

# Difference Makers: The Transition, Handoff and Sustainability of Innovative Programs

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**Abstract**—This panel session relates stories of specific engineering education innovations from around the world, hearing from the Difference Makers themselves. The panel will bring together change makers from programs that already have created significantly different, innovative engineering and computing (E&C) programs and those who may wish to do so, with the aim of highlighting salient themes and results expected to be of interest to future Difference Makers. This is planned as an interactive forum aimed to spark dialogue between those interested in effecting significant change at their own institutions and those who have led similar innovations. The focus on the challenges, benefits, change strategies and lessons learned. Panel participants have been selected from a larger pool of the programs named in the 2018 MIT report and other innovative programs recognized as having different perspectives and experiences around the focus areas of transition, handoff and sustainability. This is the second of two related panels:

**Panel 1: Champion and Entrepreneur**

**Panel 2: Transition, Handoff and Sustainability**

**Keywords**—*Innovation, engineering education, change management, sustainability, inclusivity*

## I. DESCRIPTION AND RATIONALE

This panel presents Difference Makers, specifically highlighting stories of innovators who are extending the frontiers of engineering and computing (E&C) education. This panel includes a group of key E&C program innovators for the purpose of identifying the recent successes that have pushed the frontiers of engineering education forward by exploring the issues surrounding innovative education programs, specifically the transition and adaptations needed beyond the start-up and initial implementation stage: the handoff to the next leaders, and issues of sustainability, inclusiveness, and recruitment. The panel focuses on three topics:

**The Transition:** How the innovation vision adapted and changed during the development and implementation process. How the end result differed from the envisaged program.

**The Handoff:** Transitioning from the start-up team into a continuing program.

**Sustainability:** How success is sustained and maintained as an innovative program develops into an established program that continues to evolve and improve.

These key topics are best served by a panel in that the roles appear to be common in the experience of education change, yet also have significantly different stories as to how the roles worked, and how they could work for others in their own setting.

## II. AUDIENCE

This panel is expected to draw interest from a broad audience of educators, administrators, and practitioners in all disciplines included in the conference. The Ruth Graham report [1] and other recent literature advocating for change in higher education (*e.g.*, [2]–[6]) has led to thinking about how to adapt education for Industry 4.0 and beyond [7]. The primary audience is engineering and computing educators interested in better understanding how to succeed in creating sustainable educational innovation. This includes E&C faculty, deans, practitioners, and students.

## III. GOALS AND FORMAT OF THE SESSION

The panel aims to be more than just the collected stories of different institutions and their stories of making sustained differences in engineering and computing education. Rather, the panel will reflect the work of the Difference Makers pre-conference workshop and the presentations of the individual institutions and their representatives.

The topics are centred on the processes and issues required for sustaining program innovation, *e.g.*, The handoff: transitioning from the start-up team into a continuing program and sustainability: How programs morph and success is sustained as an innovative program develops into an established program that continues to evolve. The goals of the panel are to engage the audience into a discussion of both the mechanisms of change, and the work of sustainable program innovation. This will be accomplished by three different phases planned for the panel session:

- I. Introduction/Synthesis:** A brief presentation of the Working Group summary lessons related to transitioning, handoff, sustainability and related topics. This will summarize the key take-aways from the Difference Makers

working group (panel leads) and includes collecting of questions from the audience.

II. **Summary stories:** These are a series of minimally four stories from individual panellists highlighting their experience and key lessons learned from and what it takes to prepare for and manage handoff and sustainability of program-wide innovations.

III. **Directed questions:** Whilst the panel presenters are sharing their stories and lessons learned, the panel organizers will collect questions from the audience and organize them by topic. These will be used to initiate the discussion and audience interaction. The intent is to allow audience themes to be addressed and spark conversation.

#### IV. PANEL FACILITATORS

Elizabeth Pluskwik, Ph.D. leads the Engineering Management and Statistics competencies at Iron Range Engineering, a project-based engineering education program located in northern Minnesota. Her research interests include gamification, entrepreneurship & innovation in engineering, cooperative learning, and engineering management.

