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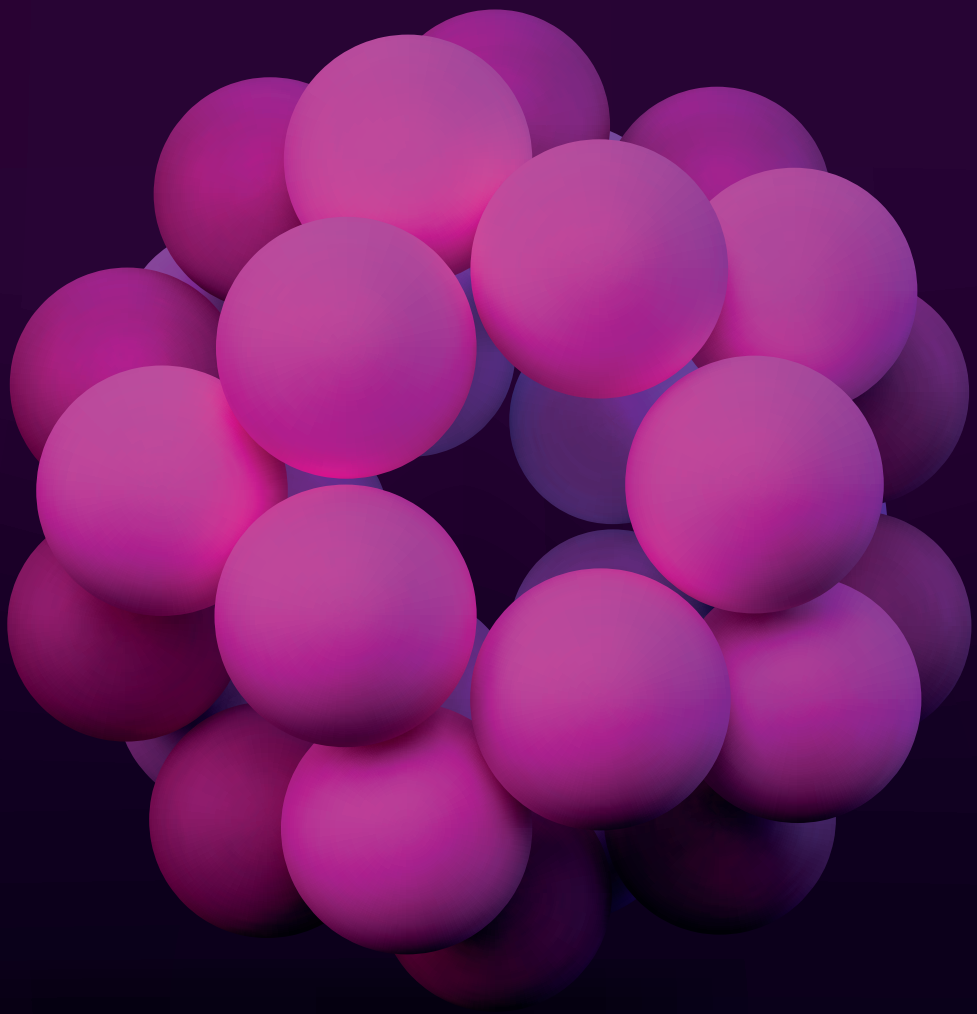

FOREWORD

Dear participants in the ARTEMIS Community,

We are in the middle of many discussions with the European Commission and Member States of the European Union plus Norway about a follow-up programme of ECSEL to be started in 2021 on Key Digital Technologies (KDT). The recent European Forum on Electronic Components and Systems gathering (EFECS 2019) in Helsinki in November 19-21 has been a lively preamble for this. In its third edition EFECS 2019 attracted about 650 participants, significantly more than in the years before.

This issue of our Magazine is almost fully dedicated to EFECS 2019, highlighting the most significant messages that were given over the three days conference.

Jean-Luc di Paola-Galloni, president of ARTEMIS-IA in its function as Chair of the ECSEL Private Members Board gave a short but powerful address with a joint statement of AENEAS, ARTEMIS-IA and EPoSS with recommendations for the KDT partnership, stressing the importance of the digital technologies for the European economy.

Jari Partanen, Finnish State Secretary to the Minister of Economic Affairs and Employment and the Minister of Agriculture highlighted the theme "trust" being important for Europe.
Wolfgang Dettmann, Frans List and Andreas Eckel, from large enterprises, describe how important the cooperation ecosystems are involving many companies (including SME's), RTO's and universities.
Knut Hufeld, Gereon Meyer and Ronald Dekker gave an overview of the ECSEL Lighthouses in which ECSEL projects are brought in connection with key projects in other programmes on industry, mobility and health.
Jerker Delsing reports about a workshop of the Arrowhead Tools with the project Productive4.0, the last one being a cornerstone project in the Lighthouse Industry4.E.
Dimitry Serpanos, the chair of the newly started Scientific Council of ARTEMIS introduces this new body in ARTEMIS.

Elisabeth Steimetz tells about work in progress of the ECS SRA 2021 by AENEAS, ARTEMIS-IA and EPoSS that should be the basis for the SRA of the new KDT partnership.

Finally, Bert de Colvenaer, Executive Director of the ECSEL Joint Undertaking highlights the achievements of ECSEL, mentions the impact study as work in progress of Deloitte/VVA and closes with a firm recommendation for ECSEL and the future KDT partnership: "ECSEL is a splendid car with a warm, running engine, waiting outside the door and ready to take you to there – but please pay for the fuel."

I wish you an enjoyable read.

Jan Lohstroh
Secretary General ARTEMIS Industry Association

CONTENT

"It wouldn't be an exaggeration to say that our future – digital or otherwise – depends on an unprecedented level of cooperation, innovation and knowledge sharing," began moderator Katrina Sichel. "Without the full engagement of the ECS value chain, it's not going to be possible to reach both the European and global sustainability targets which are essential to the healthy future of our society." This is EFECS 2019, the third edition of the European Forum for Electronic Components and Systems. Organised by ARTEMIS-IA, AENEAS, EPoSS, ECSEL-JU and the European Commission, in association with EUREKA and Business Finland, this year's event was the most successful yet.

UPDATING THE INTERNATIONAL STYLE

Despite having the word 'European' in its title, EFECS is an international forum in which the global Electronic Systems and Components (ECS) community is recognised as the key to unlocking the digital economy. Helsinki's Finlandia Hall therefore proved an inspired location: in addition to being one of Finland's masterpieces of construction, the entire building was designed by Alvar Aalto, an early proponent of the International Style of architecture. With its emphasis on volume, flat surfaces and lightweight materials, this spread from its 1920s origins in Europe to become the world's dominant architectural style for decades – one of the first truly international innovations.

Of course, much has changed since the days of Aalto. Globalised networks and ecosystems are a part of daily life for many, leading to questions of trust and sustainability. This

ARTEMIS Magazine 27 *January 2020*

EFECS 2019: ANOTHER KIND OF SUPERHERO

by **JOSH GRINDROD**

was reflected in many of the conference's events, with efforts to collaborate sustainably and successfully providing the content of many discussions. As Katrina put it, "you're the ones continuously building applications and systems. Coming from the outside as a citizen of Europe and the world, I say to you: with great power comes great responsibility. This should be a watchword for the innovation here as it has a direct impact on all of our lives. It was Voltaire who coined that phrase, by the way, not Spider-Man."

EXPERTS IN EVERY AREA

This year, EFECS enjoyed both a packed programme and a record-breaking attendance of 666 individuals. Besides the main speeches, guests had the opportunity to explore an exhibition space with the latest updates on ground-breaking projects. From mobility to manufacturing, all aspects of Our Digital Future were covered. The networking continued in after-conference events, including a reception at Helsinki City Hall and a poster/cocktail session with project idea owners.

In this issue of the ARTEMIS Magazine, we take a closer look at a number of their goals, challenges and breakthroughs. Jari Partanen of Finland's Ministry of Economic Affairs and Employment kicks off proceedings with an opening speech on the complexity of systems, while the European Commission's Khalil Rouhana examines big trends in Europe and the need for coherent policies. As President of ARTEMIS-IA, Jean-Luc di Paola-Galloni announces a new stage in the work of the three industry associations; Elisabeth Steimetz of EPoSS also highlights successes in their joint updating of the ECS-SRA.

Sustainability is the focus for Henrik Ehrnrooth of KONE and in a panel discussion with representatives from agriculture, healthcare, energy and the European Commission. From a large enterprise perspective, keynote speeches by Infineon Technologies, ASML and TTTech also highlight the role of collaboration, while Jerker Delsing of Arrowhead Tools gives insights into how knowledge transfers have benefited this project. This theme is returned to in Lighthouse presentations on behalf of industry, mobility and health. Dimitrios Serpanos, meanwhile, outlines his role as chairman of the new Scientific Council and what this can mean for the community as a whole.

