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S&YP of IES in the time of information, automation and energy transformation

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The fall semester of 2021 for Students and Young Professionals (SYPs) was quite active. We have some scientific events in the 2021 IEEE International Conference on Emerging Technologies and Factory Automation (ETFA 2021), Annual Conference of the IEEE Industrial Electronics Society (IES) (IECON), SYP Competition (led by Prof. Wenbin Dai), and examples of how to link academia with industry in daily life.

S&YP at ETFA 2021 and Complex Real-Time Embedded Systems

Mälardalen University (MDU) is a Swedish university with two campuses, located in Västerås and Eskilstuna. At MDU, research is carried out in many directions to solve problems and challenges in society, whereby research in future energy and embedded systems is internationally prominent. MDU is active in research and continuously establishing a close collaboration with the private and public sectors, which contributes toward better health of people and a more sustainable world.

The Complex Real-Time Embedded Systems (CORE) research group was established as a part of the research activities of the Division of Networked and Embedded Systems at MDU, which aims to strengthen the quality and excellence of research at the division and university levels. In CORE, we focus on the execution and analysis of realtime systems, with a particular focus on multiprocessor scheduling techniques, synchronization protocols, predictable execution of real-time systems, compositional theory and technology, and similar topics related to the predictability of real- time systems. We also work with communication protocols and architectures based on switched Ethernet. In addition, the most recent research direction of CORE is cloud computing and the Industrial Internet of Things. In summary, the timing, execution, analysis, and modeling of complex embedded real-time systems is the main focus of CORE within the Division of Networked and Embedded Systems at MDU.

Today, CORE consists of 16 members. We are actively engaged in a large portfolio of research projects, and we are involved in many scientific associations, scientific communities, regular panels, and so on. In 2020, we published six journal papers and 23 conference papers in various prestigious venues.

Among these venues, we are assiduous in publishing research results at ETFA, an annual event that gathers experts from industry and academia to present research results and emerging trends in industrial and factory automation. This is very much in line with the field of interest of our research group. Moreover, CORE members commonly play central roles in organizing the conference, in articular the latest version, ETFA 2021, which was located in Västerås (see Figure 1). There, Prof. Moris Behnam served as general cochair, and Prof. Thomas Nolte served as program committee cochair. Dr. Mohammad Ashjaei served as finance cochair of the conference. Also, Associate Prof. Alessandro Papadopoulos was responsible for two of the ETFA sessions, and Dr. Auday Al-Dulaimy ran the SYPs event, supported by the IES.

FIGURE 1 — The ETFA 21 team. (From left) Moris Benham, Thomas Nolte, Mohammed Ashjaei, Alessandro Papadopoulos, and Auday Al- Dulaimy.

In collaboration with IES, we organized the SYPs event and the competition to advance and meet the needs of modern industrial sectors. The SYPs event provides a unique opportunity for young professionals to meet with their peers and experts in the field, present and receive feedback on their research works, and publish works in IEEE *Xplore*.

Three industrial, high quality works were accepted for presentation and discussion at the event. The first work, "*Motor Torque Analysis for Diagnosis in PMSMs Under Nonstationary Conditions*," presented an approach to investigate the use of load-torque information for motor diagnostic purposes under nonconstant speed assumptions. The proposed approach can detect and overcome the mechanical failures of robotic systems that are working continuously under varying conditions, such as loads and velocity.

The second work, "*Towards Re-Identification for Warehousing Entities— A Work-in-Progress Study*," proposed reidentification methods to identify previously recorded warehousing entities and assign a unique descriptor to them. These methods are recommended to avoid altering the entities they are equipping by the manufacturers as such alterations require additional steps in the identification process.

The third work, "*Fingertip 6-Axis Force/Torque Sensing for Texture Recognition in Robotic Manipulation*," presented an approach to recognize different materials based on surface textures using a six-axis force/ torque sensor. This can be done by investigating how local force/torque sensing at the end-effector fingertip best enables the robot to classify different surface textures.

In CORE, our utmost priority is to maintain relationships with our partners in the academic and industrial sectors, establish new collaborations, and expand the list of participants to include SYPs in our research.

