



## A Model for Collaboration for Academia, Business and Engineering Institutions Consideration

### The Institution of Mechanical Engineering - The Custodian of Mechanical Engineering Profession

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**The author has been a member of several professional institutions for many years and has supported professional institutions in different capacities. He was the Midlands' representative of the Engineering Council Regional Organisation and served on the Engineering Senate of the Engineering Council for several years. He initiated a number of projects with EEF, CBI and served as the Chair and a member of the accreditation panels for several professional bodies. He has held senior appointments in academia and industry and has been an external examiner for several colleges/universities. He was the Chief Engineering Examiner for BTEC/Edexcel/Pearson and sat on their Engineering Advisory Committee for many years; serving also as the Government Teaching Quality Assessor. He has initiated many national and international funded projects and written over 120 papers and instigated several education, research and innovation centres worldwide including several universities. Author's profile can be viewed at [http://www.c4ff.co.uk/history/Profiles/Chairman\\_Profile.pdf](http://www.c4ff.co.uk/history/Profiles/Chairman_Profile.pdf).**

This paper outlines the importance of Mechanical Engineering and why it is crucial to maintain our Institution and invigorate it for future generations of Mechanical Engineers. The Institution's recent deliberation as to why Mechanical Engineers are important, highlighting that it empowers the world and cares for our planet are important statements which could have been expanded by stating that almost everything physical is designed and made by Mechanical Engineers. In forty years of my engineering career, mechanical engineers have played a central role in every project that I have initiated or collaborated on. Formula 1 cars, new hydrogen buses, hybrid cars, new airliners, modern ships and yachts and how we are shaping the future by designing wind turbines, novel solar panels, batteries for electric cars not to mention the space ships landing on Mars and orbiting many of the planets around us. Without mechanical engineers, all these innovations would not have been possible. Mechanical Engineers have helped the UK to remain a major force in engineering excellence manifested through the recent launch of the Queen Elizabeth and Prince of Wales aircraft carriers.

It is clear from the Council's recent Strategy Framework discussions that many engineers, especially the new generation of those coming into the industry, do not see the benefits of becoming a member of the Institution. A recent document published by the Institution, referred to as "Member Relevance", touched upon important issues such "what does success look like?" yet, it is primarily a set of data that shows our stagnation and some decline in training and apprenticeships areas but even more significantly, our inability to recruit student members and hence graduates. This is not a challenge just faced by mechanical engineers but also by other engineering institutions. It seems to me that the first task for engineering institutions should be to set out in clear terms what benefits there are for a young engineering student to join the institution and moreover what is the added value to a working engineer in industry, commerce and in academia in being a member of our Institution. In doing so our Institution should define the main reason for their existence viz., what are they for, is it for their members and/or supporting other organisations or the society as a whole? In both or either case, they should make a clear statement of the value added and set out a clear strategy for recruiting more students, graduates and young engineers. The latter is not an easy challenge and requires a great deal of hard work mainly by an army of dedicated volunteers.

It is stated that the institutions often claim that they are for their members and their institution is member focused. Such macro statements often assume that all members have the same requirements



which cannot be true; the needs of student members for instance, are very different to the needs of CEng members. Maybe the time has come for a review of the target groups and the re-assessment of their needs.

The Institution's recent document "Relevance to Society" is an interesting document which highlights Patents, Learnt Papers and Standards as three key areas. Although training and education has been mentioned, what is crucial after considering new recruitment strategies is to encourage continuous personal and professional development of young mechanical engineers not only through those areas identified as policy examples such as climate change, pollution, smart homes and so forth but through meaningful and several targeted mentorship programmes. We all need mentors and yet we do not have a recognised and nationally certified programme focusing on key mentoring skills and attributes to instil professional conduct, together with identifying key social and personal skills, particularly for our younger members

### **Student Membership**

It is my view and the view of many engineers whom I know, that the key issue for almost all professional engineering institutions is to encourage young engineering students or graduates to join them.

