Entretien avec José Moura - Main challenges for IEEE, the largest global technical professional organization

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Abstract

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José Moura

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128 Z REE N°5/2017 ENTRETIEN AVEC... REE: IEEE is a professional association which focuses on electrical, electronics, communications, computer science and information technology. Its mission being "to foster technological innovation and excellence for the benefit of humanity". You have been elected by its members and will be IEEE President in 2019. Could you describe IEEE? José Moura: IEEE has around 420,000 members in more than 160 countries, from its origins in the USA to the newest country in the world, South Sudan. This makes it the largest global technical professional organization. It is composed of 46 technical societies and councils. The largest in membership are the very well-known Computer Society, Communications Society, and Power and Energy Society. Some are much smaller, which gives the richness and breadth of IEEE. For instance, Engineering in Medicine and Biology, Oceanic Engineering, or Photonics. And IEEE is proud that two recipients of the Nobel prize for physics in 2018 have been long time members of the Photonics Society. But they are not the only members who have won the Nobel Prize. The first one was Marconi, in 1909. IEEE is also strong on standards, with more than 1,300 active standards. It has a digital library of more than 4 million documents, holds 1,800 conferences per year, and is the publisher of 200 top-rated periodicals. It is also strongly involved in education in all its different fields with numerous webinars and tutorials IEEE gathers some 420,000 members in more than 160 countries REE: How does IEEE prepare future new activities? J.M.: Every society within IEEE has its own agenda and its volunteers identify new issues. But many new topics cut across many societies. To achieve this, IEEE has a Future Directions Committee within its Technical Activities Board. A few recent examples include Cybersecurity, Big Data, Smart Cities, 5G, Green ICT, Future Networks, Symbiotic Systems and Rebooting
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French Chapter for the Computer Society, another one for the Communications Society, still another for the Photonics Society, and so on. In the last few years, membership growth is flat in the USA, flat in the rest of the Americas, and growing in most
Europe-ean countries. There is strong growth in membership where the population and the economy are booming, as is the case of Asia. Africa's population is
growing too, and so is its economy and our membership there. We are making a significant effort in sub-Saharan countries. Growing membership is important
because it helps develop the local technical communities and the technical leaders of tomorrow that will lead the technical and economic development of
countries. To support this geographical evolution, beyond its offices in the USA, IEEE has set up offices in China, India, Japan, Singapore, and Vienna. The Vienna office, which is the latest opened outside the US, is focused on Standards and charged with strengthening relationships with the
European Union and with supporting public policy in Europe. REE: IEEE membership is now tilting toward a larger share of members from universities and academy. Though this is not true of all IEEE Societies, how do you see things on this matter? J.M.: Excluding student members, about half of IEEE members work in industry, 20% work in government agencies, and 30% are academics. This is a good balance, but we have to continue making a great effort to appeal
to our industry professionals. I believe it is important to keep track of what our existing members expect from IEEE, but it is also very important to understand
how IEEE could best serve and provide value to the professionals in the broad fields of information technology, electrical and computer engineers, and
computer scientists. This is crucial for us with respect to industry. Times are gone when large corporations were led by engineers. Companies are now
concerned with the short term and their financial margins. Smaller companies continue to value IEEE, but sometimes its employees do not get involved with
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fertilization between academia and 130 IEEE N°5/2017 ENTRETIEN AVEC... effect IEEE and we are considering open access publications, so we can continue to offer high quality journals to our European authors. This is a major change, but IEEE will successfully meet this challenge with our very large repository of papers, tutorials, and webinars. For example, the IEEE Power and Energy Society has developed a Resource center that col-lects in a single repository all its tech-nical offerings, a concept that is now being used by half of IEEE's societies and entities and that can be a path for our future. The fast development of Open Access represents a challenge for IEEE REE: And in terms of demographics and membership? J.M.: We are used and know well how to track technology and its break-throughs. But IEEE also needs to focus on present and future membership. Amongst our 1100 strong IEEE staff, we have a special department that is