S&YP at IECON 2021

During the fully online IECON 2021 conference, SYPs and IEEE Women in Engineering (WIE) scientific events, among others, consisted of "Three-Minute Speeches" and mentor-industry roundtables, such as "Energy, Information and Industrial Revolution." The invited keynote panelists were Seta Bogosyan, Lucia Lo- Bello, Morgan Kiani, Jose Rodriguez, Regina Roos, Reinaldo Tonkoski, and Ludwig S. Sahesch-Pur. The panel started with short presentations of the panelists, followed by a 10-min discussion.

Keynote Panelists

Seta Bogosyan earned her B.Sc., M.Sc., and Ph.D. degrees in electrical and control engineering from Istanbul Technical University, Turkey, in 1981, 1983, and 1991, respectively. She conducted her Ph.D. studies at the Center for Robotics, the University of California, Santa Barbara, California, United States, where she was a researcher and lecturer between 1987 and 1991. She has been a professor with the Department of Electrical and Computer Engineering, the University of Alaska Fairbanks, Fairbanks, Alaska, United States, since 2003. She is also a

program officer with the National Science Foundation, Washington, D.C., United States. She has authored more than 100 journal and conference proceedings and several book chapters. She has served as the vice president and an associate editor of IEEE Transactions on Industrial Electronics, IEEE Industrial Electronics Magazine, and International Journal of Intelligent Automation and Soft Computing. Her research interests include motion control, teleoperation/ bilateral control systems, and applications of nonlinear control/estimation techniques to electromechanical systems in general. She is a Senior Member of IEEE.

Lucia Lo Bello earned her M.D. degree in electronic engineering and her Ph.D. in computer engineering from the University of Catania, Italy. She is a tenured associate professor with the Department of Electrical, Electronic and Computer Engineering, the University of Catania, Italy. She qualified as a full professor in the Italian National Habilitation. She was a guest professor at MDU, Sweden (2014), and a visiting researcher with the Department of Computer Engineering, Seoul National University, Korea (2000– 2001). She has authored or coauthored more than 200 technical papers in the area of wireless sensor networks, automotive communications, industrial networks for Industry 4.0, and realtime embedded systems. She gave a speech titled "Novel Trends in Automotive Communications." She is the principal investigator for the University of Catania in several international and national projects and for research grants funded by companies. She is the author of a granted U.S. patent on traffic management in Ethernet switches. Since 2004, she has participated in standardization activities relevant to wired and wireless industrial networks at both the national (Comitato Elettrotecnico Italiano) and international levels (the International Electrotechnical Commission). She was the recipient of the IEEE IES Early Career Award (2008) and IEEE Rudolf Chope Research & Development Award (2021). She is the current IES secretary. Since 2017, she has been the IES representative within the WIE and is responsible for the Women in IES initiative. She is a Senior Member of IEEE.

Morgan Kiani was born in 1972. She earned her M.Sc., and Ph.D. degrees in electrical engineering, with a specialization on power systems and renewable energy sources, from the University of Texas at Arlington in 2006 and 2009, respectively. She is currently an associate professor in the engineering department at Texas Christian University (TCU), Fort Worth, Texas. Her research interests include the field of modeling and analysis of energy converters, numerical methods in power system simulation, integration of distributed generators in smart grids, fault detection in wind farms, energy harvesting, and energy diversification. She has authored several scientific articles in peer-reviewed journals and conference proceedings. She holds a patent on active control of doubly fed induction generators used in wind energy harvesters. Her research, scholarship, teaching, and service in the engineering department at TCU, across IEEE Societies, the IEEE Smart Village, and other nonprofit groups have allowed her to empower individuals to engage in activities that promote access to clean green energy and healthy living in other communities as well. Driven by a desire to increase the visibility of women in the science, technology, engineering, and mathematics (STEM) field, she is spearheading STEM initiatives for underrepresented students. She works to overcome gender and cultural barriers to achieve equality in the STEM field and to obtain resources that can help young people learn about STEM fields and gain the confidence to set higher education and career goals. She is a Senior Member of IEEE.