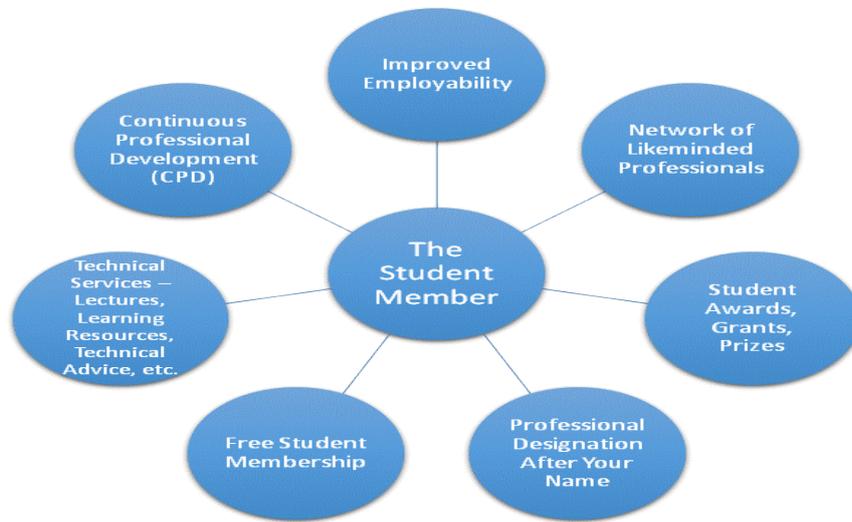
The key question of why should students join an engineering institution is as shown in the diagram below. The following are some of the benefits:

- Improve their employability
- Provide them with the opportunity to join a network of professional engineers, within different sectors of industry, commerce or academia
- Provide opportunities to apply for awards / funding/ grants to support their studies and/or progression into higher status
- Enjoy the benefits that come from joining a professional body without paying a fee
- Provide for distinction by allowing the students to use the designation SIMechE, SIMarEST or SIET
- Open access to a range of benefits such as lectures, learning resources, technical support and advice.

By joining a professional institution, students should also be given the opportunity to work with their peers at university or college or become involved in mentoring young pupils at primary and secondary schools.



## Why join as a student member?



### The Stairway

The following diagram, courtesy of IMarEST, clearly shows the skill levels which college and university students are engaged in. Some start from level 2 to higher levels, right up to higher level skills including PhDs. It is important to keep contact with all students throughout their study in a professional and structured way and involve them in professional engineering activities such as accreditation, STEM and engineering initiatives and projects.



### The Challenges for the Engineering Institution



I strongly believe that engineering institutions exist to promote their given profession. Systems and components are designed, developed, marketed and maintained. Academia has a role in educating young people in engineering subjects for industry's needs, therefore our role should also be to support universities to incorporate as much as possible, the industry's requirements into their courses bearing in mind that young graduate engineers might end up working for commercial or banking organisations or even opting to enter a teaching profession.

It has to be realised that the interests which a business has in wishing to establish or improve links with academia are different from those of academia, and may not always be compatible. The educationalists can aspire to be altruistic; business people can only afford to be altruistic when they have made more than enough money for the maintenance and development of their businesses. This is not a moral judgement – it is a pragmatic one. Academia needs the industry to support it in the development of its programmes so that they can identify and respond to the needs of industry and commerce. It needs industry to seek funds to progressively develop its laboratories, and it needs industry to develop its staff members. Industry needs academia to improve the quality of its employees, present and future; it needs academia for technological progress useful to business, and to better management of business; it needs academia for the formation of its future customers, and so of demands for its products and services (Ziarati, 2015)<sup>1</sup>

Furthermore, another article (Bozbura, Ziarati, 2017)<sup>2</sup> describes the mismatch between the two worlds of academia and business and offers a means to help young people to learn using novel technologies about opportunities available in the engineering and business world and how to prepare themselves for a career that would fulfil their aspirations.

The article by Singh (2017)<sup>3</sup> states that in today's competitive economic environment, the need to be open and stay connected with the eco-system networks and actors has become crucial for a firm's performance (especially for science-intensive companies). Particularly, collaboration with universities has proved itself as an instrument for companies' generating radical innovations – products/services that are novel to the market. However, several barriers like differences in organisational culture and internal characteristics keep the university-industry collaboration particularly challenging.

A review of these articles which is also an argument behind the ongoing EU funded UniBus project,<sup>4</sup> clearly provides an opportunity for professional institutions to address the mismatch between academia and business and help young people to acquire the skills and competences needed by industry and commerce and by working closely with the schools, colleges and universities.

Engineering institutions, through their accreditation services, have managed to find a means of ensuring colleges and universities diplomas/degrees underpin the respective industry's needs. They also ensure a balance of programmes which include non-engineering subjects, with topics such as social sciences or business related subjects, to broaden the minds of young engineers.

If there is a mismatch between academia and business, how deep is this mismatch? What about exposure of engineering subjects such as Science, Technology, Engineering and Mathematics (STEM) in primary and secondary education tiers? Clearly, there is a role for professional engineering institutions to promote STEM in all schools. While we are doing well with projects such as Fan Boats in primary schools there is room to develop a great deal more and help secondary schools to become engaged in more continuous and systematic areas outlined earlier in this short paper.

