

What is an Engineer in Residence?

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CONTEXT

This paper describes the Engineer in Residence position as it applies to the staff at CSU Engineering. This position was originally envisioned as a mechanism for providing role models for student engineers, much as artist in residence programs give aspiring artists access to *real artists*. Engineers in Residence have been incorporated to provide a comprehensive staff and to bridge any possible divide between the university and engineering practice in the real world.

PURPOSE

Engineers in Residence play a key role in providing workplace ready cadets as well as helping secure work placement opportunities. They also can serve as role models for student engineers, provide bridges between academic and student engineers, and add value in other ways. The purpose of this paper is to explore which roles are best utilised, which roles could be better utilised, and what might be the best path forward.

APPROACH

The paper will investigate the difference between the role envisioned by the founders of CSU Engineering and the actual day to day life of an Engineer in Residence. It also will identify the benefits of having Engineers in Residence within CSU Engineering, and explore the mechanisms of maintaining these benefits as the Engineers in Residence are no longer working in industry. Qualitative data will be collected from reflections by the Engineers in Residence, Foundation Professor and Course Director.

RESULTS

It is expected that the day to day life of an Engineer in Residence is quite different from the original job description and that the benefits are also greater than would have been expected. For example, preliminary results indicate a greater level of involvement in teaching and academia than originally envisioned. The Engineers in Residence have also displayed different perspectives on course content and different approaches to mentoring of student engineers.

CONCLUSIONS

CSU Engineering has received very positive benefits from having Engineers in Residence. In part this results from the individuals on the team, in part from the environment at CSU Engineering, and in part from luck. The Engineers in Residence have quickly established strong connections between CSU and the engineering industry.

Plans for the future include maintaining the current positive team environment whilst providing a mechanism for obtaining *recent, relevant engineering experience*, and appropriate career opportunities for all staff. Whilst this role is currently unique amongst universities in Australia it is worth investigating how the benefits would apply to other engineering schools.

KEYWORDS

Industry Engagement, Engineer in Residence, Adjunct Professor, Professor of Practice, Work Integrated Learning (WIL).

Introduction

This paper describes the Engineer in Residence position as it applies to the staff at CSU Engineering. It will commence with a description of the original vision of the role before covering the current responsibilities of the Engineers in Residence and consider several future possibilities of the role. Also contained within this paper is a discussion on the benefits to the CSU Engineering course of the Engineers in Residence as well as some of the issues experienced. Supporting these ideas are quotes from the current CSU Engineering staff who were asked to complete a reflection on their thoughts of the role of the Engineers in Residence.

Background Information

Charles Sturt University (CSU) established Australia's newest engineering school in 2015 (Lindsay and Morgan, 2016). CSU Engineering was developed with a focus on innovation in engineering education and preparing engineers for the realities of working in today's engineering industry. CSU Engineering sees engagement with industry as a critical part of the success of an engineering program. Student engineers spend 18 months on campus in a largely project-based learning environment and then complete four year-long industry work placements at host organisations where they gain valuable practical skills and experience prior to graduation. "The success of the program is heavily dependent upon finding a pipeline of work placements" (Lindsay and Morgan, 2016), which in turn requires CSU to engage with industry to identify the necessary skills cadets need to possess in order to make a meaningful contribution to their host organisation.

Typical academic staff members in engineering education come from an entirely academic background, and as a result possess little knowledge of industry best practice. In the past this issue has been addressed in several ways, the most common being Professors of Practice. Duties of this role include "a deep understanding and appreciation of the best practices as applied in real-world settings, something few tenure track faculty members have" (Cornell, 2015). However these individuals are often at the height of their career, making this an expensive option or one for universities with extremely loyal alumni. Another option, commonly used in urban areas is that of adjunct professor. As adjuncts are employed part time, this can be a less expensive way to "utilize the expertise of practitioners to enhance instruction in courses related to engineering design and construction" (Varma, 2009; Willis and Dunlap, 2002). In any case, it is important for engineering educators to "understand what it takes to practice the engineering profession" (Morell and DeBoer, 2010). To address this issue CSU Engineering employs three staff in the position of Engineer in Residence; "practising engineers who have come directly from industry into an academic role, and who have been hired based on their industrial, rather than academic, experience" (Lindsay and Morgan, 2016). The Engineers in Residence are involved in the development of the CSU Engineering curriculum and actively seeking input from industry on the skills and attributes they desire in cadets and graduates.

Staff Reflection

In August 2016 academic staff members at CSU Engineering were asked to complete a short reflection on their thoughts about the role of the Engineers in Residence. In total eight responses were received from the ten staff members contacted. General academic staff were asked to complete a short three answer reflection whilst the Engineers in Residence and professors completed a more detailed five question reflection. All reflections were completed and compiled over several weeks, roughly 12 months after the commencement of the first engineers in residence.

The reflections were compiled and analysed to identify common themes and issues. The most common themes throughout the reflections were used as a starting point for discussion

of the benefits and issues associated with the Engineer in Residence role. Quotes from the reflections were used throughout this paper to support the points being made.