José Rodríguez earned his Engineer degree in electrical engineering from Universidad Tecnica Federico Santa Maria, Va l - paraiso, Chile, and his Dr.-Ing. degree in electrical engineering from the University of Erlangen, Germany, in 1977 and 1985, respectively. He has been with the Department of Electronics Engineering, Universidad Tecnica Federico Santa Maria, since 1977, where he was a full professor and president. Since 2015, he has been president of Universidad Andres Bello, Santiago, Chile. He has coauthored two books, several book chapters, and more than 400 journal and conference papers. He has received a number of best paper awards from IEEE journals. In 2014, he received the National Award of Applied Sciences and Technology from the Chilean government. In 2015, he received the Eugene Mittelmann Award from the IES. His main research interests include multilevel inverters, new converter topologies, control of power converters, and adjustable-

speed drives. He is a member of the Chilean Academy of Engineering and a Fellow of IEEE.

Regina Roos earned Dip.-Ing from DHBW, Germany, and her master of business administration from INSEAD, France. She has 30 years of experience in the electro- and electronic industries, servicing the energy sector and mineral and mining industries in Australia, Chile, and South East Asia. She has been a successful leader of sales organizations, with annual sales revenue growth of 30% and more. She has overseen the transformation of business units to international business partners by setting global key account management by leading 20 account managers and revenue growth of 20% and more. She has participated in the restructuring of organizations and digital transformation of small and midsize enterprises (SMEs) to gain international market share, delivering and implementing strategies to grow business from €10 million to €100 million in five years. She took part in executive business development roles for more than15 years and was responsible for up to 100 people. She successfully closed contracts worth up to €200,000 million. She delivering and implemented strategies for SMEs to launch new products. She demonstrated the ability to develop high-performing teams by delivering strategy. She has strong intercultural experience in Asia, Australia, and South America, along with the proven ability to develop performing teams.

Reinaldo Tonkoski is the Harold C. Hohbach Endowed Professor in t he Electrical Engineering and Computer Science Department, South Dakota State University, Brookings, United States. He earned his B.A.Sc. degree in control and automation engineering and his M.Sc. degree in electrical engineering from Pontifícia Universidade Católica do Rio Grande do Sul, Brazil, in 2 004 and 2006, respectively. He earned his Ph.D. degree from Concordia University, Montréal, Canada in 2011. He was with Canmet- ENERGY, Natural Resources Canada, from 2009 to 2010, where he worked on projects related to the grid integration of renewable energy sources, and he was a visiting professor at Sandia National Laboratories from 2019 to 2020. He has authored more than 100 technical publications in peer-reviewed journals and conferences and is currently an editor of IEEE Transactions on Sustainable Energy and associate editor of IEEE Access and IEEE Systems Journal. His research interests include grid integration of sustainable energy technologies; power electronics and control systems. He is a Senior Member of IEEE.

Ludwig S. Sahesch-Pur earned his master of business administration degree from Fachhochschule Nordwestschweiz, Basel, Switzerland, in 2022, his master of advanced studies degree from Hochschule Wirtschaft, Zürich, Switzerland, in 2019, Dipl. Ing degree in mechanical engineering, and his International
Welding Specialist diploma from SLV München Schweisstechnische Lehranstalt, München, Germany, in 2012. He has 15 year's international experience in risk management, contract management, the industry segment, and utilities. He has been a change manager for organizations, dealing with peoples' lives and a project management. He is a dynamic leader and had built and motivated high-performing teams across diverse cultures within multiple global locations. He has successfully implemented global health and safety guidelines, working on- and offsite construction. He has implemented maintenance-operation guidelines and skill matrices for building information modeling on construction sites. He has provided in/outsourcing topics for the Society of Manufacturing Engineers. He was with Bacher AG as the interim manager/ head of quality management (2019– 2020), Swiss Federal Railway as head of program multiproject management (2017–2020), BVB as department
head of maintenance (2015 –2016), Alstom/ABB Power as inspection commissioning manager (2007–2015), and Siemens Power as R&D engineer (2007). He had a leading role in the Swiss Engineering Association as vice president of the Mobility Section. He is the owner and founder of Airpur Drones GmbH and is now leading various start-ups, with focus on "Digitalization in the Last Mile and for Senior Citizen With/Without Mental Health Issues." He is a member of the German Federal Expert Team for Digitalization and Technology (https://www.digitale-technologien.de/DT/Redaktion/DE/Standardartikel/autonomik_abschlusskonferenz_tn.html), the German Digital

Advisory Board (https://www.deutsche-digitale-beiraete. de/sadredin-sahesch-pur.html) and is a founder and consultant at Pur Consulting (https://www.pur-consulting.org/).