dedicated to these issues and provides support to the members in IEEE's 10 regions in which we group the more than 160 countries where our members reside. France is part of Region 8. IEEE Regions are organized in Sections. For instance, there is a France Section. And in each section, there are different local Chapters. Chapters are organized by technical societies: a French Chapter for the Computer Society, another one for the Communications Society, still another for the Photonics Society, and so on. In the last few years, membership growth is flat in the USA, flat in the rest of the Americas, and growing in most Euro-pean countries. There is strong growth in membership where the population and the economy are booming, as is the case of Asia. Africa's population is
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fertilization between academia and 130 IEEE N°5/2017 ENTRETIEN AVEC... industry as one of the main drivers for advancing technology. The role of IEEE
in education is also very important. The fact that we have 120,000 student members is a tremendous asset. IEEE has a dedicated board to address and
support education. We could ask ourselves, how to grow from say four hundred thousand members to four million members? Just posing the question of why
10 times more members forces us to question why would they engage with IEEE, what new services would IEEE need to offer of interest to them, and what
infraструктура would we need to develop to achieve that target? Growth is a necessary step to strengthen the technology community. First, realize that the
number of engineers worldwide is booming. But, second, professional associations whose technical interests were distant from IEEE, like the ones dealing with auto-motive, aviation, or space industries, for instance, need and develop technology strongly related to the fields of IEEE. REE: IEEE has about 25% of students-members. Retention rate is however weak. Which argument would you put forward to convince them to remain members after they start their professional careers? J.M.: IEEE provides technical education and information that is very relevant to them. But we need to further these, so that IEEE continues to be relevant to them. IEEE membership, excepting its 25% students, is well balanced between industry, governmental bodies and industry. It is important to stress that IEEE is a tremendous global community of people. Yourself, you come from the Power industry. Consider the impact of a major
natural disaster that imperils the power grid. Through the IEEE worldwide com- munity, experiences and assistance can be shared; how did other regions handle similar situations. If you remain involved with IEEE, you realize its full richness. To say IEEE is a large family may be seen as a cliché; it is a large family, but also much more than that. Take the case of the Power and Energy Society again. You see technical disruptions coming up: Internet of Things, 5G, and so on, which will affect that business. You may immediately share technical transversal experiences, bring to bear to Power and Energy professionals the know-how of other information and communication technologists through IEEE. And this is also reflected in the way technical fields become more fashion- able, how they come and go. I have been a university professor for a long time. Wireless communications and now 5G bring renewed tremendous inte- rest in areas of electrical and computer engineering that twenty years ago were may be out of fashion. The smart grid and renewables have brought Power Engineering to the forefront of interest in engineering. Artificial Intelligence and Machine Learning are now dominant in Computing, after a period of many years with reduced interest. This is a lesson to students and young professionals: the fields that they embrace when they enter their professional career will be radically transformed in the future, in unknown directions. It is more than likely that, when these changes occur, IEEE will have strong activity in these new fields and can help them come up to speed very quickly. REE: Can you expand on your wish to increase IEEE technical leverage? J.M.: Look at the last 10 years, how technology has changed the way people interact. In the extreme, we could nearly say email has become an age divider: the younger generation no longer communicates by email. To reach out to our existing or potential young community of professionals, we need to see how we engage with these new channels of communications. IEEE is present in many global social media. But we should do much more. Also, interest groups form and disappear very quickly. If a hot technical issue comes up today, say blockchain, a technical group will start immediately; but when interest in blockchain subsides and people understand better the techno- logy, these same groups may become dormant; we see a Darwinian process taking place. IEEE has the strength and clout coming from its long history to help form these groups; but it has to be nimble and agile. IEEE has developed over the years tools which are widely used by its mem- bers and beyond. The XPLORE digital database is a great success. More than four million people access it every year, so this is ten times more than our pres- ent membership. How can IEEE better serve these four million professionals? Also, how do we attract the younger generation and retain our present student members. We are considering how IEEE can develop an infrastructure that facili- tates this engagement of professionals, possibly, by partnering with others. We should take into account the speed at which these tools are developed –or disappear- via start-ups that suddenly become giants. We should find ways to better leverage technology. REE: IEEE has started a strategic move to be more present in develop- ping countries and in Africa in parti- cular. There, some countries are very developed including in high tech, while in others, some people don’t have electricity. J.M.: You are right. Rwanda is in that res- pect an interesting example. Tom apart with civil war and genocide a decade ago, it now is at the forefront of digital technology. My university, Carnegie Mel- lon (CMU) in Pittsburgh, has a campus in Kigali. And Africa should not be taken as one block; South Africa and Northern REE N°5/2017 Z 131 ENTRETIEN AVEC... Africa on the one hand, and the other sub-Saharan countries on the other hand have different levels of develop- ment. And there too, things are subtler. Kenya was a world pioneer of payment by mobile phone, but it also has large areas poorly or not electrified. IEEE has a role to play in contributing to training and developing a technical community in these countries. It is important to underline that all IEEE work is basically done by local vo- lunteers. Hence the need to grow our membership in Africa. We have recently launched an Africa council. The objective is to kick start initiatives that can have large impact and are sustainable. For example, IEEE can support the develop- ment of successful “Proof of concept” initiatives, say, in education, and by par- tnering with industry, NGOs, and Foun- dations then scale this proof of concept to have a much larger sustainable im- pact. IEEE has a role to play in developing countries and in Africa in particular REE: Artificial Intelligence and Deep Learning bring lots of expectation, and also fears, including on ethics. Experts from IEEE already work in these fields. Which views do you have on the matter? J.M.: Indeed, IEEE looks at issues which are related to its main core tech- nical activities. This is the case with Artificial Intelligence. AI raises strong questions that have to be considered very seriously by industry, as for instance decisions made by driverless cars. In the case of an imminent accident, should the car favor hurting an elderly fragile person or a family with children. IEEE has set up a group to develop standards on ethics and has engaged with other professional societies in the AI space in many different ways to contribute to this debate. These are topics of strong media interest. It is very important that IEEE take this leadership position. I take the opportunity to come back to how we should evolve and leverage technology. We are very strong with tech- nical journals and technical conferences. But nowadays people is looking for other means to get their information, even tech- nical information. We are considering new ways to convene technical professionals, a mix of Ted talks with entertainment. These new type events will enable us to convene, reach out, and engage a much larger number of young professionals. REE: Smart Cities is a concept that appears fuzzy to many but attracts lots of attention from mayors and lo- cal government. Some of its concepts are at the convergence of many IEEE fields (energy, communications, com- puting, signal processing, sensors etc.). What is your view on the subject and the role IEEE could play? J.M.: Smart Cities is one of these trans- versal initiatives that cut across many areas. We are investigating it as an ini- tiative within IEEE’s Future Directions Committee. Some of its concepts may appear ill-defined and at first may appear as not necessarily related to IEEE (water distribution, waste treatment, police and public safety, and so on), but in fact IEEE can contribute very significantly to all these areas because our experts understand deeply its technologies and how they work together. I live in the US, in Pittsburgh, Pennsyl- vania, and it is impressive to see how the city has transformed itself from a steel and coal heavy industry city to one that is becoming “Smarter”: a clean, high tech city and a hub for robotics, driverless cars, AI, and information technologies. I believe this is the result of a con- cerned effort between the city and world- renowned universities in medicine like the Medical School of the University of Pittsburgh, on the one hand, and in engi- neering and computer science like Car- negie Mellon on the other hand, working together to transform the city. Today, many big players, from Bosch
to Google, Microsoft, or Intel among many others have set up R&D centers in Pittsburgh, at the same time that we have many new start-ups spun off by researchers and professors from these universities. Uber has over a hundred driverless cars driving around Pittsburgh; there still is a person inside, just in case, but these cars move around completely autonomously. And they take customers like you and me. So, definitely cities are becoming “smarter,” and the rate of these transformations is simply phenomenal. REE: Intellectual Property (IP) is a major driver for industry. You are the co-inventor of patents which led to a record 750 million dollar settlement between CMU and a manufacturer. This was the largest Intellectual Property settlement ever in the field of information technology. Which lessons do you take of this major event? J.M.: I will have two comments. The first is that Universities can contribute in very fundamental ways to solving very important real-world problems. In our case, in the mid-nineties, the disk drive industry was experiencing tremendous increase in recording densities – more and more bits could be squeezed in ever smaller space, leading to disk drives that