Original Vision

From the outset of planning for an engineering course at CSU there has been a strong focus on “integration of industry engagement into the curriculum” (Taylor et al., 2012) in order to prepare student engineers for practice in industry. The idea for the Engineer in Residence was born out of discussions during the CSU curriculum development workshop held in February 2015 in Sydney. The role was originally envisioned as a mechanism for providing role models for student engineers, much as artist in residence programs give aspiring artists exposure to real artists. Initial discussions focused mostly on providing role models to student engineers; providing valuable industry contacts; and “to provide immediately recent industry context and experience to the teaching team” (Lindsay and Morgan, 2016). Overall the original vision of the Engineer in Residence was for “people whose identity was that of a professional engineer” (E. Lindsay). This vision was further refined prior to recruitment into the position description included below (figure 1).

Position Overview – Engineer in Residence

(Senior) Engineers in Residence will draw upon their industry experience and background to ensure that the CSU Engineering learning environment represents the environment in which Cadet and Graduate Engineers will work. He/She will serve as a role model to students through their professional activities that contribute to the Engineering discipline and profession. He/She will contribute to the establishment and running of our Industry Placement program, ensuring that Student Engineers on placement are given the necessary opportunities and support for their workplace learning.

Key Working Relationships

Foundation Professor

Course Director

Faculty and School Staff

Students

Industry Partners

Principal Responsibilities

1. Apply CSU learning and teaching methodologies, processes, technologies and tools to deliver high quality student centred learning opportunities in Engineering and as required to meet the teaching needs of the University
2. Proactively develop and foster relationships with a range of stakeholders predominately in industry, as well as community, government departments, and professional bodies;
3. Engage in professional activities linked to knowledge development and problem solving such as research with, for and about the profession and about professional practice; projects related to critical evaluation and enhancement of practice; collaborations with research colleagues and professions/industries/businesses; authorship/editorship;
4. Actively contribute to the governance, marketing and promotion, and administrative activities to facilitate the work of the Faculty/School.

Figure 1: Extract from Engineer in Residence Position Description

It is also worth noting how the Engineers in Residence originally envisaged their role within CSU engineering. Coming from an industry background their focus was very much on

providing “an industry perspective to the academics and help make sure what was taught reflected as closely as possible the reality of industry best practice” (J. Devitt) and “seeking to apply industry practice to teaching, provide case-studies, linking academics with industry, organise site visits and guests” (S. Cameron). The aim of this approach “would result in CSU Engineering developing a culture of industry engagement amongst all staff and student engineers” (S. Cameron).

Current Responsibilities

CSU Engineering currently employ three Engineers in Residence, one employed full time, one part time and one on a casual basis. The full and part time employees have completed one year of a three year fixed contract. The fixed period of employment helps ensure that the Engineers in Residence maintain relevant industry knowledge and experience. In order to reapply for a continuing position the Engineers in Residence must demonstrate that they have maintained relevant industry experience.

The current responsibilities of the Engineers in Residence involves much more of a teaching role than originally envisioned. It is estimated that the Engineers in Residence spend as much as 80% of their time during session on teaching related activities with the remaining 20% spread over industry engagement and administrative duties. This is perhaps driven by the short timeframe between the engineers in residence commencing and the first student engineer cohort arriving, and the ensuing demand for teaching activities and curriculum development that this entails.

The Engineers in Residence have been particularly involved with certain areas of curriculum development. Their individual fields of expertise cover areas that many of the other academics do not and they have helped develop practice based topics of their own whilst assisting other academics in incorporating a practical focus to their topics. There would not have been as much of a focus on practical topics without the input of the Engineers in Residence.

The Engineers in Residence are taking an active role in the mentoring of teams of student engineers in project based subjects. These subjects are designed to provide student engineers with experiences in team based, project work that is reflective of what they will be doing once they are on placement. In this regard the Engineers in Residence are particularly valuable, being able to provide realistic industry supervision and examples of how certain tasks would be completed in the industry.

One Engineer in Residence is currently overseeing the delivery of one of the core subject streams of the CSU engineering course, that of the Performance Planning and Review (PPR) subjects. The PPR subjects are modelled closely on standard industry performance reviews conducted in industry. They enable student engineers to gain an understanding of what will be required of them and how their competence will be tracked once in paid employment.

Establishing links between the university and the wider engineering industry is one of the core responsibilities of the Engineers in Residence. Each of the Engineers in Residence maintains a network of industry contacts and actively engages with other practicing engineers and industry bodies. These contacts are used to source field trips to current projects, discuss potential placements for cadet engineers and external consultancy work for the Engineers in Residence to maintain their industry based skills.

Benefits of the Engineer in Residence

The qualitative data obtained from staff reflections indicate that the majority of the CSU Engineering team believe there are several key benefits of the Engineer in Residence role. The benefit identified most often in reflections of the Engineer in Residence role was the ability to promote industry best practice. Referring specifically to the methods and techniques used by engineers operating in the engineering industry today. Some specific comments

from the staff reflections were that the Engineers in Residence “provide an awareness of industry-related engineering problems and provide context for the academics” (A. Goncher) and that “Engineers in Residence provide a unique insight into the realities of industry that are often lacking in present day engineering programs” (K. Sevilla).