It is now becoming apparent that the engineering institutions are the custodian of their respective profession/sectors and while member-focused; their members have a moral and professional duty to work closely with schools to provide opportunities for their young pupils and students to find out more

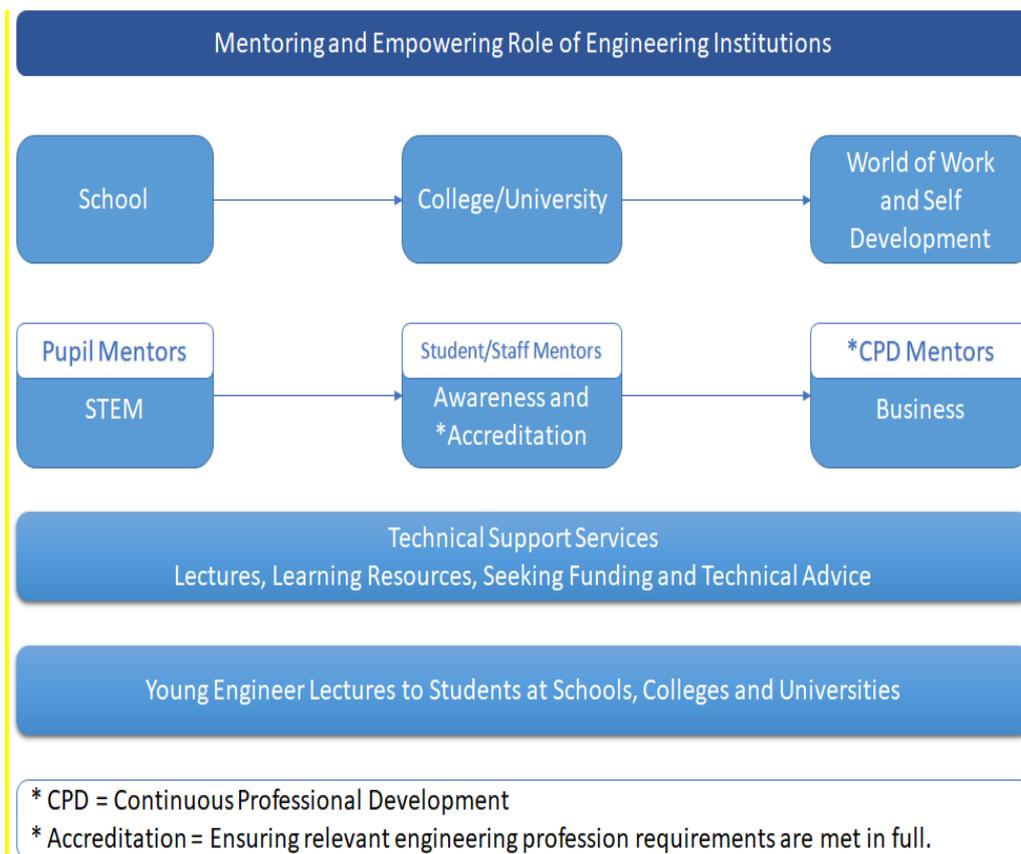


about engineering. It is crucial that this commitment is followed through to the tertiary education. Arranging meetings with students from year 1 to the final year ensures that student members become involved with their institution’s work. It is equally important to involve student members in the accreditation process so that colleges and universities could value the membership of their students with the engineering institutions. It is well known that major and well respected universities value the accreditation of their programmes by professional institutions and this is one way of ensuring that their students are encouraged to become members of appropriate institutions.

The same vision would encourage involvements with schools. The Continuous Professional Development (CPD) practice currently in place in one or two organisations would provide the institution with an opportunity to take a young pupil from a primary school right through to a professional job and then through CPD ensuring the engineer goes through a life-long learning process.

The concept of Engineers as mentors is therefore an important role for all engineers once incorporated. Engineers should also be seen as a bridge between academia and business helping to bring these two distinctive entities together without adding extra burdens on them.