were smaller and smaller while able to record orders of magnitude more bits. The challenge was reading out these bits with error rates that were also small. We looked at the problem understanding the underlying physics and then coming up with a very different solution that turned out to be the best in terms of reading out the bits with less errors. So, on the one hand you have this important role of universities contributing to solving real world problems that allow revolutionary technology advances. But there is another important issue. And this one has to do with technological transfer and innovation. In the past, if a professor wanted to launch a new company, Universities wanted to keep significant equity in these companies, which made it very difficult for start-ups to raise funding and other needed resources. Today, Universities are much smarter, they want professors to be successful with their start-ups, and hope that, when the start-up succeeds, they will come back and reward Universities by contributing funds to their endowment REE: Standards is an historical area for IEEE, in a world where industry need and fight to impose their views at international levels. How do you see the evolution for standards? J.M.: I had the opportunity when serving on the Board of Directors of IEEE to meet several CEOs from around the world and asked them what they most wanted from IEEE. It was two things: Understanding Future technologies, which we deal with in our Future directions committee, and standards. Future technology and Standards are key expectations from industry IEEE has 1300 active standards. We have a Standards Association that works globally in most fields covered by IEEE, from telecommunications (and IEEE is famous for its WiFi standard) to autonomous vehicles or the power industry. Nowadays, as I referred to before, there is for example a strong effort led by IEEE on standards for ethics in AI and autonomous systems. REE: Only 14% of IEEE are women. What should be done to move toward a higher share? J.M.: This number is obviously too low. It is even lower than the fraction of women in engineering. We have set up a committee of volunteers to look at diversity and inclusion and make engineering a welcoming and inclusive profession for all. We are committed to working with others on attracting young women to our professions, the value of becoming an engineer, to encourage them to become graduate students, researchers, and young professionals. There are plenty of talented women engineers; we should look into why they don’t participate more in our organization. We need to adapt ourselves, so we become more welcoming to them and so that we can benefit more from their talent and ideas. We are committed to making IEEE a diverse environment and to empower women to become leaders. It is important to nominate and appoint women to key positions in IEEE governing bodies. This is important in multiple ways, from benefiting from a larger pool of talented leaders and volunteers to serving as role models to younger women interested in pursuing engineering. We will follow the leadership in this regard provided by several industries. REE: You have recently had a meeting with the Secretary General of the United Nations. Could you tell our readers a bit more about the conclusions and follow-ups of that meeting? J.M.: This meeting was essentially a random meeting, but I’d rather see it as the consequence of the richness of human networking. It so happens that Secretary General Antonio Guterres is an engineer, probably the first Secretary General that is an Electrical Engineer in the history of UN. But, more importantly, many years ago, he was a student of mine. And we met by chance recently at a social event. After that meeting, there was another one with a senior member of the UN management, to examine how IEEE can work with the Secretary-General’s High-level Panel on Digital Cooperation in the areas of privacy and data governance. IEEE’s vision is to foster technological innovation and excellence for the benefit of humanity and has numerous humanitarian initiatives, either through the IEEE Foundation or directly through initiatives of its volunteers and IEEE Societies. An example, among other projects is the Smart Village initiative to help remote villages to have access to electricity. Another important opportunity is in training future leaders in Africa. Our goal is to partner with companies that are engaged in Africa and need a technically trained workforce. For example, IBM has an R&D center in Nairobi. There are many construction companies involved in large infrastructure projects in sub-Saharan Africa. By partnering with these companies, we hope to develop scalable sustainable programs that will educate the workforce they need. IEEE has a tremendous repository of tutorials, training courses, and education materials, and of course we can develop new ones. Whatever we do, it needs to be in strong collaboration with the local Universities and local Governments so that we have real impact. Q Interview made by Bruno Meyer (RTE), Member of the Board of Directors of IEEE. Prof. José M. F. Moura is a member of the US National Academy of Engineering, he is the Philip L. and Marsha Dowd University Professor at Carnegie Mellon University. He is the founder and Director of the Information and Communications Technology Institute (ICTI), a large partnership between Carnegie Mellon and several universities in Portugal funded by FCT, the Portuguese Science Foundation. He is 2019 IEEE President and CEO.