TOMORROW'S MAINSTREAM

With such a wide variety of experts contained in one hall, there was a sense of optimism at EFECS 2019 – the feeling of being at the forefront of big developments and the excitement of sharing what has been achieved so far. Concepts like digital industry and automated driving are no longer considered niche topics or unattainable dreams, as was clear from the sea of hands that went up when Katrina asked how many tech experts, policymakers and researchers were in the house. Interestingly enough, all but one of these hands dropped when she asked how many hardcore nerds were present. It seems that the slogan on ARTEMIS's giveaway bags was correct: '*Nerd? We prefer Intellectual Superhero*'.

TRANSPARENCY AND CO-RESPONSIBILITY

PREPARATIONS FOR A KEY DIGITAL TECHNOLOGIES PARTNERSHIP

by **JOSH GRINDROD**

ECSEL, the Joint Undertaking (JU) on Electronic Components and Systems (ECS), will launch its final calls for proposals in 2020. As a result, the presidents of the three industry associations – ARTEMIS-IA, AENEAS and EPoSS – used EFECS 2019 as an opportunity to deliver a 'Joint statement on preparations for a partnership on key digital technologies'. This covers ECSEL's successes, recent geopolitical and technological developments, a European Partnership for Key Digital Technologies and envisioned improvements. ARTEMIS President and Chair of the Private Members Board, Jean-Luc di Paola-Galloni delves deeper into what this all means.

ARTEMIS Magazine 27 *January 2020*

ONE CLEAR VOICE FROM THE BENEFICIARIES OF ECSEL

"What I want to say, in the name of the 3 Associations, is that ECSEL has delivered," begins Jean-Luc, quoting the opening section of the joint statement. "Clearly, we have done a lot in improving collaboration on ECS, maintaining competitiveness, driving innovativeness and scientific excellence and contributing to addressing European societal challenges. As listed and unlisted companies, we are all worldwide leaders." This is more than just a pat on the back – those four areas of impact have all been proven by the preliminary results of the ECSEL impact assessment.

"However," Jean-Luc continues, "we need to have a wider scope from the proposal. I couldn't agree more that we need to double the budget of ECSEL. Sectors of the economy are multiplying their R&D budgets three, four, five times. I belong to a company which is the number one patent depository in its country (Valeo, one of France's biggest automotive suppliers) and we dedicate more than 11% gross of our turnover to R&D. I also want to salute Finland, which is the best in class in Europe for dedicating 4% of GDP to R&D. Private members are making the biggest efforts, so we don't have to be ashamed to ask for a bigger budget. On the other hand, I do hear the Commission and the public when they ask us to speak with one voice. That is what we're trying to do."

A CONSCIOUSNESS OF CO-RESPONSIBILITY

Part of the process of finding this voice is the preparations being made by the 3As, the European Commission and member states for an institutionalised European Partnership for Key Digital Technologies (KDT) under Horizon Europe (2021-2027). This proposal is a means for ECSEL to continue beyond 2020 with an extended scope, intensified R&I efforts and further improvements to its way of working while still reinforcing Europe's innovation potential.

"As President of ARTEMIS," says Jean-Luc, "I fully support this. But I do agree that we need to build more transparency behind this unification. Together with the chairwoman of the Governing Board, we have spoken as three presidents and all agreed that we want to have a yearly Transversal Management Committee of the 3As. This will let the entities – SMEs, universities, start-ups and larger companies – speak with one voice alongside the valuable work that their offices are doing. They are the beneficiaries."

Since joining the ARTEMIS Steering Board in 2016, he's put these words into action, having set up the first seminars in which each country and entity of one of the 3As outlines their medium-term strategy. This includes, for instance, their financial situation and willingness to cooperate further. Jean-Luc: "It was really well-received by the entire community. We wanted to create a higher degree of transparency and transversality, which means bringing a new consciousness

of co-responsibility among the different stakeholders, building solidarity and removing the silos of thought. At the end of the day, we need to think at a European level as the real competition is global."

ETHICS SHOULD REINFORCE THE SPIRIT OF INNOVATION

Indeed, the world's geopolitical situation was a driving force behind the European Partnership, as the pushback against global trade increasingly hampers European access to KDT. At the same time, other parts of the world have rapidly increased their R&D investments and threaten to create an insurmountable lead in fields such as Artificial Intelligence. As Jean-Luc notes, there is also a conscientious element to this.

"In China, for example, we know that a lot of data-related technologies can be used for the control of social credit. If you misbehave, data is going to control you as a citizen or company. In America, the regulators have given too much freedom to the digital platforms and the new players to do whatever they want. We are in-between. In Europe, with the arrival of GDPR, there is a cultural, ethical and juridical spirit on how to use data."
"We need to collaborate with fair rules when other areas of the world are imposing theirs. If we disagree, we need to be strong and clear. We need to see where our value chain lies as European actors. Semiconductors and Tier 1 automotive suppliers, for instance, were able to provide European technologies that we can sell to final users as solutions systems in other worldwide markets. That's where the value chain is strong and that's what we need to protect."

He refers back to the keynote speech by Khalil Rouhana of the European Commission, who reminded EFECS of the need to protect Europe's inclusiveness while also focusing on environmental aspects. "For sure, sustainability is important: we need to make sure that the huge development of digital is not going to harm the environment, such as through the electricity consumption that data centres and clouds could create. I couldn't be happier as this is one of the parameters in my operational duties."

TOMORROW'S SMES, COOPERATING WITH ALL OTHER STAKEHOLDERS

Inclusiveness also plays a large role in the KDT partnership, which proposes (in addition to the extended scope and increased R&D budget) a referral mechanism to EUREKA clusters for good proposals lacking EU funding and an improved co-funding mechanism that simplifies participation for beneficiaries. It also promises dedicated measures to increase SME participation, which Jean-Luc elaborates on. "First of all, we need to start from what exists. It's not well-known enough that there is a dominant participation of SMEs in all European projects," he says with a smile.

"We live in a flexible world of capital in which SMEs are often the ones that bring disruption. What is important is that we get that innovation, which means removing a certain fear of access. What is the problem, concretely? SMEs are struggling with their budgets. They have a constrained timeframe in their day-to-day business and can't engage themselves in a three- or four-year project. I always say though that it's non-equity money for them. If they're able to allocate just one person to that for three years, this is 100% funding for them. ARTEMIS has done this exercise with a few start-ups, which is the best way to involve them in the wider ecosystem. This approach needs to be upgraded and shared amongst the community."

Jean-Luc followed through on this by attending Slush, the world's leading start-up event. In addition to mentorship activities with organisations involved in predictive health and retirement preparations, he was part of a panel with Director-General of DG Research and Innovation Jean-Eric Paquet and Trivago co-founder Rolf Schrömgens. Jean-Luc: "I've never spoken in front of so many people! It went very well and focused on how European research schemes are helping digitally-involved companies and stakeholders. One thing I mentioned was the importance of embedded systems versus hardware and how the value chain is the core of what will be a worldwide competition. I could also elaborate on why ARTEMIS is the right kind of association for embedded and intelligent systems that are going to be massive GDP markers, from automotive to consumer life goods and e-health to connected agriculture."

COMMITMENTS FROM ALL STAKEHOLDERS

Through his involvement with Slush, Jean-Luc gained the opportunity to promote ideas of European cooperation at a dinner with members of the Finnish government. "This was under the auspices of the World Economic Forum, who I would really like to thank for the invitation," he explains. "What's funny is that the Prime Minister who hosted the dinner at that time, Antti Rinne, actually stepped down and the new one (the former Transport Minister) was almost sitting next to me – Sanna Marin, the current youngest state leader of Europe. The dinner was to outline the digital challenges for our continent. I was there as I'm chairing the beneficiary party of programmes that handle between five and six billion euros of public-funded money. This is an essential instrument for enhancing the key digital agenda of Europe."

In closing, Jean-Luc returns to the ideas behind the joint statement and European Partnership. "Since joining this community, I could not have asked for more interstate solidarity. As all the speakers have clearly stated, we are in a worldwide competition. A lot of our companies, even when they're smaller, have to compete beyond Europe, so we need much higher levels of coordination in order to launch projects. I would like to say to member states: yes, you have the commitment of all the members of the 3As, and particularly of myself, but you need to cooperate beyond the border of your own country's interests when it comes to digital strategic projects. This is why we need an inclusive and flexible instrument for our KDT at a European level."

Sustainability is important: we need to make sure that the huge development of digital is not going to harm the environment

ARTEMIS Magazine 27 *January 2020*

CHAINS, SYSTEMS, NETWORKS AND TRUST

ETHICAL DIGITALISATION AS A EUROPEAN TRADEMARK

by **JOSH GRINDROD**

ARTEMIS Magazine 27 *January 2020*

"Winter is coming, but the Slush will be here even sooner," smiles Jari Partanen, Finnish State Secretary to the Minister of Economic Affairs and Employment and the Minister of Agriculture and Forest at the time of speaking. The significance of Helsinki hosting both EFECS and Slush (the world's top start-up event) in the same week is not lost on him. In his opening speech to EFECS, Jari took the time to outline the R&I and sustainability goals being pursued in Finland and his views on ethical collaboration – even if it means things got a little complicated.

