

## **From Industry to Academia: Translating Engineering Practice into Mechanism-Based Innovation**

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Engineering innovation in practice rarely starts from a fully defined problem. It requires engineers to identify the real functional need, work across disciplinary interfaces, make decisions under constraints, and refine solutions through evidence. This keynote reflects Prof. Ou's transition from nearly 17 years of industrial R&D and engineering leadership to academia. At the Industrial Technology Research Institute (ITRI), he conducted R&D on multi-axis precision machinery technologies. He later joined Pou Chen Group's Nike footwear business, where he built automation R&D capability from the ground up - developing both engineering talent and technologies - and progressively took on responsibilities in modernization development, global engineering, and senior management. He also led cross-functional collaboration among Equipment, Process, Industrial Engineering, and Chemical (EPIC) teams for manufacturing transformation. These experiences led to a central realization: professional knowledge is essential, but engineering mindset determines how effectively engineers deal with open-ended problems.

After returning to National Cheng Kung University, these industrial lessons became the basis of his research and student training. His mechanism-based research includes de-skilling and multi-state mechanism design, where human or functional behaviors are formalized and systematically transformed into mechanism concepts; passive self-regulating permanent-magnet eddy-current braking, where speed-dependent regulation is embedded directly in the physical mechanism; and escapement-regulated piezoelectric energy harvesting, where mechanical architecture coordinates energy storage, release, and excitation. Although the applications differ, the underlying approach is consistent: understand behavior, structure the problem, integrate interacting functions, and validate the resulting design through modeling, prototyping, and experiments.

The same philosophy shapes engineering education and research training. For undergraduates, Morphological Analysis and Design of Experiments are integrated into an open-ended design-and-build learning process so that students experience systematic concept generation, experimentation, and evidence-based refinement. For graduate students, research projects are structured to develop the ability to move from an engineering problem to a research question, physical principle, mathematical model, embodiment design, experimental validation, and ultimately generalizable engineering knowledge. The talk therefore connects industrial practice, academic research, and the development of engineers through one common theme: turning engineering experience into structured and reusable knowledge.

**Experience:**

2022 – present | Assistant Professor, Mechanical Engineering, NCKU

2019 – 2022 | Director, Engineering Operations, Nike Business, Pou Chen Group

*Led cross-functional EPIC engineering integration and manufacturing modernization across global footwear manufacturing operations.*

2015 – 2019 | Deputy Director, Manufacturing Excellence, Nike Business, Pou Chen Group

*Expanded automation technologies into scalable manufacturing capabilities and strengthened engineering collaboration across factories and functions.*

2011 – 2015 | Executive Manager, Automation & Modernization, Nike Business, Pou Chen Group

*Built the automation R&D capability from the ground up, developing engineering talent, technologies, laboratories, and equipment-development processes.*

2005 – 2011 | Researcher, Intelligent Machinery Technology, Mechanical & Systems Research Lab, ITRI

*Conducted R&D on precision multi-axis machining machinery, including machine and key module design, performance improvement, and prototype development.*