Jim Morgan, CPEng, P.E., Ph.D. is Professor of Engineering at Charles Sturt University. Before joining CSU Engineering as the Inaugural Course Director in 2015, he spent over 30 years on the faculty of the Zachry Department of Civil Engineering at Texas A&M University. In addition, he was active in the NSF Foundation Coalition project and directed the first-year engineering program whilst at A&M. His research focus is STEM and engineering education.

Deacon Steve Frezza, P.S.E.M. leads the Software Engineering program and is chair of the Computer and Information Science department at Gannon University. He had led or helped lead the introduction of three new degree programs at Gannon. His research interests are in the areas of philosophy of engineering, software engineering education, and the relationship between engineering and theology.

#### V. PANEL MEMBERS

Panel members will describe one or more of these topic areas from their program innovation experience that is of value and interest to other engineering and/or computing educators. They will describe the setting for their program innovations, motivations for their program innovation, and a summary of the approach or results obtained. Core questions include:

- What program innovation are you most proud of? What were most successful?
- What were the most important lessons learned?
- What was learned that would be most interesting to others considering major program innovation?
- What part of your story would impact others considering change?

#### Planned panellists include:

##### A. *Making Engineering Education Sociotechnical*

Susan Lord & Chell Roberts, University of San Diego, San Diego, California, USA have developed curriculum (courses and modules) that infuses the lenses of social justice, humanitarian

practice, and peace into engineering content. This includes seven modules and three courses. Their work includes developing workshops for broadening the capacity of engineering faculty to teach these topics and creating a focused hiring cluster to bring new faculty to the school that have the desire and expertise to work in these areas.

##### B. *Improving First-Year Teaching with Project-Based Learning and Support of STEM Modules*

Marco Minzker, Hochschule Bonn-Rhein-Sieg, University, Bonn, Germany. With work beginning in 2011, focused on anchoring innovation within the existing workforce and not treated as a separate add-on. They have since founded a centre for teaching development to transit the initial work in from project to permanent institution. A call for workspaces was announced to give lecturers a structure for networking on new approaches for teaching. Ten university-wide initiatives were founded, most of them across faculties covering laboratory didactics, online labs and e-assessment. The centre will also be the organizer for events, promoting exchange on teaching innovation.

##### C. *Pocket campus for accelerating and catalyzing software engineering education in the Global South*

Erikki Sutinen, University of Turku, Finland and Maria Ntinda, University of Namibia, Namibia. Their innovation centres on the Future Tech Lab as a pocket campus: an arrangement where a foreign university (base institution or university), sets up its presence by allocating its faculty at a physical and permanent space within an existing university (host institution or university). In order to succeed, the operations of the pocket campus are integrated into the academic and societal realities of the host. Also, the pocket campus needs to be integrated into the local science, technology and innovation ecosystem to ensure a truly shared academic learning, research and societal impact experiences.

##### D. *The Blank Slate: CSU Engineering*

Jim Morgan, Charles Sturt University (CSU) Faced with the opportunity of developing a program where they did not have to do all those things “we have always done,” CSU chose to abandon routine classes, instead leveraging project-based learning in teams in parallel with just in time or as-inspired online delivery of content. Online content is parsed into 3 hour chunks accessible anytime and anywhere and mostly any order. The first three semesters focus on realistic, authentic projects using a topic tree and a mastery learning paradigm. The program then morphs into a series of four paid work placements as cadet engineers where the campus projects are replaced by real projects for real clients. These two strands are bound together by a thread of performance planning and review (PPR) where the student and cadet engineers are guided to connect the dots through SMART goals and reflections. Early PPR subjects help them prepare for and adapt to the engineering work environment and build a portfolio demonstrating the competencies for becoming a Chartered Engineer.

##### E. *Continuous Change: Iron Range Engineering*

Ron Ulseth & Elizabeth Pluskwik, Iron Range Engineering (IRE) Starting with project-based learning (PBL) from the Aalborg model [8], changes welcomed by industry. Continuous

improvement has seen the student experience changed by 10-20% each semester as new strategies were developed, tested, and improved. Now 10 years have passed. Continuous improvement is still the norm. The original change agents are fading away and new leaders are taking the program into a sustainable future.

These personal stories of the innovative program leaders are expected to be highly valuable to others who plan to undertake educational innovations at their home institutions.

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