CHAINS AND SYSTEMS ARE COMPLEX

"In this speech," Jari begins, "I will talk about both simple and complex things. It's evident to me that we are dealing with things on the complex side. First of all, there's chains. In the field of electronic components and systems, you are familiar with long and intricate value chains. In mobility solutions, for example, you have to bring together road safety, positioning, navigation and traffic information data from various sources and sensors. Nonetheless, the ECS field has proven its innovativeness by creating amazing applications."

Systems, he notes, are also complex. Although different chains, applications and actors must be brought together to create innovative sources of new value, this inevitably leads to system challenges. Jari: "One is sustainability, so this government has outlined a socially, economically and ecologically sustainable society as our priority. We propose a European Union that sets itself the ambitious objective of becoming the most competitive, socially inclusive and climate neutral economy worldwide. Finland is committed to promoting a sustainable economy in which the digital transformation strengthens the competitiveness of our businesses and the wellbeing of our citizens. For that, we need forward-looking digital policies."

Of course, ECS plays in an important role in this vision, which Jari refers to as a holistic approach that harnesses joint forces from across all sectors. Low-carbon technologies – occasionally looked down upon by established industries as a revenue killer – have the potential to become engines for the growth of European economies. The Finnish government puts so much faith in this that the goal has been set to become climate and carbon neutral by 2035.

NETWORKS ARE COMPLEX

Continuing the theme of complexity, Jari turns his attention to a topic which reoccurred throughout the conference. "Research contributes to economic growth and innovation makes for a successful business, but these die when done in isolated pockets. Results are poor and their dissemination is limited, except when done in networks," he explains. "Finland wants to become the world's best environment for innovation and experimentation, so we plan to raise our R&I investment to 4% of GDP by 2030. We encourage other EU member states to increase their investments as well."

"In Europe, we have established strong public-private partnerships and are developing new ways of working together as challenges and opportunities change. This requires cooperation between different kinds of firms of different sizes. EFECS is therefore a great platform for fostering networks and finding suitable partners, which is crucial for maintaining Europe's role as a scientific powerhouse."

TRUST IS SIMPLE

"At the beginning, I told you that I want to talk about both complex and simple things. Chains, systems and networks are all complex. I have to admit that my fourth and final topic is complex as well. However, I want to think of it as something simple. Not in order to deceive you but because it's helpful to think in such a way in this complex and busy world. In the end, it comes down to a simple question: do your actions reflect trust or mistrust?"

Trust is both the lubricant and petrol of cooperation, a foundation on which chains, systems, networks and innovations are ultimately built. "Europe is a continent of high trust," continues Jari. "When trust is implemented in our businesses, the most capable people have better chances of making a change. Trust is, of course, a test for politics as well. Even more importantly, the public sector must be able to create trust. For all businesses and all sectors, we want to create an operating environment which is both reliable and predictable and which enables growth and innovation."

One crucial area is the sharing of data. More so than other regions of the world, this is also a topic that has provoked fierce discussion within Europe, especially following the enactment of the General Data Protection Regulation in 2018. Jari: "We need instruments and platforms for data sharing that build trust, as data must be put together with a purpose and implemented in a secure, responsible and ethically sustainable way, fit for a human-centred data economy. Trust serves the same functions in all economies and societies, but digitalisation with ethics and integrity should be a truly European trademark. Ethical guidelines should be seen as an enabler of innovation, and I believe that EFECS is full of opportunities to realise this. Learn from others and learn about yourself. What do you have to offer? What can you do together? I wish you all the best in your important work!"

ARTEMIS Magazine 27 *January 2020*

ECOSYSTEMS OF INNOVATION

THE LARGE ENTERPRISE VIEW ON COLLABORATIVE PROJECTS

by **JOSH GRINDROD**

How does collaboration within Europe work? What are the benefits for both companies and society? And what has been achieved so far? At EFECS 2019, representatives from Infineon Technologies, ASML and TTTech gave their perspectives on these questions and more – including how to never have a boring hour at work.

THE IMPORTANCE OF IMAGINATION

Getting the ball rolling is Wolfgang Dettmann, Director Funding Projects & Coordination at Infineon Technologies. "For me, it's been a really exciting ten years," he begins, reflecting on his time at the company in the area of funding projects. "But we can no longer just take incremental steps. A macro-economically independent industrial base in Europe requires world-leading electronics research. We need disruptive elements from within and we cannot do this alone." Although Infineon is a global giant in semiconductors – with reported sales of USD eight billion in 2019 – his point is clear: truly ground-breaking innovation requires the involvement of the full value chain, including SMEs, academia and other big industrial partners.

"We need a common vision on what we want to achieve in Europe, like key enabling technologies," says Wolfgang. "As a company, we have a certain skillset and our own imagination, so we talk about use-cases and functionality with our customers. But that's just the perspective of a single player. On the other hand, we see ECSEL as a strategic programme with which we can set up long-term innovations, partnerships and strategies together. It's an ecosystem." By conducting pre-competitive research, parties take the time to prepare for the future; by broadening their scope, they speed up their activities in the long term.

Looking to examples of ecosystems in action, Wolfgang points to Infineon's Dresden fab, in which 2500 employees work on over 400 different products. "We started with a transfer from 200 mm power to 300 mm. Through successive projects, like SEMI40

You need an ecosystem like ECSEL or ARTEMIS to grow a large number of companies that can meet the high levels of competition we encounter every day

and Productive 4.0, we find ourselves on the way towards a smart fab," he says. "A similar example is the Lighthouse initiative Mobility.E, from e-mobility to highly-automated vehicles. We started more on electric vehicles and the last projects covered perception, planning and automation. There are a multitude of partners in each project, but we all follow trends. In 2012, nobody thought that highly-automated vehicles would land in 2018." Having outlined just a handful of the ecosystems that Infineon has participated in over the years, Wolfgang concludes with some advice. "Our view on collaboration is that we need to know where we want to go in 2030. We need high-level support – a certain level of commitment on the public side, like funding, and content like the SRA in order to do pre-competitive research along the value chain. And we also need a lot of imagination on what's possible with our technologies. It's about developing the future."

MORE MOORE

Frans List, Senior Project Manager Strategic Technology Program at ASML, is introduced to the floor as a 'semiconductor whizz'. "One tries one's best," he concedes. "But before we go into that sort of thing, I'd like to give some context. We started 35 years ago as an SME with 45 employees, an R&D budget of less than five million euros and a 0% market share in lithography. Fast-forward and we have a 2018 turnover of 10.9 billion, a market share of 87% and an R&D budget of 1.6 billion. Collaboration has been key to our success." Like Infineon, ASML has been involved with partners throughout the value chain, from suppliers such as TNO through to customers like Samsung. "We drive the ability of the industry to improve the speed of microelectronics every two years," Frans explains. However, the continuation of Moore's Law requires research and innovations in areas well beyond the scope of individual organisations: lithography, metrology, materials, devices, processes, architectures and design tooling.

"In this context, we have been involved in thematically-connected collaborative projects for a little more than 20 years. One common thread has been the creation of extreme ultraviolet (EUV) lithography." ASML, he notes, has led 14 projects within funding programmes such as MEDEA+, ENIAC and ECSEL, which contributed to the creation of the first ever EUV products this year.

The benefits of collaboration are therefore diverse, including supporting business creation by developing low TRL technologies to a higher maturity and enabling partners to invest in their own roadmaps. "All in all," Frans summarises, "ASML's expectation is that we can initiate, speed up and intensify R&D in order to cope with an even higher demand for Moore's Law than ever before. From the perspective of industry, this is vital to the realisation of big ambitions like automated driving and AI. For society, it tackles the need for solutions on issues such as the energy consumption of data centres and sustainability."

To illustrate just how meaningful collaboration has been to the ecosystem as a whole, Frans closes with some statistics: since the start of ECSEL in 2014, the number of first patent filings per year has increased from 600 to 800, the net sales of project partners involved in litho-, metrology- and processing equipment have more than doubled and the number of highly-skilled jobs among partners has risen from 16,000 to 41,000. "Ecosystems are essential to us as they allow us to focus on what we excel in while benefiting from R&D that others excel in. It's a matter of live and let live."

EXCITEMENT EVERY DAY

As a relative newcomer in the world of large enterprises, TTTech hopes to offer a slightly different perspective on collaboration. "We're an embedded systems company, which probably makes us a little bit unique in this environment," begins Andreas Eckel, Team Lead Grants at TTTech Group. "We ensure safety and electronic robustness for a more connected, automated and sustainable world. This is the key essence of our business, and we work in areas like automated driving and fail-operational systems."