As identified by Singh (2017)<sup>3</sup> engineers can support companies, particularly the SMEs, with technical issues particularly in helping these companies to seek resources including financial benefits and R&D funding for improving their products and/or services or for developing new products or services. A portal similar to that developed by C4FF<sup>5</sup> could be used by professional bodies to support the needs analysis/idea generation and management at the SMEs which could help institutions to provide a rational support to these companies/businesses. A life-long cycle of learning and the role the professional institutions should play are depicted in the following diagram:





There is no reason why the institutions themselves should not identify the SMEs' needs and seek national, European, international funding or funds from businesses to initiate education, research or development projects. The institution would benefit in identifying their highflyers to take a lead in such developments and in institutional activities supported by young engineer lecture programmes, which would then give them the platform to promote their profession. What about a dedicated young lecturers programme which encourages young engineers to go into schools and demonstrate engineering principles through interesting activities. It would be a good opportunity for engineers to say a few words when meeting more senior students about the pathway to engineering designations and the role the professional institutions play in mentoring and help to keep them up-dated through a programme of life-long learning and development (CPD), all linked to UK education qualifications including Apprenticeship opportunities.

### Final remarks

The number of members voting in elections is known to be extremely low; this has been the case for some time. Clearly, we are not engaging our members and this has to be addressed as a major priority. There should be more emphasis on institutional culture, leadership and openness/accountability as well as in the decision making processes. Maybe the lecture programme I suggested for the young members should include such topics. The key concern for me is the lack of a collective view of what the institution is or should be. What are we trying to achieve and why? We need to find ways to support and prepare early career projects. Mentorship seems to be a good vehicle and a way forward. Our institution can and should work with other institutions; and the view that we are already doing or it or doing it well should be set on one side. There is always room for learning more, doing the right things and doing them well. My organisation (C4FF) works with many schools ([www.inspire-group.org](http://www.inspire-group.org)) and there are many ways in which we can interact with them. Climate action and air quality are topical areas which seem to be of interest to young people particularly 18-25 age groups. I proposed a brain storming session on how we can aspire, encourage and stimulate young people to become more aware of engineering and what they can achieve.

Two areas that I wish to focus on as the new Chair of the Midlands Region are Mentorship for all and Climate Change, in particular, Air Quality. I aim to try and convince HQ that allowing reputable engineering companies to offer their own CPD recognised by us is a way to engage them in helping to improve the education and training of their personnel in areas that is deemed to help them to become more competitive and hence not imposing a generic CPD solution by IMechE a norm for all. Setting up a fair and professional set of criteria for these CPDs becomes essential. I would also like to promote the achievements of engineering students by creating a set of new student awards judged by universities and colleges to be the best and not by our criteria. We should continue with what we are already doing well viz., having IMechE set project criteria as well. Finally, having helped set up several STEM programmes and groups, I would like to increase our efforts in working with schools to encourage new recruits for the industry and business; and expose those who demonstrate an interest and ability in engineering artefacts and achievements.

I intend to suggest to HQ that we need a national project to save our planet through good engineering practices.

### Key References

<sup>1</sup>Ziarati, R., (2015), The Importance of Accreditation and, Research and Development – Developing Staff and Supporting Industry and Commerce, European Platform for Education, Research and Innovation, Marifuture, February 2015 - [http://www.marifuture.org/Publications/Articles/The\\_Importance\\_of\\_Accreditation\\_and\\_Research\\_and\\_Development\\_Developing\\_Staff\\_and\\_Supporting\\_Industry\\_and\\_Commerce.pdf](http://www.marifuture.org/Publications/Articles/The_Importance_of_Accreditation_and_Research_and_Development_Developing_Staff_and_Supporting_Industry_and_Commerce.pdf)).



<sup>2</sup>Ziarati, R., Bozbura, T., (2017), Academia-Industry Mismatch, European Platform for Education, Research and Innovation, Marifuture, March 2017 - [http://www.marifuture.org/Publications/Articles/Academia-Industry\\_Mismatch.pdf](http://www.marifuture.org/Publications/Articles/Academia-Industry_Mismatch.pdf)

<sup>3</sup>Singh, L., (2017), Industry-Academia Collaboration, European Platform for Education, Research and Innovation, Marifuture, April 2017 - [http://www.marifuture.org/Publications/Articles/Industry-Academia\\_collaboration.pdf](http://www.marifuture.org/Publications/Articles/Industry-Academia_collaboration.pdf)

<sup>4</sup><http://www.marifuture.org/Projects/Projects.aspx>)

<sup>5</sup>Ziarati, M., Singh, L., Ziarati, R., Design of an Innovation Platform for Manufacturing SMES; Proceedings of the 11th International Conference on Manufacturing Research (ICMR2013 - [http://www.marifuture.org/Publications/Papers/90-ICMR2013\\_15\\_03\\_2013.pdf](http://www.marifuture.org/Publications/Papers/90-ICMR2013_15_03_2013.pdf)