Digitalization of Health is Coming Fast but "It Takes Pain to Evolve": The Smart Concepts in Nursing Are Not Sufficient

The constant advancement of nursing science leads to a permanent increase in the competence of nursing knowledge. The personal demands, needs, and resources of individual caregivers should be addressed. Nursing action should, as much as possible, be subject to and based on scientific bases and be well founded. This is a consequence of the formulation and complication of a human development of existence, which is easy to be worked out, and should be sufficient for as many people concerned. The task of nursing science is to remedy this situation and look for solutions. It has the task of developing nursingscientific knowledge with health care and nursing. Nursing professionals and the generation after them should transfer knowledge and implement nursing standards. This goes hand in hand with the fact that the examination of the actual situation must be illuminated more critically to take on the future requirements more proportionately. Doing so will meet demands, ensuring fairness to the care at that time. Perhaps it is necessary to have a new measure of care re-evaluated. Based on this new criteria, target contents must be referred to master the task size. To realize the new requirements for quality and at the same time material framework conditions, a clever concept must serve many needs.

A critical view must be encouraged; indeed, it is a prerequisite for deficit elimination. A deficit view alone, however, creates a focus on deficits and not on the intended goal achievement. So that secured knowledge can be built on or adapted to, cross-sectional experiences and successes must be relied upon. The critical view should also be pragmatic, so that implementation works easily. Further development can be gained from industry and past experience. Science coming from the "ivory tower" is counterproductive and harmful, especially because demands will change.

A thought figure of "smart concepts" can be interpreted as testing too-diverse conceptual models and need not categorically exclude other concepts. A combination or adaptation to local conditions is desirable, even sensible. Nursing science must continue to develop in the same way as other disciplines and departments, even like the church. The term primary nursing must not be confused with terms such as fragmentation of the nursing-complex communication structures unclear responsibility and missing responsibilities, be understood, exchanged, interpreted, and infused.

Meaningfulness enables new frontiers that can reveal new approaches and possibilities. If the individual can identify with it, then an organization gains identity and accepts what is and does not fight against, not the dark energies that have a strong impact on caregivers. It is a matter of finding and unifying meaning in the daily life of the care environment so that the circle does not take on extraordinary and abnormal sizes (see Figure 2).

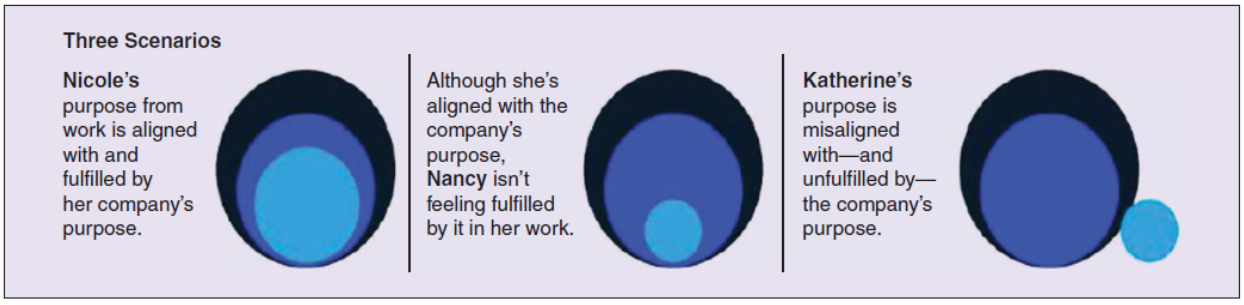

FIGURE 2 — The purpose and performance in the nursery sector. [Source: 2021, July, Engagement Alignment Organization, MBA Thesis' et al. Sahesch-Pur.]