A lot has changed in the last ten years. When ARTEMIS Joint Undertaking launched in 2009, TTTech was an SME with 150 individuals under one roof. Today, they're a group with almost 2000 employees around the world. "We started from fail-silent, which means systems that stop working when there's an error. Autonomy is now needed a lot more as getting the blue screen while in your autonomous car in unthinkable," continues Andreas. "The company is growing very fast and this makes it really exciting for me to be on board."

This growth, he observes, was only possible through collaboration within European programmes. "Consider a large tree. It creates an enormous amount of seeds. Each one could be a company or organisation, but if it doesn't fall in the right place, you'll never get a forest. You need an ecosystem like ECSEL or ARTEMIS to grow a large number of companies that can meet the high levels of competition we encounter every day. If we're in an emergency situation with a proposal, I know that there's always somebody in Europe who can have the numbers ready by tomorrow and join us. This was not the case 15 years ago."

As Wolfgang and Frans also pointed out, such an ecosystem is greater than the sum of its parts. It's this flow of knowledge and information which enabled aerospace technologies, for instance, to be utilised for time-triggered ethernet, wind plants and automated driving. "How does it work?" Andreas asks. "In the very beginning, you have an idea that goes to prototype. ARTEMIS and ECSEL can help you to grow it and reduce the risk. Once we get to the product stage, we support it on our own. There is space for every size of organisation! If you're small, this is an important way to meet potential customers and learn about their requirements, needs and skills, as well as to provide an opportunity for potential customers to learn about your skills."

Of course, this has benefits at a European level as well. New solutions to energy and mobility issues are often talked about, but Andreas brings things back to the individual. "Everybody needs employment, in this room and across society, so we need a growing economy. Collaboration provides jobs in high-skilled applications that are actually interesting. I've been in this company for 19 years and I can say that I've not had one boring hour. This is what I wish for everybody – to have such enthusiasm for your work."

ILLUMINATING THE LATEST INNOVATIONS

AN INTRODUCTION TO THE LIGHTHOUSE INITIATIVES

by **JOSH GRINDROD**

Within ECSEL, the Lighthouse Initiatives are a way of combining the bottom-up approach of project submissions with the top-down approach of strategic guidance from the ECSEL Governing Board. This helps to shine a light on specific subjects of common European interest, such as industry, mobility and healthcare. At EFECS 2019, Knut Hufeld, Gereon Meyer and Ronald Dekker introduced audiences to the successes and challenges faced in these areas so far.

ARTEMIS Magazine 27 *January 2020*

REALISING THE HYPE

With a focus on electronic components and systems, Industry4.E is enabling European industry to achieve a digital transition and strong competitiveness. "But what is this really all about?" asks Knut Hufeld, Director R&D at Infineon Technologies. "We're trying to create networks and dissemination to improve the visibility of the work we do in ECSEL. Promotion is very important, but we also link projects, national and regional activities and reduce fragmentation among stakeholders." As with all Lighthouses, the ultimate goal is to generate industrial and societal impacts across Europe.

In practical terms, this means finding solutions for today's major industrial roadblocks. "For two or three years, the hype has been for artificial intelligence as an enabler of robust manufacturing," says Knut. "This leads to the next topic: human-machine interfaces and human-centred manufacturing. This even covers ethics. Should we really follow the command of equipment? I'm in favour of being pragmatic. If traffic lights give us a red light, we all stop. If this technical system gives us a green light, we're happy to go. This has worked quite well for 120 years."

Industry4.E is centred on Productive4.0 (Europe's biggest research project in the field of digital industry) but is constantly growing. This is supported by CSA-Industry4.E, a 24-month project which began in October 2018 and manages communication, workshops and dissemination activities. Knut: "This is the baseline for running such a Lighthouse. We also have various roadmaps. It's clear, for example, that we have to use AI to enable more resilient manufacturing and need electronic components and systems for sustainable manufacturing. Of course, more modelling is important for planning our processes along the value chain."

The pragmatic approach is working well for the Lighthouse as a whole: in the space of

one year, Industry4.E has been represented at 14 international events, from the Irish Manufacturing Expo to Basque Industry 4.0. Wide exposure is vitally important for gaining trust in the deployment of new technologies, particularly of individuals and organisations from outside the field. "When you're working with colleagues in your technology export groups, it can be easy to forget to address the citizens of Europe," Knut concludes. "Remember: a YouTube video might say more than a boring PowerPoint."

FROM ELECTRIC SCOOTERS TO TAXI DRONES AND SPACE TRAVEL

As an expert in electrification and vehicle automation, Gereon Meyer is committed to the transformation of the entire mobility system – something he carries out as the Deputy Head of Department Future Mobility and Europe at VDI/VDE Innovation + Technik GmbH and within the Mobility.E Lighthouse. "You know, Finland has more lighthouses than ECSEL," he begins. "I assumed that most of them would have been turned into GPS transponders, but today I learned that they have another use – *majakka* saunas." New modes and players are clearly emerging in more than one field.

"We've already heard from Knut about what the ECSEL Lighthouses are doing in general. We can tentatively say that Mobility.E is about strengthening and making links between the ecosystems of electric, automated and connected mobility on one hand and of ECS on the other," Gereon continues. "These ecosystems are changing more rapidly and disruptively than ever before. Just last week, we saw the announcement that TESLA is building a giga-factory in Europe to provide batteries, power trains and vehicles. Wow! I don't think we know yet what impact this will have, but it will definitely affect the value chains." This requires flexibility when looking at system solutions: do we pursue environment perception with vehicle-based sensor suites or with connectivity to digital infrastructures and AI in the cloud?

Gereon: "The other thing we're learning now is that changes in the mobility domain also have a non-tech dimension. We have to consider economic, social and legal demands – the human factors. Sometimes, innovation doesn't arise from technology but from a business model or societal factor that requires it." This applies to electric scooters and spaceships alike, as well as to everything mobile in between. "In the Lighthouse, we are distinguishing between the application ecosystem and the ECS ecosystem, taking into account these non-technical dimensions. Practically speaking, we're comparing the roadmaps in these different ecosystems so we can understand where there are new links are to be made."

In doing so, the Lighthouse doesn't limit itself to ECSEL but rather looks at how Horizon 2020 projects relate to seven urgent priorities: data availability and sharing, decarbonisation, connectivity, infrastructure and services for smart personal mobility and logistics, sensors and sensor fusion, intelligence on board and safety, security and validation. Projects that address the latter three categories have already been found. "Some of these are push projects, but we also fund exciting pull projects," Gereon explains. "The benefits are obvious. We highlight these projects and try to support them with analysis, matchmaking and advice."

As for the future, he believes that the Lighthouse should cover the entire world of new mobility. "We've talked about road transportation, but urban air mobility – i.e. taxi drones – is a good example of a push project in which knowledge developed in the ECS domain can be applied. We could go even broader and start considering mobility technologies in the context of application areas like well-being and health, entering a new landscape of ecosystems – the Lighthouse of Lighthouses."

BREAKING DOWN BORDERS

"Did you know that only one out of every ten candidate medicines that works on mice also works on humans?" asks Ronald Dekker. "And that the fourth cause of death worldwide is side-effects of drugs?" In over 30 years at Philips, he's seen a lot change in the medical domain. For the Health.E Lighthouse, personalisation represents the next step in creating safe medical technologies that work for everybody – but challenges lie ahead.

"The other thing we're learning now is that changes in the mobility domain also have a non-tech dimension. We have to consider economic, social and legal demands – the human factors.

"Basically, the efficiency of the pharmacy industry (as measured by the amount of money to develop a single drug) halves every nine years or so," says Ronald, referring to the creatively named Eroom's Law. "This is in complete contrast to the semiconductor world, and I'm pretty sure much the same is happening to electronic medical devices. It's a shame to see how much research is going into this and how little is hitting the market."

One reason is that innovation is driven by the volume of production. "In the eighties, Philips did everything alone. First, we stopped making silicon wafers. We realised that if you have just one company doing that, you get much better wafers as they have the sheer volume needed to innovate. The medical domain is different as innovation stops when you get to the point of systems interacting with real matter like tissue. These technologies are complicated, so it's difficult to get the required volume and there's almost no practice of open platforms."

Nonetheless, there are opportunities to be found. Through the move from treatment to prevention and the desire for personalised healthcare, the borders between pharma, medical technology and ECS are fading; new technologies then arise in these grey zones.

ECS 2019

"One example," says Ronald, "is eHealth. Many hope that consultations with doctors in hospitals will largely be replaced by the many sensors in mobiles, IoT and cars, which can diagnose us and coach us on our health. But again, there's a lack of open platforms for data integration and trusted communication."

To generate solutions to this issue, the Health.E Lighthouse rests on three pillars: creating awareness of emerging opportunities in the ECS community, promoting an Open Technology Platform model for medical technologies and creating a sustainable ecosystem. Ronald: "Many will say that's not possible, but let me give you an example of something we're doing in the POSITION-II project. This is the cornerstone of Health.E and addresses minimally-invasive surgery. These days, there are a whole host of smart instruments that can gives eyes and ears to a cardiologist. We're making one technology platform that can serve all these applications and we're doing this with five direct competitors to Philips."

