

# **Accelerating a Commercialization of the Innovation Technology Using Early Supply Chain Integration: A Case Study the Electric Motorcycle Swap Battery in Indonesia**

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## **Abstract**

In most cases, many technology products resulting from research happened to fail to be launched to the market due to the valley of death. This obstacle usually occurs in the transition process between technology development and technology commercialization. Hence, critical action is needed to accelerate the technology commercialization to ensure the commercialization potency of research output does not fall into the valley of death. The innovation of the Electric Motorcycle Swap Battery (EMSB) technology encourages the formation of a new ecosystem at the early of the supply chain, including technopreneurs and startups from manufacturers, suppliers, and distributors for commercialization. Swappable Batteries (SB), Electric Motorcycle (EM), and Battery Swap/Charging Station (BSCS) are key components of EMSB that have attracted the attention of supply chain players and government to find a thriving solution to enable faster adoption and diffusion of EMSB in Indonesia. Previously, the Center of Excellence for Electrical Energy Storage Technology, Universitas Sebelas Maret (or CoE-EEST UNS) has developed SB, EM, and BSCS prototypes with limited systems to operate the EMSB. However, to transfer technological innovations and/or facilitate operations of the EMSB on a large scale, there are various challenges and problems with products, processes, innovations, and businesses that are required to be solved. There are five interventions/models that were proposed by CoE-EEST UNS, namely circular business for EMSB, innovation diffusion and adoption, technology readiness and economic benefits prediction, location-allocation for smart charging, and Internet of Things based decision support system for distributing EMSB, and the technical requirements for interoperable of EMSB. The interventions/models are seen as alternatives to accelerate the downstream of EMSB technology innovation, and then maximize the economic benefits of a green economy in Indonesia.

## **Keywords**

Accelerating commercialization; early supply chain integration; electric motorcycle swap batter; green economy; technology innovation.

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## **Biography**

**Wahyudi Sutopo** is a professor in industrial engineering and Head of Industrial Engineering and Techno-Economics Research Group, Department of Industrial Engineering, Universitas Sebelas Maret (UNS), Surakarta, Indonesia. He is also as researcher for centre of excellence for electrical energy storage technology (CoE-EEST), the president of the industrial engineering and operations management (IEOM) society for Indonesia's professional chapter, and Director, IEOM Asia Pacific Operation. His educational background is the profession of engineer from UNS (2018); Doctor and Bachelor in industrial engineering from Institut Teknologi Bandung (2011 & 1999); and master of management science from Universitas Indonesia (2004). His research interests include supply chain engineering, engineering economy & cost analysis, and technology innovation & commercialization. Dr Sutopo has completed research projects with more than 45 grants and carried out research projects funded by Institution of Research and

Community Services - UNS, Ministry of Research and Technology / National Agency for Research and Technology, Indonesia Endowment Fund for Educational (LPDP), PT Pertamina (Persero), PT Toyota Motor Manufacturing Indonesia, and various other companies. He has written 4 text books and 7 chapter books and made 5 intellectual property rights (IPR) in the form of copyrights, and 3 patents. He has initiated to commercialize research outputs of UCE-EEST UNS related to energy storage technology and electric vehicle conversion through start-ups where he is one of the founders, namely PT Batex Energi Mandiri and PT. Ekolektrik Konversi Mandiri. Dr Sutopo has published articles over 185 documents indexed by scopus with H-index 12. His email address is wahyudisutopo@staff.uns.ac.id.