Primary nursing was developed in other countries and serves to further the development and improvement of nursing care for patient satisfaction and humanization of the working environment. The aim is to achieve the greatest possible benefit-cost ratio. For this reason, many countries with strong demographic development should also concern themselves with this technology. The second starting point is to increase efficiency in care. The use of benefit-cost ratios must be redefined in relation to effects on patients and must be remapped with impacts on the patient to question old, outdated billing models. Everything must be re-evaluated, and every service must be re-examined in terms of its benefit. We cannot avoid this work. Organizational and personnel changes as well as transformations in the nursing and ambulatory view we must also be considered.

Particular attention must be paid to the enthusiasm and motivation of the nursing staff. Both commitment and organizational graft do not necessarily require large financial resources but must be implemented in companies and clearly expressed. Ideally, they must be initiated and implemented by experienced change managers because they often have an antifragile personality, which is indispensable for these tasks if they are to be successful.

The use of IT technologies should be applied sooner rather than later because this can also provide an important impetus for efficiency savings, and load support can be done. In addition, further technological development is created, which will only satisfy the requirements of an aging society because there is a need for the use of new technologies.

In many places, it is a question of correct clearing-up and marketing, which would be helpful in addition to flat-covering employment of some technologies. The further development of the nursing organization and its stakeholders requires a ruthless reappraisal of misguided approaches and an equally blunt reappraisal of new methods that are available today and are being applied, too sluggishly in some cases. A science that does not adapt to changing societal changes does not serve the people concerned, nor anyone anymore if the goals are not readjusted.

The panel discussion was lively, interesting, and as can be seen above, highly interdisciplinary. For more details, please ask for IECON 2021 records.

IEEE Industrial Electronics Society Student Branch Chapters Newsletter 2021

The Number of Student Branch Chapters Reached Record High

The number of IES Student Branch Chapters (SBCs) reached 50 in September 2021, an increase of 31.6% to the 38 IES Chapters in 2020. Currently, our SBCs are located all over the world, from the United States, China, India, Australia, Poland, Korea, Sri Lanka, Italy, Russia, and so on.

In May and September 2021, the IES membership team organized SBC chair meetings to deliver the latest news from the IES and listen to comments from SBC chairs and representatives. This meeting will continue four times a year beginning in 2022.

IES Support to Student Branch Chapters Local Activities Fund 2021

The IES announced its first support to the 2021 SBC Local Activities (SBCLAs) Fund. Each SBC can apply for a maximum of US$1,000/year to support local technical activities. In 2021, five SBCs will receive their funds from the IES. The IES SBCLAs fund will continue in 2022, and more SBCs are welcome to submit their proposals to attract new SYP members to join the IES via the local activities.

2021 IES SYPs Competition

The very first IES SYPs Competition provided a chance for SYPs members to present exciting research results and demonstrate their outstanding talents. Due to the COVID-19 pandemic, the IES SYPs competition was held online this year. The competition was divided into two tracks. In track 1 (see Table 1), the individual participants submitted a five-minute recorded video for their research project. In track 2 (see Table 2), a group of members developed a preventative maintenance app based on data analysis. Congratulations to all the winners, who were awarded prizes. Videos are available from the IES Youtube Channel. We hope more SYPs members will join the competition next year!

Track 1 Results

First Prize

Name	Organization	Title
Nikolai Galkin	Luleå University of Technology, Sweden	design of reconfigurable modelling tool for simulation, validation and debugging of investigated electrical system

Second Prize

Name	Organization	Title
Mateja Novak	Aalborg University, Denmark	AI based design and implementation of Model Predictive Control algorithms for NPC converters

Third Prize (Same Marks)

Name	Organization	Title
Arnab Sarkar	Indian Institute of Technology Kanpur, India	GaN Based Multiple Output Flyback Converter with Independently Controlled Outputs
Yuchao Chen	Shanghai Jiao Tong University, China	Design of TSN Scheduling Algorithm Considering Path Constraints