Ronald finishes his speech with a positive view of the future, a vision of 'Moore for Medical' in which high volumes and low costs provide breakthroughs in healthcare. "We hope to extend this community. Hardcore technologies are still needed, and I think that the Lighthouses will play a crucial role in this. After all, I know that's what you guys are good at!"

SENSORS, STRESS TESTS AND DOLLS THAT SEE

THE EFECS 2019 INNOVATION AWARDS

Across Europe, ECSEL JU, CATRENE and Horizon 2020 have poured billions of euros into research and development that has changed the way we live and enabled technologies that were once deemed unfeasible. This is only possible through the hard work of project consortia that cut across international lines and push the boundaries of innovation. To say thank you, EFECS 2019 took the opportunity to honour a handful of success stories in the form of innovation awards.

by **JOSH GRINDROD**

SENSING EUROPE

Oliver Pyper of Infineon Technologies Dresden is first to the stage, receiving the ECSEL JU Dissemination Award on behalf of IoSense. As the coordinator of this project, he's worked with more than 1000 people, 33 organisations and six countries on a ubiquitous part of modern life. "Sensors are everywhere. They give us a better idea of our world, health, traffic and homes. You know this," he announces. "But what you might not know is that Europe is currently leading the way. Some of the top companies are here, exporting sensors to China to be built into familiar devices. We have to keep this position, which is what IoSense is for."

To start with, Oliver outlines some of the key achievements, including the publication of *Sensor Systems Simulations: From Concept to Solution*, a book describing the various technical outcomes. Collaboration, however, takes the forefront. "IoSense brought together partners who didn't know each other," he emphasises. "We had a partner in the Netherlands, for example, who had developed a sensor and wanted to test it in a demanding area. During the project, he learned that Graz, Austria, has the most thunderstorms in Europe. We had a partner there, so he could easily set up his environmental sensor and got some very nice results."

IoSense has resulted in more than ten demonstrators in diverse fields, but Oliver only has time to outline a few. "One was lighting as a business, investigated by our partner Signify. If you do maintenance too late, you'll have additional costs and unsatisfied customers. If you come too early, it's just very costly. We put sensors on the light to detect not when it dies – that would be very easy – but to find out when it has only 100 more hours to live. This is now possible."

In addition to this, IoSense involved partners from machinery industries. "In former times," Oliver continues, "this was just putting mechanics together. Nowadays, it's a bit different. Our partner XENON, for instance, is selling production lines for sensor systems, but is also using sensors so that engineers can easily learn what the machine is doing today, tomorrow and the week after. This helps to control the quality of the product as you can

ARTEMIS Magazine 27 *January 2020*

see failures much earlier, which is what makes engineers happy."

In closing his speech, Oliver takes the time to share his gratitude for the project as a whole. "I really want to thank everybody who was involved, and also the six national authorities for spending money on this and giving practical support in some cases. I also need to thank the European Commission and, last but not least, ECSEL for doing an excellent job. It was a great collaboration."

THE NEW AUTOMOTIVE

Speaking next is Tanja Seiderer, another member of the Infineon family and the project leader of NexGen. Thanks to its work on healthcare innovations with 16 partners in Germany, Belgium and the Netherlands, this was the proud winner of the 2019 CATRENE Innovation Award. "We came to this project because of demographic change," Tanja explains. "During the next decade, the average age of EU citizens is to rise by five years. Even worse, more elderly people are living alone without any support. If the healthcare sector wants to overcome this hurdle, we need applications to help people stay out of hospital and to be able to care for themselves."

NexGen's solution lies in micro-electronic technologies and components for mobile and wearable healthcare systems, which involved structuring the project along two supply chains. "The first was about an implantable Glucose Monitor. The main innovation was the quality of the tests. There were a lot of biomedical and functional evaluations and the results in the lab were so good that we convinced the ethical committee in Germany to do testing on animals," continues Tanja. "The second was a Multiparameter Monitor for measurements like skin temperature and hydration. A lot of integration work had to be done, but we achieved the ethical vote to do tests on humans. At the end of the project, we performed stress tests on volunteers, functionality tests on the sensors and data transmission tests. Even the doctors had to sweat on the trainer."

"All this was combined into a communication and user interface. There are many new applications coming to the market and so the idea of the consortium was to set up a value chain that can incorporate many of these." The capacity to address many applications was made possible by basing communication on different technologies: using Sub GHz, NFC or WiFi, data from devices can be collected, treated via a Raspberry Pi Gateway and a router and ultimately stored in a cloud solution. There, either the patient themselves or a healthcare professional can request the data and react to it, depending on the situation. In setting up this system, the consortium placed high value on data security to guarantee both market and user acceptance.

"Last year at EFECS, it was said that healthcare is the new automotive. I really love this sentence!" Tanja concludes. "If you look at the market, it's been proven. If we want to lead that market in Europe, we have to be fast in development – but this is a bit of a problem for medical products. It takes a lot of time and a lot of work, which is what makes pre-competitive projects like NexGen so important."

A VISION OF INNOVATION

As Horizon 2020's winner of the Innovation Award, Eyes of Things has focused (perhaps unsurprisingly) on artificial vision. "Previously, this has mostly been used in factories for quality inspection," begins Oscar Deniz Suarez, project coordinator and Associate Professor at the University of Castilla–La Mancha. "It works very well in that controlled environment, but this scientific discipline has progressed enormously in the past few years – especially with the advent of deep learning. The capabilities of artificial vision are now very close to human capabilities. So why don't we bring this outside of the factory?"

That's precisely what Eyes of Things has done, designing and building an open platform for embedded computer vision in which deep learning is a crucial element. An optimised Software on Chip (SoC) is at the centre of this, having been designed for low energy consumption in the face of demanding vision applications. "We managed to bring it to a very competitive price in volume – around 120 euros – as compared to products coming from America and Asia," says Oscar. "Besides that, we think that our product is much better, especially in the ratio of high performance to power consumption. I'm happy to say that we got the highest marks in the EC review last year in Brussels."

Of the project's various demonstrators, he chooses to highlight two. The first is a mock-up of a headset that serves as a hands-free audio guide for museums and can automatically recognise which painting an individual is looking at. Oscar: "We also inserted the device into a doll's body, including the camera and a rechargeable battery that can run for thirteen hours. This doll is able to detect the child's face and recognise their expression from one of seven basic categories. Everything runs locally – no image is ever sent to any server, which obviously would be a problem. These are just two examples of potential consumer products."

As for the future, he echoes sentiments expressed throughout the conference on why teamwork in Europe matters. "I agree with Tanja that we have to be very fast in innovation and I think that the key is to find good collaborations between partners in consortia. The key ingredient that started my product was a manufacturer of chips, Movidius, who told me they had developed a new device but didn't know how to use it to create cool products. I said, 'your device is great, it lets me bring my computer vision methods to life outside of the scientific paper'. That was the match that started it all, so feel free to reach out!"

EFECS 2019

KNOWLEDGE TRANSFERS AND DIGITAL SOLUTIONS

THE JOINT PRODUCTIVE 4.0-ARROWHEAD TOOLS WORKSHOP

by **JOSH GRINDROD**

As one door closes, another opens. Europe's biggest automation project, Productive4.0, is coming to an end in the summer. Having utilised a budget of 100 million euros and the involvement of 108 partners, this aimed to make Europe's digital industry more predictable and flexible. Arrowhead Tools, meanwhile, is plugging the gaps that hinder the efficient engineering of IT/OT integration. With 80 partners and a budget of 90 million, it's become Europe's second largest project. Their first ever joint workshop, held in Porto from November 11 to 15, has big ramifications for future projects and the competitiveness of Europe as a whole.

A TECHNOLOGICAL LEGACY

Besides almost 25 years as a professor at Luleå University of Technology, Jerker Delsing is the coordinator of Arrowhead Tools – a position with roots that go back a long way. "In 2002 or 2003, I joined a project called Socrates, working on early things that are now part of Productive4.0 and Arrowhead Tools," he begins. "There's been a chain of projects since then, but the general idea has always been: how can we make use of internet technologies to create automation and digitalisation solutions?"

Currently, these are implemented using operational technologies. Factories, for instance, use Supervisory Control and Data Acquisition (SCADA) as a control system architecture to manage automation. Jerker gestures towards the exhibition area of Finlandia Hall, the site of EFECS 2019 and a deceptively large space that fits over 4000 individuals. "In this building, the control of lighting and heat is a SCADA system. But such systems are not compatible with the internet. They use a lot of legacy operational technology, which tends to be engineering-heavy and thus expensive," he says.

"Integrating this with new IT technologies adds complexity and therefore costs. People want to reduce the costs of creating automation and integrate a larger number of sensors and actuators while also bringing stakeholders into the value chain to create optimisation. We're talking about huge systems that don't exist today."

