**Experiences and Learnings from the ERC program**

**By Iqbal Hussein**

An Engineering Research Center is an inspiration and a platform at the same time for engineering education, research and innovation. I consider myself to be extremely lucky to have been able to associate with the NSF ERC program in the roles of an aspirant, a reviewer, a faculty member, and finally as a Director. In the mid 90’s when I first saw the call for ERC proposals while I was at the University of Akron as a young Assistant Professor, I became an aspirant for a role in an ERC as I always enjoyed cross-disciplinary activities and team work. I would say that my journey through the various levels of an ERC started right then. While working at or for an ERC didn’t come rightaway, it came a few years later when I was asked by an NSF program director to serve as a site visit team reviewer for the Center for Power Electronic Systems headquarters at Virginia Tech.

Serving as an ERC Site Visit Team member helped me grow professionally both as a reviewer and as a researcher. As a reviewer, I could evaluate things from outside the box, being able to not only observe the excellent contributions, but also to see where there were potential gaps. I understood and appreciated the challenges in addressing these gaps while serving as a reviewer who posed questions in the late sessions and then evaluated the responses. A tremendous multi-dimensional effort is needed by the ERC PIs to move things forward towards systems integration and demonstration. It became apparent pretty soon that the greatest contribution of the ERCs are the nurturing of talents and the great accomplishments which would not be possible without multi-disciplinary, collaborative efforts.

Participation in an ERC as a faculty member and as co-PI of a project revealed the intricate details of project guidance and graduate student supervision where deliverables are required not only to meet the deadlines, but also in alignment with the overall goal of a thrust. While the graduate students initially get excited with the overall vision of the Center, soon they realize that a lot of time and effort is required for the small segment of the overall program that they are associated with and all of the efforts may not be directly contributing to their PhD degree goals. While this can be an issue with any sponsored project, the difference in an ERC project is that it is difficult to keep the students’ focus on the Center needs over a long period of time. Emphasizing the overall objectives and special advising relating to the importance of team work and soft skills development is helpful in this situation. The faculty member needs to remind himself or herself of the importance of those goals.

I assumed the responsibility of the Director of an ERC halfway through its NSF supported life and it has been an amazing experience despite the many challenges that came along the way. Being in the Director’s role has enabled me to guide the Center’s activities; I needed to align the vision toward a common good by accepting and implementing changes as necessary. I gained tremendous leadership and problem solving experience while working with a large group whose passion and dedication is always there but sometimes differ in the approaches. The challenge for the Director is identifying the right projects and pathways. Being a good listener to your own team members as well as external reviewers, and scientific and industry advisory board members give the Director ample guidance to charter the course of the Center. The Director need to fully comprehend the importance and relevance of each thrust and testbeds that leads to the fulfillment of the systems vision in the end. At the same time she/he need be visionary enough to identify the gaps and promote innovations. A challenging task for the Director is to shift resources from one PI to another as need arises. Particularly, when the center approaches its final years, the projects are rightfully to shift from more fundamental plane level towards system integration types. The Director has to manage the overall program, but the researchers and the program directors have to deliver for the overall success. The Education program has to accomplish its objectives, and the industry program has been managed with strong engagement of the industry members. The student leadership council (SLC) has to provide the feedback on whether they are learning and developing themselves or not. Center diversity has to be addressed at all levels. The Director’s role and responsibility has to be balanced so that she/he will get into sufficient depth, but not to the bottom of everything. A good supporting staff is essential, and having prior experience on managing large multidisciplinary teams is always beneficial. This is why I feel than an ERC Director needs to be groomed in an ERC environment as a graduate student or as a PI in an ERC program or as a thrust leader or in a combination of these roles.