Participation Prize

Name	Organization	Title
Hui Yie Teh	The University of Auckland, New Zealand	Unsupervised Feature Selection for Anomaly Detection in Industrial IoT
Julian Karoliny	Silicon Austria Labs GmbH	Distributed Interference Tracking in Industrial Wireless Sensor Networks
Yu Wu	Shanghai Jiao Tong University, China	A Cloud-edge Collaboration and Deep Learning Based Data Transmission Reduction Scheme

Track 2 Results

First Prize

Name	Organization
Mingyi Huo, Kuan Li, Hao Luo	Harbin Institute of Technology

Second Prize

Name	Organization
Xinyi Xu Huiwen Wu Xiao Wu	Shanghai Jiao Tong University

The University of Moratuwa Stands Steadfast: The New IES SBC's Journey in 2021

The IEEE IES University of Moratuwa (UoM) SBC was initiated at the first inaugural Annual General meeting on 5 September 2020, with a vision to bridge the gap between undergraduates and industry or academia in the field of electronics. The key mission was to organize events and activities to share experience and knowledge from experts in industry and academia to enable a smooth transition for student members to their future careers after graduation.

The UoM SBC organized the "Glimpse Into Industry" webinar series to share the latest technology enhancements, and trends of companies and start-ups with student members. Furthermore, a strong link can be created between companies and students, which makes students more prepared for employment after graduation.

Additionally, pioneers in academic research and active graduate research joined with the UoM SBC for the "Road to Academia" webinar series to share their knowledge and expertise in their respective research areas related to the scope of the IES. The students interested in academia received guidance and support in pursuing their chosen career path.

The Annual General Meeting (AGM) of the IEEE IES SBC was held virtually on 20 August 2021 via the Zoom platform. The outgoing chairman of the IEEE IES UoM SBC, Oshada Jayasinghe commenced the AGM, delivering the welcome speech and retrospection of the IES SBC. The meeting was graced with the presence of Vice President for Membership of the IES, Prof. Yousef Ibrahim, and Prof. Dai, coordinator of the IES SBCs. Dr. Peshala Jayasekara, Chapter advisor of the IES, delivered an inspiring speech explaining how the IES SBC has progressed through the past year, while benefiting the members as well as the community, and bridging the gap between undergraduates and the industry. Newly appointed chairman for the 2021–2022 term, Deepana Ishtaweera, shared his plans for the upcoming term to raise IES UoM SBC to even greater heights. The event was successfully concluded after a vote of thanks by newly appointed Secretary, Sachini Wickramasinghe.

IES UoM SBC 2021 Activity Highlights

Create an IES SBC at your university now and join our activities! Please contact IES SBC Coordinator Dai for more details at w.dai@ieee.org. The SYPs from the IES are linking academia with the industry at the University of Žilina (UNIZA).

Introducing UNIZA: Historical Background

The Faculty of Electrical Engineering and Information Technology (FEEIT) at UNIZA is the one of the oldest parts of entire university (since the university's origin). For more than a half of century, this faculty has followed novel trends in electrical engineering, electronics, industry, and science. After WWII, regions of Žilina and Považie in the northwest corner of Slovakia concentrated on heavy industry and electrical engineering research centers inside Czechoslovakia. The reallocation of the new university from Prague to Žilina was a logical step to support industry in this region. The idea of cooperation between academic and industrial environment was established for the first time.

Later, after the origin of the modern Slovak republic, we also see increased interest from foreign companies to establish their branches here. The graduates from UNIZA became very valuable resources for these companies. Inside FEEIT, we find several departments oriented toward crucial topics in modern electrical engineering: power electronics, electrical drives, automobile electronics, signal processing, physics, and automation. Some of these departments are interdisciplinary, which is a huge benefit today. An example is the Department of Mechatronics and Electronics (DME). Since 2005, this department has transformed into an "organic compound" of three divisions, fully cooperating to solve a defined task and implementing it directly into the educational process.

