

Preface to Special Issue “Knowledge Integration and Value Creation through Industry-Academia Collaboration”

Masatoshi Takahashi

Research & Development Management Department, Shimadzu Corporation, Kyoto, Japan

(Received February 9, 2026)

1. Introduction

In this preface, I would like to share my thoughts on the role that industry-academia collaboration has played in technological development at Shimadzu, and its importance for future development. Since it was founded in 1875, Shimadzu has upheld its corporate philosophy of “Contributing to Society through Science and Technology” and commitment to “Realizing Our Wishes for the Well-being of both Mankind and the Earth,” and through product development and real-world solutions based on the continued refinement of core technologies, Shimadzu has striven to address the challenges faced by customers and wider society while expanding its scope of operations. Along this journey, industry-academia collaborations with universities and research institutions have functioned as a vital ecosystem, offering a key pipeline for transformative and industry-leading knowledge, the front-line deployment and commercialization of this knowledge, and supporting technological development at Shimadzu and expansion of its operational footprint.

As the technological challenges faced today become ever more sophisticated and complex, the in-depth expertise retained by universities and research institutions offers unmistakable opportunities for improved speed and quality of research and development. Interdisciplinary knowledge and rapid deployment are essential for addressing today’s increasingly diverse range of societal challenges, and the role of industry-academia collaboration in linking the operational expertise and market insights of the private sector, with the cutting-edge knowledge and talent development of academia, is becoming increasingly important. This synergy between the rigorosity of basic research and the results-driven mindset of industry yields extraordinary technological breakthroughs and real-world successes that position industry-academia collaboration as much more than a transfer of technology, but a strategic framework for fostering research talent, identifying research topics, and creating new value.

Shimadzu is currently pursuing a diverse range of collaborative schemes, including joint research initiatives, industry-academia partnership programs, joint talent development, and open innovation. Built on Shimadzu’s technical expertise in measurement, analytical, and other technologies, and facilitated by trusted relationships in the academic community, these initiatives promise to accelerate the translation of basic research into practical applications, and serve as a driving force for technological development and front-line implementation in new domains. It is firmly believed that close partnerships with universities and research institutions are pivotal drivers for technologies and services that create new value, the delivery of sustainable

social growth, business development, and help us have a positive impact on the numerous challenges facing society.

Although this special issue presents a select few of Shimadzu’s industry-academia initiatives, it provides a useful insight into how Shimadzu pursues technology development and value creation through these collaborations. Specifically, this special issue describes how key technologies from universities and research institutions are married with measurement technology and product development at Shimadzu (articles 1, 2, and 3), how a comprehensive partnership delivers a complete pipeline from research and development to front-line application (article 4), how Shimadzu pursues technology development and commercialization with a university and various commercial organizations through a consortium framework (article 5), and how Shimadzu collaborates with key opinion leaders (KOLs) in universities and research institutions (articles 6, 7, and 8).

2. Special Issue Articles on Industry-Academia Collaboration

Article 1: “Development of Moisture Content Monitor for Food Using Electromagnetic Sensing Technology from the National Institute of Advanced Industrial Science and Technology” reports on efforts to develop non-contact, non-destructive, real-time moisture content measurements in food production, where moisture content control has a major impact on product quality. This is a prime example of industry-academia collaboration leading to a real-world application in which core technologies from a research institute were combined with Shimadzu’s expertise in measurement instrument development and commercialization. The article discusses how measurement principles were refined from the research phase to a level suitable for food production.

Article 2: “Joint Development of the ‘Aroma Designer’ for Complex Odor Evaluation,” describes how the results of basic olfactory research and a search for bioactive compounds carried by a university were used as a starting point for a collaborative research effort exploiting Shimadzu’s expertise in analytical instrument design and flow-path control technology to develop a practical scheme for the precision identification of specific, key components in natural aromas and complex odors in food and flavorings. An analytical platform is now being developed that offers potential applications in fragrance design, odor analysis, and olfactory research.

Article 3: “Combating Mental Health Issues with Measurement Technology: Academic-Industry Collaboration as a Path to Social Implementation” reports on an industry-academia collaboration for research and

development related to mental health, a critical issue facing society. Building on academic findings into blood biomarkers of mental illness, this collaboration with Shimadzu was established to address the technical challenges involved in developing the advanced measurement technology, automation, and quality controls required for front-line deployment. This article discusses the course of events leading up to the collaboration, describes the collaborative development process and its outcomes, and outlines future prospects for the initiative.

Article 4: “Bone Health: Building a New Strategy for Osteoporosis Prevention and Early Detection through Industry-Academia Collaboration” covers a comprehensive partnership with a university that drove development from R&D to clinical adoption via a large-scale framework that offered potentialities beyond any individual collaborative research project. This initiative developed a front-line system to address the social issue of increased risk of osteoporosis associated with vitamin D deficiency by integrating clinical data and medical findings from a university partner with Shimadzu’s analytical and measuring technology and medical imaging technology.

Article 5: “Development and Commercialization of Production Technology for Structured Cultured Meat: A Multi-institutional Consortium Approach” reports on the establishment of an open innovation consortium involving a university and multiple private sector partners that aims to commercialize university-developed cultured meat technology to fulfill rising demands for meat and other protein sources. This article describes how this scheme developed equipment and also leveraged know-how in areas such as materials and distribution for technological development while simultaneously pursuing public acceptance. A showcasing at the 2025 Osaka-Kansai Expo acted as a pivotal milestone for development and as an opportunity to gauge public acceptance and stimulate policy discussion.

Article 6: “Development of an Integrated Platform for Lipid Analysis: Towards the Standardization of Lipidomics” presents an industry-academia collaboration with its origin in a proposal paper issued by an industry body. Focused on lipidomics, a field of growing potential for health maintenance and disease research, this article reports on an initiative that identified technical challenges such as structural heterogeneity and inadequate reproducibility between institutions, and the technical advances achieved by a partnership between Shimadzu for developing

analytical techniques and equipment, and a university KOL in lipidomics.

Article 7: In “Progress and Advancement of Industry-Academia Collaboration Focused on Glycan Derivatization Technology,” while mass spectrometry is an increasingly effective platform for glycan analysis, challenges remain in the analysis of sialic acid (an acidic sugar), including low sensitivity, residue release, salt adduction, and differentiation between linkage types. This article outlines how joint research progressed with university and research institutions as key opinion leaders, technical improvements were iterated through feedback, and the initiative drove maturation and wider adoption of product technologies.

Article 8: “Development of a Current Density Sensor Using Underwater Electric Potential (UEP) Sensor” covers the topic of cathodic protection, an anti-corrosion technology used to protect marine structures, such as offshore wind farms and ports. This essential protection is defined in terms of a parameter called protection current density, which varies based on factors in the marine environment. This article reports the course of development of a non-contact underwater electric potential (UEP) measurement device, and how a joint development effort that integrated specialist expertise in corrosion and corrosion protection from universities and research institutions led to marine field trials demonstrating the feasibility of in situ current density measurements.

3. Conclusions

As society is faced with increasingly sophisticated and complex challenges, the technology required to tackle these challenges also becomes increasingly advanced and diverse. Industry-academia collaboration marries the foundational knowledge possessed by universities and research institutions with the development strategies and market expertise of the private sector, serving as a platform for not only improving the quality and speed of research and development, but also sustainable value creation and robust front-line implementation. This special issue presents diverse and concrete examples of how industry-academia collaborative schemes have contributed to technological advancement and real-world solutions. Looking to the future, it is essential that we continue to foster broader and increasingly strategic collaborative relationships.