Nonetheless, enormous strides have already been taken: Jerker points to companies that have released internal data which proves that things are moving in the right direction. "These companies took very early versions of what's now called the Arrowhead Framework and implemented it in well-known customer solutions. One solution was heat control in buildings. Normally, they spent 48 engineering hours putting that together for a customer. With this new technology, they were down to six to eight hours. As a ballpark figure, the released industry data showed 65 to 80% savings on engineering costs."

BUILDING UP MOMENTUM

Taking place at the University of Porto, one of Portugal's key centres of research and development, the Joint Productive 4.0-Arrowhead Tools Workshop was a significant achievement in terms of both technology and collaboration within ECSEL. Instead of working in parallel, Europe's two biggest projects have been able to pool their knowledge and expertise, helping to significantly speed up innovation.

"The aim was to take the next step towards the implementation of Industry 4.0 and digitisation with respect to both efficiency and profitability," says Jerker. "There's a very nice technology transfer between these two projects, which we could do because the technology has already been declared open source. We can communicate without bothering about intellectual property, so there's an open arena."

"Getting together 150 researchers and developers of different backgrounds for four days creates momentum. For all these types of projects, it takes a while to get to the core of what you want to produce, as different partners have different understandings of the problem. It can take one and a half to two years before things really get moving, at which point these projects become very efficient. When I concluded the meeting, I stated that Arrowhead Tools is talking key stuff after just six months and we already have a great alignment with a large number of partners, very much thanks to the close collaboration with Productive4.0."

One outcome of this is that the substantial investments of society, industry, members states and the European Commission will have benefits far beyond the scope of either project. The enhanced capacity to scale up technologies and bring them to market means that knowledge transferred to successor projects will be at a higher maturity level than in the past, bringing about interesting results at an earlier stage. "We'll be working on the right things from day one."

PAVING THE WAY

Before looking further to the future, Jerker reflects a bit on the changes he's seen since the Socrates project in the early 2000s. "The most pleasant development for me is that we now have an open-source framework for integrating digitalisation and automation solutions which is freely available and already so mature that it's being used by industry. With such foundations for Industry 4.0 currently being laid, I think that we'll be able to create the next generation de facto standard in an area in which Europe has long been the leading lady."

"Get behind the more mature technologies, the things people have been working on for 15 years. Project alignments, strong knowledge transfers and liaisons between both European and national projects are the key factors in becoming fast enough – it's not about trying to reinvent the wheel."

As Jerker further points out, "other regions of the world – the US, Japan, China, South Korea – are keen on taking on the businesses that we have a big chunk of today. It's important for Europe to stay in that lane and maintain advantages compared to other regions. It's thus vital that we further focus our efforts through continuous R&D&I project alignments, strong knowledge transfers and liaisons between both European and national projects in order to become fast enough."

BUILDING BLOCKS FOR THE FUTURE

UPDATING THE ECS-SRA

by **JOSH GRINDROD**

The Electronic Components & Systems (ECS) Strategic Research Agenda (SRA) is a living document: updated each year, it provides ARTEMIS, AENEAS and EPoSS with the opportunity to set out their common vision for a digital Europe and outline the key application areas, challenges and solutions. In addition to her background in semiconductor physics and several years of experience as project officer at VDI/VDE Innovation + Technik GmbH, Elisabeth Steimetz is currently Office Director of EPoSS. At EFECS 2019, she outlined the work being done on the 2020 ECS-SRA update and how this can shape new collaborations.

FITTING THINGS TOGETHER

"I started working for EPoSS in January and got volunteered to take over the ECS-SRA chair shortly after," Elisabeth laughs. "In previous years, the chairs came from ARTEMIS and AENEAS, so it was EPOSS's turn in 2020. My first thoughts were, 'Oh, my god! What do I have to do?', but it turned into a great experience. In the ECS-SRA team, we feel that the three associations are working closely together regardless of which association the members come from. This is a really good working atmosphere and I received a lot of help from the co-chairs Patrick Cogez from AENEAS and Patrick Pype from NXP."

As the initial ECS-SRA was released in January 2018, only relatively minor updates took place in 2018 and 2019. These included expanding the long-term vision, which contains surveys on emerging technologies that will have significant potential for the European ECS landscape ten years into the future and beyond. "For the 2020 minor update, the structure and the teams working on the different chapters were established. We had one replacement in the core team, but everything was already more or less set up and fortunately stayed the same," says Elisabeth. "A challenge actually came towards the end, as we received eleven different chapters and had to merge them into one concise document without any mistakes."

THE FIRST MAJOR UPDATE

Having successfully brought these chapters together in a cohesive whole, attention has now turned to the 2021 update – the first major revision since the original publication. "At the end of September, we discussed the changes that will come next and came to the conclusion that we need a revised structure for the major update," Elisabeth says. "We're discussing the team and what topics must be added in order to prepare us for the coming years. If you're doing an update, you always add things. It gets longer and longer if you never skip anything. For next year, we want to make it more concise, but this is going to be a real challenge."

As for the new topics, she's quick to name artificial intelligence as the most important area that requires more attention. Nevertheless, it's important to keep the core of the document in sight. Elisabeth: "The ECS-SRA 2021 must still focus on electronic components and systems. There will be other instruments and organisations taking care of the software development of AI, but it is necessary to connect these different worlds. We need to collaborate more with other associations beyond ours and align their roadmaps with ours."

"We want to cover the topic of sustainability more in-depth. Topics that are not that prominent in the current SRA, like agriculture and climate change, need to be better covered. What do we consider necessary for a better future? Our work covers technical things that need to be improved, but the ways in which we approach matters and communicate them to the outside world also need to be worked on."

By and for the community

One such opportunity to share ideas took place at EFECS 2019 in the form of six ECS-SRA related workshops. In the three parallel ECS-SRA sessions (Technology Trends, Application Trends and Broadened Scope), the future content of the ECS-SRA 2021 was the focus. As the moderator of the latter, Elisabeth not only oversaw talks and a panel discussion with those involved in the SRA update but also sought to make affairs more interactive. At the end, guests were invited to add stickers to a diagram showing different application areas, with the sticker's colour representing their field and its placement showing where they believe opportunities for collaboration lie.

"For me," says Elisabeth, "there were two real highlights in the Broadened Scope session. One was integrated photonics, as this will open a whole lot of new opportunities for the ECS community." The workshop agreed, with many stickers being placed at the interface of integrated photonics and electronic components and systems. "The same is true for flexible manufacturing, as applications are getting more and more specific. Especially in healthcare, a lot of applications use a combination of flexible and standard ECS components to run the sensors. I see potential there."

"On the software side, I learnt that it's tremendously important that we come to more standardisation of software codes," Elisabeth continues. "It's like Lego blocks. The principle is that you have to break down software into small pieces that you can then combine. But they need to be modular and generate safe and secure software for Internet of Things: less data but a higher level of security. There's definitely a need to further improve security while simultaneously reducing computing power. It's already in the SRA but will have to be stressed more."

As a whole, things are looking highly positive for the 2021 update. "I'm proud of the fact that the three associations cooperate without anybody saying, 'there should be more from this or that community'. We found a great way to bring things together for the greater good," Elisabeth says with a smile. "I'm also happy that we had a different format for the ECS-SRA workshop this year. Rather than just reporting on what we've done, as was our approach in the past, we got a lot more interaction and feedback this year. My intention is to collect input for the future and to get even more people involved in the ECS-SRA. The goal should be to make us all feel that this is not the document of just a few people but of the whole community."

DIGITAL SOLUTIONS AND BETTER COFFEE

SUSTAINABILITY IN THE ELEVATOR INDUSTRY

by **JOSH GRINDROD**

"As a company, we move one billion people every day. Over a week, we move the world's population. If what we do doesn't work, whole cities stop." It's no exaggeration: as a leader in the elevator and escalator industry, KONE serves more than 450,000 customers in over 60 countries. At EFECS 2019, President and CEO Henrik Ehrnrooth outlined the ups and downs for sustainability and revealed how they've harnessed this to improve customer experience.

EFECS 2019

REASONS TO BE CHEERFUL

"When it comes to sustainability, I'm actually an optimist," smiles Henrik. "The challenge is enormous. We know that. But in the past year alone, we've seen that the demands of shareholders, customers and end-users have increased many-fold. The largest shareholders and asset managers in the world actively divest from companies who are not sustainable, making it hard for them to raise capital." One example is the construction sector, as buildings use roughly 40% of the world's energy. Currently, green building certifications are a minority, but the total amount is expected to grow significantly over the next three years.

This is nothing new to KONE, which turns 110 years old in 2020. "The reason we've succeeded is simply that throughout our history, we've always focused on sustainability and what's important to our customers," Henrik continues. "But first, let me tell you what we do. We perform 70,000 service visits and sell between five and six hundred new elevators and escalators every single day. We have an industry that is not only growing but transforming." Urbanisation is one of the driving factors in this, with companies striving to keep up with the 200,000 individuals who are moving to cities on a daily basis. In China alone, this represents the biggest migration of people in all of human history.

