested technique. Instead of an electro-chemical reaction, the user winds up the battery to stock the energy needed for their journey.

For now, the mechanical battery is heavier than the lithium-ion battery it replaces and the team is still testing the battery and its performance.

"The good thing about a bicycle, or a tricycle in our case, is that it's not a dangerous vehicle. If we tested our innovative solution in a helicopter it would need much more time to develop because it's a complex and risky machine. A tricycle is a perfect platform for such innovations. First we test on something simple, we try to reveal the weaknesses, the disadvantages. Then the next step will be to scale it up," Kostiuk says, adding: "We hope that one day this could become a means of energy storage for other types of transportation."

The Green&Bike project is making rapid progress with plans to build the first working prototype in the coming months.

"We've already built the very first prototype and tested our first assumptions. It worked, and it allowed us to move forward with a more advanced concept–the demonstrator. If everything goes well, we will proceed with development and in a few years it will be ready to be commercialised."

The assembly work is taking place at the company's site in Poissy, just outside Paris, a city that has pledged to become 100% cycle friendly by 2026, with plans in place to add hundreds more kilometers of cycle lanes to an already-dense network over the coming years.

The Green&Bike team draws on internal expertise in design, materials and manufacturing as well as the skills and experience of French suppliers, used to providing parts and materials for high-tech sectors including aerospace and automobile manufacturing.

> Our tricycle is made using hi-tech expertise and knowledge that has been developed to make aeroplanes, helicopters and hi-tech yachts.

It showcases the skills of many people and many businesses. We thought to ourselves that with our mix of engineers and complex skills and an innovative, sustainable approach we could really do something unique," Kostiuk says. "Normally people do things how they have always been done. We were able to have this new vision to design in an innovative, environmentally way. Environmental responsibility has become our primary metric."

About Akkodis

Akkodis is a global digital engineering company and Smart Industry leader. We enable clients to advance in their digital transformation with Consulting, Solutions, Talent, and Academy services. Headquartered in Switzerland and part of the Adecco Group, Akkodis is a trusted tech partner to the world's industries. We co-create and pioneer solutions that help to solve major challenges, from accelerating the clean energy transition and green mobility, to improving user and patient centricity. Empowered by a culture of inclusion and diversity, our 50,000 tech experts across 30 countries combine best-in-class technologies and cross industry knowledge to drive purposeful innovation for a more sustainable tomorrow. We are passionate about Engineering a Smarter Future Together.

We are passionate about Engineering a Smarter Future Together.

Read more about how we
Make Incredible Happen

Engineering a Smarter Future Together.

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