The Magnificent Seven Qualities of the Engineer of the Future

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US companies are growing leaner and leaner. Fewer engineers are hired for the same jobs, and they are expected to know more, do more, be more efficient and more effective and more broad in their knowledge and skills. Engineering curricula have concentrated on dealing in-depth, specific subjects. As a result, graduate are not prepared to survive in this new world of engineering. What qualities are expected of these engineers of the future?

In the quest for training highly technical and well-rounded engineers, King pursued one very important aspect of engineering that very clearly industry leaders want – multi-disciplinary integrated engineers. An advisory committee was formed for this NSF supported project. It consisted of a company president, a vice president of operations, one retired VP, three Directors, a general manager, and a manger, all in engineering or information technology. "What can Kettering do to graduate students that are more job-ready, particularly in manufacturing?" The input from the advisors was surprising. In their frustrations, the advisors turned up with the "Magnificent Seven qualities for the engineer of the future", which they do not see in current engineering graduates.

The Magnificent Seven Qualities are (1) leadership skills, (2) conflict resolution, (3) ability to act as a change agent, (4) innovation and out-of-the-box thinking, (5) interdepartmental collaborations, (6) knowledge and experience in system integration, and (7) current technologies (nano-technology, MEMS, bio-engineering) was barely mentioned

Many of the ***magnificent seven*** stem from management. Many practicing engineers, after a 3-5 years of experience, return to the classroom to earn the MBA degree. How can we incorporate this startup knowledge into our undergraduates so they will have a head start upon graduation? The co-author, Joshua Richwine, an engineer, is a MS degree student in management and is an integral member of this NSF integration project team. Using his management knowledge and with the aid of his management professor, he helped designed a *multidisciplinary system integration engineering capstone course* where students from different fields of engineering can enroll and work on a combined project that involves all the engineering and management areas.

The following is a synopsis of the course: (1) the course begins with a seminar and project introduction by a management professor to guide in project management, leadership, conflict resolution, affecting change, and assist in grouping the students into multidisciplinary teams, select change agents, group leaders, establish goals and objectives, (2) out-of-the-box / innovation seminar to promote unprecedented designs to satisfy functional requirements, (3) in the weeks to follow, guided by engineering professors, an innovative product that involved different engineering disciplines is designed, a coordinated Gantt time chart is made from the various groups of students, various engineers are involved with product development in their respective areas and prototypes are built, (4) different engineering skills are utilized, (5) in the meantime, many disagreements, differences in opinion are resolved through conflict resolution. *The result is the functional product designed and built by different walks of engineers, who are all knowledgeable in their own fields, all opinionated but operated as a whole.*

Acknowledgement: This research and implementation is supported by NSF EEC-234478.