The Division of Power Electronics deals with modern devices and topologies for power electronics and implements all the knowledge bases to efficiently increase research, wireless energy transfer, or optimization of power electronics structures. The Division of Autotronics focuses on the use of specific devices, topologies, measurements, and diagnostics in automotive applications. The final branch, the Division of Special Electronics, acts as a supporting body for the entire department. Its focus is on visual inspection and virtual instrumentation, and automated measurement creates feedback for quality control of the research process while preparing students to use modern measurement tools in praxis. Partners like onsemi, BROSE, Schaeffler Kysuce, Semikron, Bel Power Solutions and Protections are regular collaborators, while cooperation is provided in the way of specific research task solving or grant funding for common projects.

The Division of Special Electronics uses visual hardware driven by National Instruments drivers and software. The algorithms based on both high-speed and depth imaging are implemented into diagnostics praxis in the university hospital in Martin (Slovakia) with the potential to be spread abroad (see Figure 3).

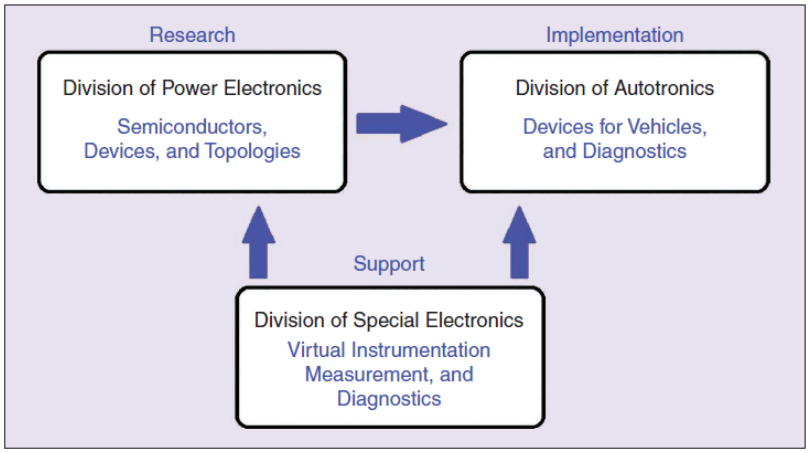

FIGURE 3 — The mutual cooperation among divisions in an interdisciplinary department.

The aforementioned characteristics and main objectives of FEEIT UNIZA resulted in cooperation between UNIZA and Onsemi. This project integrates and supports all the incentives that were formed and accepted in the academic environment of UNIZA: an interchange of experiences between schools and universities in Slovakia and in the world, obtaining experience with solving practical tasks in companies, and acquiring financial grants, which help develop and implement results that motivate researchers (see Figure 4).

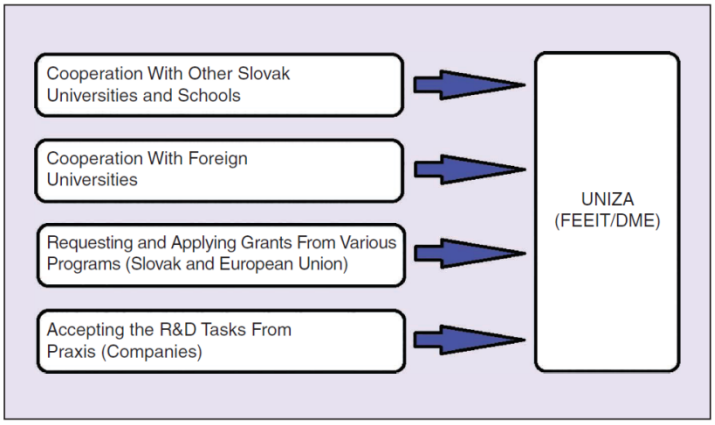

FIGURE 4 — The factors that positively influence development of the academic environment. [Source: Year in Review (2019).] FEEIT: Faculty of Electrical Engineering and Information Technology; DME: Department of Mechatronics and Electronics.

Onsemi is driving disruptive innovations to help build a better future. With a focus on automotive and industrial end-markets, the company is accelerating change in megatrends such as vehicle electrification and safety, sustainable energy grids, industrial automation, and 5G and cloud infrastructure. With a highly differentiated and innovative product portfolio, onsemi creates intelligent power and sensing technologies that solve the world's most complex challenges and leads the way in creating a safer, cleaner, and smarter world.