In Europe, this trend is manifesting itself in the form of single-person households, which will make up more than 50% of residences in the UK and France within ten years. Henrik: "Why is this relevant? When you have massive change, you need to be able to provide flexibility – otherwise, you'll need to redo everything, which isn't sustainable. At the same time, significant technological disruptions are taking place. The way we look at that is that it provides amazing opportunities."

EFFICIENT IN MORE THAN ONE WAY

"We know that cities have sustainability challenges, but we also believe they can be a solution: better education, better healthcare and more sustainable ways of moving around. Let me take you on a journey through our history." Henrik gestures to a picture of the KONE MonoSpace 500, the world's best-selling elevator. "Today, it consumes up to 90% less energy than in the early nineties. This was the first step. Next was for us to think about reducing the carbon footprint of our operations relative to net sales. 15 years ago, we set the challenge of 3% per year relative to net sales; last year, we managed 5.5%."

This approach clearly pays off, as KONE has been repeatedly named as one of the world's one hundred most sustainable companies. It's also proven to be a springboard for new endeavours, such as digitalisation. "What do digital technologies do?" asks Henrik. "They enable us to provide services that fit the individual needs of our customers. It's no longer a Henry Ford world where any colour is good as long as it's black. Any office building in a big city today probably houses 30 to 40% more people than it was designed for. It's not meeting the needs of its users, who expect ease and convenience. Our strategy is about understanding the problems that this causes our customers and helping us to find solutions."

This is where the KONE digital platform comes in, aiming to connect all aspects of the business: equipment, employees and users. "I would say our flagship digital service is KONE 24/7 Connected Services, with which we connect our escalators and elevators to the cloud via IoT technology," says Henrik. "We can therefore understand much better what it is happening in a building, including the condition of the equipment, and predict faults before they happen. Maintenance visits can be scheduled proactively, reducing unnecessary driving and pollution. And of course, the customer has their problem fixed quicker."

THE COFFEECONUNDRUM

As another example of how sustainability and customer experience can be intertwined, Henrik points to KONE People Flow Planning and Consulting. This service focuses on the optimisation of existing buildings, giving users the opportunity to extend the period before refurbishments are necessary. "We have an important customer with a five-year old building," he explains. "They told us that a law firm was threatening to leave, and law firms usually pay quite high rent. We found that the elevators worked perfectly, but they still complained that they had to queue every morning to get in. This meant that they were less at their desk, and we all know lawyers are very good at billing when they're at their desks."

"We looked at all the connected data we had and found that there was a lot of interflow traffic within the building. Everybody on every floor was heading to the third floor all the time. What was the outcome? We found out that they had better coffee there! And you know what? We actually convinced them to improve the coffee on all floors. The law firm was incredibly happy and signed a ten-year lease at a higher rent. This shows that it can sometimes be very simple things that help create sustainability and let buildings adapt to changing needs."

Another success story for KONE is Bloomberg London, currently hosting 5000 employees. Having achieved a BREEAM score of 98.5% during the design phase, the score at the final stage was 99.1% - the highest ever for a major office development. From the water supply to the escalators, all suppliers had to strive for an exceptional level of energy efficiency. "How do you bring the whole value chain into an environment while reducing energy consumption?" Henrik asks. "Materials are also important for healthy indoor air quality. We're pleased that we're the only company in our industry today that can meet their requirements."

WORDS OF WISDOM

It's clear to Henrik that companies which fail to acknowledge the trend towards sustainability will not survive. In closing, he returns to a period from KONE's history in order to demonstrate how being ahead of the curve can make all the difference. "In about 2004, we started to focus on China, which is 63% of the world market today. But at that point, our competitors were paranoid that bringing the latest technology to China would result in it being stolen. We said, 'you know what, Chinese consumers deserve better'. We got known as the ones with a totally different approach to energy efficiency and things moved so fast that it didn't really matter if something got stolen."

"Today, we can see that when it comes to buildings and building owners, the number one question is sustainability. The younger generation in particular – although the older ones are also getting there – is not going to accept companies that are not doing the right thing. We also see investments going in that direction, which is creating a fantastic environment in which to thrive. For me, this provides optimism. I hope you'll think about this every time you use an escalator or elevator!"

MAJOR IMPACTS AND ECSEL'S MISSION

COOPERATION IN 2020 AND BEYOND

by **JOSH GRINDROD**

"Looking at the title of today's session, I felt like a kid making his wish list for Christmas!" smiles Bert De Colvenaer, Executive Director of ECSEL Joint Undertaking. It's no wonder he feels spoilt for choice: given ECSEL's successes throughout Europe, there are many possible ideas and directions that could be pursued after 2020. In his talk at EFECS 2019, Bert provided a sneak peak of the upcoming impact assessment and an outline of a project close to his heart. "Of course," he adds, "I'll also make a small wish of my own for the future."

MANY IMPACTS TO ASSESS

Even before delving into the assessment, it's clear that ECSEL has achieved impressive results. Across ten calls and 34 countries, 64 projects have been realised. EUR 3.4 billion has been invested in R&D&I, allowing roughly 1200 participating entities to work on socially relevant technologies that shape the way we live. "Last year in Lisbon," says Bert, "you may remember that I asked for your help in assessing the impact study that we've conducted over the last year. It's not yet complete but there are four main headlines. These are based on an inquiry to which more than 450 people subscribed, as well as some more in-depth interviews."

This first of these is improved collaborative behaviour along the ECS value chains and beyond, which is beautifully illustrated by the fact that 80% of respondents indicated that ECSEL projects allow them to integrate better into the full value chain. Cooperation between different ecosystems and technologies is also highly promoted, with a third of representatives quoting this as a main benefit. "It's about breaking the silos between the fields and applications," Bert explains. "Another aspect is the integration of SMEs in the full ECS value chain. An ecosystem needs a healthy share of each of the different entities – small companies, big companies, RTOs, industries, universities – and ECSEL participation is clearly showing that."

Continuing onto the second main headline, he notes that "80% of respondents indicated that participation in ECSEL helps the competitiveness of the European ECS market at a global level. On one side, this is about the development of products, initiatives and components – 63% have developed at least one new product through an ECSEL project. On the other side, we see the importance of modernising ECS manufacturing process, specifically Industry 4.0. 55% believe that contributing directly to this is one of the most important aspects of ECSEL's strategy."

THE ROAD TO 2030

Unsurprisingly, driving innovation is another vital impact. "As mandated by Horizon 2020, scientific excellence the most important factor in any project we try to select," says Bert. "And when companies consider their R&D strategy, they consider what ECSEL can contribute as a partner. Where do we fit? How can we be used to complement the activities which they already do? We also leverage the expenditures for each company and partner by up to an additional 70%. Once they start to participate in our activities, many beneficiaries begin to invest even more in R&D." Over three quarters of respondents agreed that the generation of new knowledge and scientific advancement is a top scientific impact of ECSEL.

Bert: "The last element and a direct impact of our activities is that we address European societal challenges. Firstly, this is obviously related to clean, automated and connected transport, such as how we stimulate the development of electronics within vehicles or develop sensors and processing. Secondly, we systematically promote the health of the European citizen through many of our projects, including pilot lines for micro-health devices. Last is energy efficiency, as power electronic systems are really about how we can bring electric power from A to B most effectively." Big targets have been set for 2030, including increasing the production of electric cars from nine to 27% and reducing the fuel consumption of electro-mobility products by 50%.

ECS 2019

ECSEL is about thinking together, working together and investing together. What I'm now saying is that together is not enough. It needs to be that one and one is more than two.

A MEANINGFUL REFERENCE

Having outlined the impact assessment (so far), Bert provides an example of these successes. "I would like to make reference to a project called REFERENCE. I'm a little – how to say it? – emotionally-connected to this specific project as it's the only one where I had sweaty hands when I had to sign the grant agreement. In doing so, I overruled some key figures who pointed out that the company, Soitec, was not financially perfect. I decided to visit them and assess their expectations. I'm happy to say (and this is easier to say after the project, of course) that we allowed them to move forward."

Like many great ECSEL projects, REFERENCE focused on a disruptive technology – in this case, Radio Frequency communication applications based on RF Silicon-on-Insulator (RF-SOI) and the move from 200mm diameter to 300 diameter manufacturing. Soitec's participation led to almost a doubling of turnover, with 60% of their growth and over 150 new jobs related to RF-SOI. "But what is even more important," Bert says, "is that all of your mobile telephones contain this kind of technology. It's more than just having something in our hands that is directly or indirectly related to some of our projects. It's that this kind of thing will also be the cornerstone of future 5G technology."

1 + 1 > 2

His attention turning to life after 2020, Bert reminds the audience that what's also important is how you sell impact. "At ECSEL, we are now organising impact visits to show stakeholders – in this case, public authorities – what we have realised. My personal input is that this is how collaborations in 2020 and beyond should look. 'Business as usual' is not going to work anymore. We have to actually go and show that what we're doing will bring a direct benefit to those who are providing funds."