The second most quoted benefit was the ability to form closer ties with industry. Specific benefits cited include the ability to organise case studies, site tours and guest speakers for student engineers as well as potential research and consultancy opportunities for staff. Comments received include that the “main responsibility is to make links between CSU engineering and the industry” (L. Senevirathna), “The Engineers in Residence have really strong links to industry, and they don’t have the traditional academic barriers to engaging outside the university” (E. Lindsay).

Following closely behind the previous two was the benefit of the Engineer in Residence to act as a role model and mentor to student engineers. As the CSU engineering course has such a strong focus on integrated work placement the ability to provide student engineers with an experience close to the reality of working in the engineering industry is important. Some of the specific comments around this benefit were that their “skills in industry can be transferred to the benefit of our student engineers” (R. Mahinroosta) and that “the advantage of the Engineers in Residence is that their authentic practice is different to the authentic practice of our Lecturers and our Professors. This means that they are exhibiting different behaviours, they emphasise different skills, and they focus the attention of the student engineers on different things” (E. Lindsay).

The Engineers in Residence have also been involved of activities beyond the original role envisaged for the position “not just the industry engagement and role model bits” (J. Morgan). One of the unexpected benefits of the Engineers in Residence was their assistance in preparing course materials for student engineers. None of the current Engineers in Residence had any teaching experience prior to commencing with CSU. Despite this they have been integral in developing topics which focus on industry best practice techniques and methods. “In the QA process, Engineers in Residence have pushed to make topics more practical and more practice oriented” (J. Morgan). “The Engineers in Residence role provides a more practice-oriented approach to how we deliver the engineering challenges and topic/technical content.” (A. Goncher).

What was interesting was also the lack of certain characteristics which featured strongly in the original position description. For example the sourcing of placements for cadets was identified by the current Engineers in Residence and the head of school but not by the remaining academics. This is despite the fact that the original position description includes a responsibility to ‘contribute to the establishment and running of our industry placement program’. This can be attributed in part to the fact that industry placements won’t commence until June 2017 and that the current focus is on the creation and delivery of subject material to student engineers.

Future Possibilities

Owing to the fact that it is such a new program CSU engineering is constantly evolving and as such the role of the Engineer in Residence role will continue to evolve with it. One of the areas that has been identified for expansion is the provision of the Engineers in Residence to undertake outside consulting work. This would have a number of benefits to the program; bringing in outside financial gain and providing fresh resources for case studies and project examples. It would also benefit regional NSW by providing professional engineering services to communities who are struggling to access them. Finally it would be of benefit to the Engineers in Residence themselves whose continued employment is predicated on having recent industry experience.

The Engineers in Residence are well-suited to deeper engagement with industry. As the CSU engineering program matures there will be a constant stream of cadets seeking

placement and it is envisaged that the Engineers in Residence will be heavily involved with both sourcing placements from interested industry partners, supporting the cadets whilst they are on placement and helping to mediate any issues that may arise. This view is supported by both the academics: "I hope that Engineers in Residence will be able to spend more of their time on industry engagement (including interacting with cadet engineers on placement as well as their employers) whilst maintaining the positive benefits to the traditional academic staff mentioned above" (J. Morgan) and Engineers in Residence : "In the future I believe the role will transition to reflect more closely what I originally envisaged, with a greater emphasis on engaging with industry and supporting students whilst they are on placement" (J. Devitt).

One of the possible future pathways for some of the Engineers in Residence is to transition from their current role to a more traditional academic role. This would require completion of further post-graduate study "to ensure that the role isn't seen as a "back door" entry to academia for people without PhDs" (E. Lindsay). This in turn leads to one of the main concerns about the current trajectory of the Engineers in Residence, that of "losing the outside perspective that makes them so valuable" (E. Lindsay). This is a concern shared by other members of the team, both traditional academic: "I think we are currently merging into one style of staff member rather than focus on our individual strengths" (K. Sevilla) and Engineer in Residence: "the down side is that I am not as involved with industry as much as I could be and potentially end up becoming another academic. I think it is vitally important to maintain the distinction of the two roles as they are both valuable" (J. Devitt).

It remains to be seen whether Engineers in Residence will transition into more traditional academic roles (perhaps becoming the first wave of post-graduates for CSU Engineering in route), return to the engineering industry or manage to maintain the inherent dichotomy of their current role.

Conclusion

CSU Engineering have found the inclusion of Engineers in Residence as members of the academic team to be extremely rewarding for staff, students engineers and the development of the course in general. The Engineers in Residence have contributed an industry-based perspective to the development of curriculum and course materials and provided student engineers with a diverse range of mentoring experiences. Furthermore they have assisted in the engagement of the program with the engineering industry, a critical part of a program which places such importance on the development of on-the-job skills.

There is an increasing demand from industry for graduates who are job ready from day one and recognition within the engineering education community of the importance of industry engagement. The Engineer in Residence is an attempt to address these issues and based on results so far has been successful. Other institutions may like to consider employing an Engineer in Residence or a similar position with a focus on industry experience to help improve their engagement with industry and ensure graduates are appropriately prepared for today's workforce.

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