Editorial on Innovation in Science and Engineering Technology

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Abstract:

Engineering Science, Technology and Innovation provides power to a human being to develop our civilization and culture. Knowledge obtained from practicing science has enabled us to be advanced in the race. Exchange of precious information and idea in this regard is vital and requires a common platform for discussion.

Such programs are increasingly held accountable for evidence of impact—that is, innovative goods and services resulting from R&D activity. However, the absence of comprehensive models and metrics skews evidence gathering toward bibliometrics about research outputs (published discoveries), with less focus on transfer metrics about development outputs (patented prototypes) and almost none on econometrics related to production outputs (commercial innovations). This disparity is particularly problematic for the expressed intent of such programs, as most measurable socioeconomic benefits result from the last category of outputs.

Leadership in innovation is essential to U.S. prosperity and security. In a global, knowledge-driven economy, technological innovation—the transformation of new knowledge into products, processes, and services of value to society—is critical to competitiveness, long-term productivity growth, and an improved quality of life. Preeminence in technological innovation depends on a wide array of factors, one of which is leadership in engineering research, education, and practice. A threedecade- long decline in the share of federal investment in research and development devoted to engineering and a perceived erosion of basic, long-term engineering research capability in U.S. industry and federal laboratories have raised serious questions about the long-term health of engineering research in the United States. This book illustrates the critical role of engineering research in maintaining U.S. technological leadership; documents major challenges and opportunities facing the U.S. engineering research enterprise; and offers specific recommendations for leaders in federal and state government, industry, and universities to help strengthen U.S. engineering research in the face of intensifying global competition.

The resulting logic model framework explicitly traces the progress of knowledge from inputs, following it through the three knowledge-generating processes and their respective knowledge outputs (discovery, invention, innovation), as it generates the intended socio-beneficial impacts. It is a hybrid model for generating technology-based innovations, where best practices in new product development merge with a widely accepted knowledge-translation approach. Given the emphasis on evidence-based practice in the medical and health fields and “bench to bedside” expectations for knowledge transfer, sponsors and grantees alike should find the model useful for planning, implementing, and evaluating innovation processes.