"I've said this many times: ECSEL is about thinking together, working together and investing together. What I'm now saying is that together is not enough. It needs to be that one and one is more than two. As an example, a combination of two companies might result in outsiders investing more due to the trust built in that cooperation. We want to initiate a leverage effect technologically, financially and in terms of impact."

Technology convergence, particularly for Key Digital Technologies and Key Enabling Technologies, presents an important opportunity in relation to this. Digital companies, for instance, know how to write software and the medical sector knows how to cure patients, but the benefits of new developments will fall somewhere in the middle of these fields. Health can contribute to digital solutions; digital can improve health. Countless other intersections are possible.

WAITING AT THE DOOR

"Data is the elephant in the room," says Bert in closing. "This is a quote from the first day of EFECS and I found it interesting to hear. If you look at a large part of the technology we work on, it's about data that we need to transfer, process and store. We have to be careful that we don't run too quickly and that we keep control of all this data management. The last point I want to make is that solving problems requires resources, but resources do not need a problem to be solved."

"What we need to know is how we, as technology providers, can help policy. If we assist governments and stakeholders in trying to address societal challenges, they will be very happy to say, 'we understand that you want to improve mobility and health and so this is what we can do'. This is in both financial and human terms. In some areas of Europe, we're starting to have problems finding teachers. If there's no more teachers, we'll surely have problems finding engineers."

"On the first day, Khalil Rouhana (*Deputy Director-General for Communications Networks, Content and Technology at the European Commission*) asked if he can count on us. I'm more than happy to reply: yes, Khalil, you can count on ECSEL," Bert concludes. "ECSEL is a splendid car with a warm, running engine, waiting outside the door and ready to take you there – but please pay for the fuel."

CALENDAR

ECS BROKERAGE EVENT 2020

14 + 15 Januari 2020
BRUSSELS, BELGIUM

HIPEAC 2020 CONFERENCE

20 – 22 Januari 2020
BOLOGNA, ITALY

EMBEDDED WORLD 2020

25-27 February 2020
NUREMBERG, GERMANY

DATE 2020

9-13 March 2020
GRENOBLE, FRANCE

SSI INTERNATIONAL FORUM

31 March – 1 April 2020
BRUSSELS, BELGIUM

TRA 2020

27 – 30 April 2020
HELSINKI, FINLAND

GSVF 2020

5-6 May 2020
GRAZ, AUSTRIA

FUTURE SUMMITS

14-15 May 2020
ANTWERP, BELGIUM

ITS EUROPEAN CONGRESS 2020

19-20 May 2020
LISBON, PORTUGAL

AMAA 2020

26 – 27 May 2020
BERLIN, GERMANY

ITF SUMMIT

27-29 May 2020
LEIPZIG, GERMANY

STEERING NEW STRATEGIES

THE SCIENTIFIC COUNCIL AFTER SIX MONTHS

by **JOSH GRINDROD**

With over 200 members from across Europe and constant growth in the field of embedded intelligent systems, ARTEMIS Industry Association works hard to maintain a strategy that aligns with the needs of businesses, stakeholders, universities and research institutes throughout the value chain. In recognition of the need for long-term development goals, the Steering Board has opened a new chapter: the creation of a Scientific Council. Chairman Dimitrios Serpanos discusses the impact so far, the work to be done and how a combination of disciplines gives strength to the community as a whole.

GETTING STARTED ON THE SRA

It's no surprise that Dimitrios was elected chairman at the Scientific Council's first meeting, which took place during the ARTEMIS Technology Conference in 2019. In addition to almost 20 years of experience as a professor at the University of Patras, Greece, he serves as the Director of Athena Research Centre's Industrial Systems Institute and was a Principal Scientist at the Qatar Computing Research Institute. Based in the Department of Electrical & Computer Engineering, he's published over 150 papers on embedded systems architecture, with a speciality in cyber-security.

"The Scientific Council," Dimitrios explains, "ensures that the strategy being developed is consistent with the goals of the members and that the strategies of the various member states are aligned with our approach. I was chosen as one of the first six members as I've been involved in ARTEMIS since the early years and have participated in several projects. As I previously helped in the setting of strategy in directions such as cyber-security, I was intrigued by the prospect of getting involved again under the current conditions."

Indeed, plenty has changed in the last few years, particularly through the publication of the first ever joint Electronic Components & Systems Strategic Research Agenda (ECS-SRA). This means balancing the interests of ARTEMIS alongside those of AENEAS and EPoSS for the creation of a truly digital Europe. "Right now, the Scientific Council is very new, about six months old," continues Dimitrios. "However, all members are enthusiastic about our first assignment, which is to provide feedback on the ECS-SRA. This year, we influenced the long-term vision chapter of the SRA, which underwent a minor revision. And we're now preparing for our work on the major revision for 2020."

A EUROPE-WIDE REACH

An important asset for the Scientific Council is the diversity of its members, who represent a variety of disciplines and countries: dependable embedded systems (Jon Perez of IKERLAN, Spain), security automation and digitalisation solutions (Markus Tauber of AIT, Austria), semiconductors (Stefan Van Baelen of IMEC, Belgium), telecommunications and Internet of Things (Gianluigi Ferrari of the University of Parma, Italy) and control and automotive (George Nikolakopoulos of Luleå University of Technology, Sweden).

"People come with different skills, but all are related to the fundamental technologies and applications of ARTEMIS," says Dimitrios. "They have contributed to various aspects of the SRA, for example, because this includes activities in several domains, including beyond ARTEMIS." The geographical spread of members is also important as it allows the Council to interact with a larger number of local governments. This informs their other ongoing tasks of influencing and improving funding schemes for projects and increasing the reach of the ARTEMIS Technology Conference.

I hope that the Scientific Council will increase in size because I believe that we need more people involved if we want to have a local impact.

"Right now, the conference is mostly attended by people who participate in projects and are presenting their work. This is not sufficient for a high-impact research conference. We are looking into getting sponsorship from high-calibre international organisations, like IEEE, and setting up the conference in such a way that it attracts researchers and industrial partners from different groups rather than just the organisations that are implementing ECSEL projects. Of course, there are many other tools we can consider for increasing the visibility of the research work that is taking place among ARTEMIS partners. This is what we are consulting on with the members of the various chambers."

One such example was Dimitrios' presence at an SRA workshop at EFECS 2019, in which he presented strategy concepts for software technologies in the realm of embedded intelligence. As well as spreading the word and helping to network with members of other associations, active involvement in the community sends the simple message that the Scientific Council is open to new ideas and looking to grow.

IMPROVEMENTS AT ALL LEVELS

"In general, we have good support from the ARTEMIS office and the Steering Board, so we should be able to fulfil our mission appropriately," says Dimitrios. "One difficulty is access to local stakeholders and states in order to make sure that their priorities are being addressed. I believe that this is independent of the Scientific Council and needs work at several levels." After all, nothing at ARTEMIS operates within a vacuum – as was mentioned many times throughout the conference, collaboration is key to unlocking Europe's potential.

Reflecting on the momentum achieved in the last six months, Dimitrios outlines his ambitions for the years to come. "I hope that the Scientific Council will increase in size because I believe that we need more people involved if we want to have a local impact. This comes at a point at which Europe has already established itself as one of the leaders in embedded and cyber-physical systems, but it's at a turning point due to the level of international competition," he concludes. "It's exciting for me to be part of the development of strategies for technology and innovation, especially in application domains in which Europe is very competitive, like smart factories, mobility and autonomous vehicles. There's a lot we can do."

ARTEMIS-IA ENDORSES HIPEAC VISION

by **AD TEN BERG**

Earlier this year, the steering board of ARTEMIS Industry Association, the association for representatives in embedded computing and cyber-physical systems, decided to endorse the HiPEAC Vision 2019. The HiPEAC Vision 2019 is a long term vision on high performance and embedded architectures and low-level software. It depicts trends at the levels of technology and systems, considers requirements for acceptability and discusses the business context and social impacts of computing technologies.

ARTEMIS-IA states that it welcomes the HiPEAC Vision 2019 as complementary to the Strategic Research Agenda (SRA) on Electronic Components and Systems, the ECS-SRA, which goes deeper into concrete application domains, addressing the impact of digitalization on applications. The ECS-SRA identifies the research needs of the essential capabilities in ECS needed for realizing this digitalization by collaborative projects. This is detailed in five application chapters and five chapters on essential capabilities, followed by a longer-term outlook.

Further information:
Electronic Components and Systems Strategic Research Agenda
artemis-ia.eu/documents.html

HiPEAC Vision 2019
hipeac.net/vision

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Submissions:
The ARTEMIS-IA office is interested in receiving news or events linked to the aim of ARTEMIS-IA, related projects or in general: R&D in the field of Embedded and Cyber-Physical Systems area.
Please submit your information to info@artemis-ia.eu

ARTEMIS Industry Association strives for a leading position of Europe in Embedded Intelligence