Onsemi established its Technical Support Center (TSC) in an area of the university to connect the academic and industrial environments (see Figure 5). From the company's point of view, it is very important to stay in close contact with students. This contact offers many advantages for both sides: an educational institution that stays in touch with the most modern trends, and a company that equips students with up-to-date and optimal knowledge (ideal for company needs).

FIGURE 5 — The opening ceremony at UNIZA, 26 October 2018.

Onsemi's TSC includes faculty graduates (in master's and doctor's studies) and students in bachelor's and master's studies. By participating in company projects, students acquire new skills and practical experience in such environments.

The contract between UNIZA and ON Semiconductor, Slovakia, sets the main objectives of cooperation as follows:

- design of modern electrical solutions, selection of modern semiconductor components for customers' applications, application and product support of onsemi's and mutual solutions
- integration of talented students into projects dealing with semiconductor devices design and implementation of modern knowledge in the educational process
- requesting grants from various schemes for the R&D of novel solutions.

After significant competitive benchmarking, we identified an opportunity to leverage the TSC to go deeper with customer-specific block-diagram reviews (see Figure 6). These block diagrams are built according to customer- provided requirements and include anchor products, along with the many commodity products needed to complete the design. Although this initially started as a pilot program in the Americas, these block-diagram reviews have generated momentum in all regions.

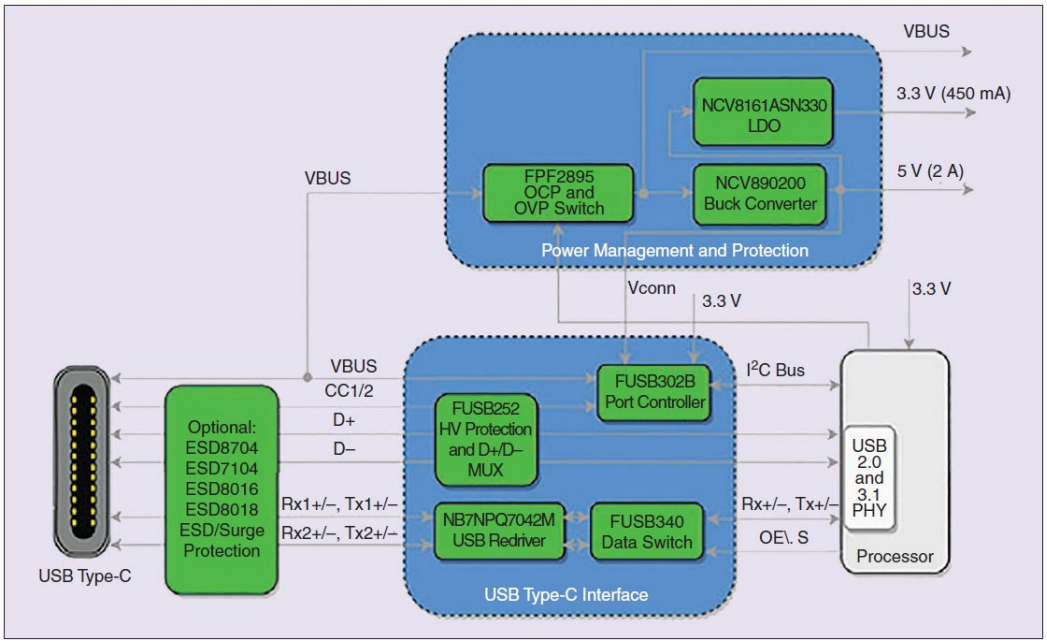

FIGURE 6 — An example of the block diagram proposed by the ON Semiconductor TSC. LDO: low dropout; PHY: physical layer; HV: high-voltage; MUX: multiplexer; Rx: receiver; Tx: transmitter.

When it opened in 2017, onsemi TSC employed two engineers. Currently, 12 Ph.D. graduates from the DME are working on customer tasks worldwide (see Figure 7). This development trend makes it clear how direct cooperation between academia and industry can be beneficial. Also, the expertise and top talent entering onsemi from UNIZA will strengthen innovation in key areas of study in the region.

FIGURE 7 — Members of the TSC team at UNIZA.