Curriculum Development of Master's Degree Program in Industrial Engineering for Thailand Sustainable Smart Industry

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Advancement of technology, especially the introduction of internet, has changed customer behavior significantly. Today, customers can easily acquire products from anywhere whenever they need. They have access to nearly all products' information, study them and make decision even before they step into a store. Therefore, a competition is no longer limited locally. More importantly, the competitive environment empowers customers to demand for better responsiveness, and forces companies to timely deliver quality products and services to satisfy customer expectations. Product of manufacturer in the early days has been replaced by product for customer today that will sooner or later be replaced again by product by customer. As a result, companies are being forced to change the way they conduct business. It has become more explicit in many parts of the world that the companies have been moving from utilizing technologies individually (Industry 3.0) to applying information technology to connect technologies together (Industry 4.0) to better respond to customer needs in order to be secured, prosperous, and sustainable in an open competitive global market.

For Thailand, the government has foreseen recently the need for change from production-based economy (Thailand 3.0) to value-based economy (Thailand 4.0) in order for Thai industries to be competitive. Technology and creativity will be new driving forces for Thailand economy. Instead of trying to produce commodity products in mass effectively or of being OEM, the Thai companies will focus more on producing innovative products and services which require high potential and skilled knowledge workers. Therefore, human resource development for all levels is indispensable for realization of this change. Unfortunately, existing curricula in both undergraduate and post graduate levels, including in industrial engineering discipline, cannot effectively upkeep this change. Therefore, proposed in this project is the collaboration of Thai and European academic institutes to develop a curriculum of Master's degree program in Industrial Engineering to support sustainable smart industry for Thailand.

As illustrated in EXHIBIT 1, this curriculum will focus on improving the contents regarding

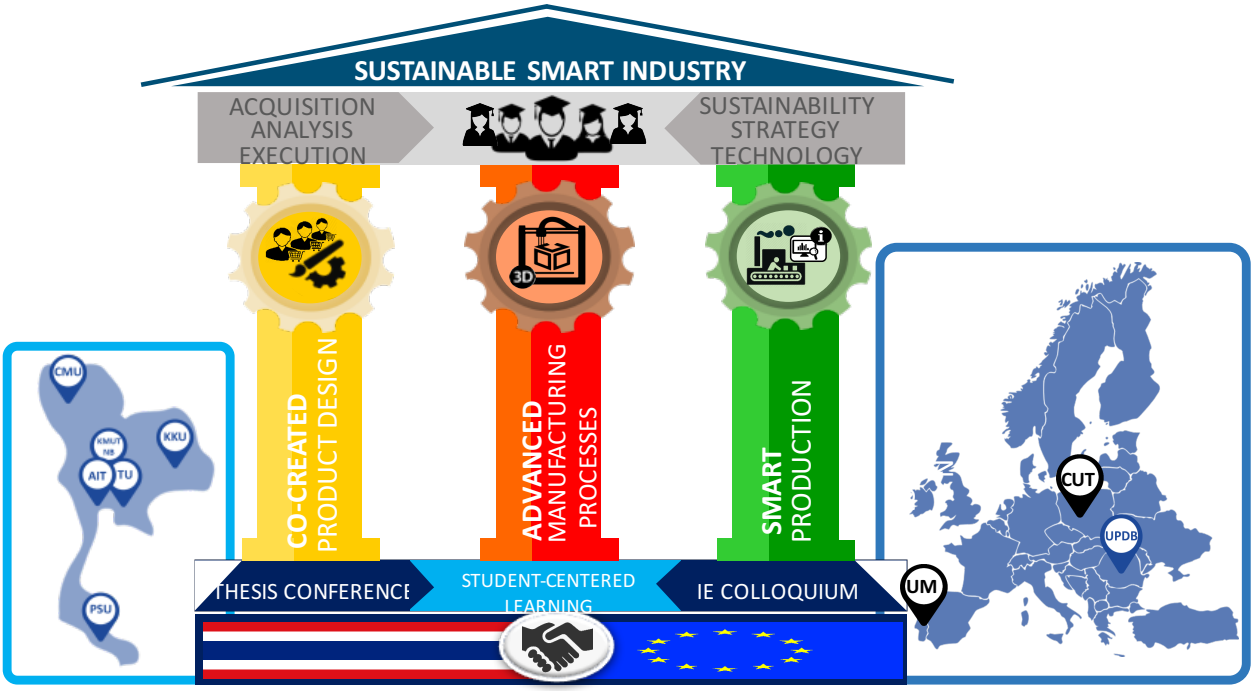

EXHIBIT 1 Conceptual Model of the curriculum

product, process and production that are the three pillars for engineering successful products to be in line with sustainable smart industry. As aforementioned, modern customers are active. Focusing only on product differentiation will not give companies an upper hand in the competition. Additional values beyond the products themselves are desperately needed, and customer experience especially through their involvement in designing their own products will lighten a success path. Therefore, contents for the product pillar will be emphasized on co-created product design. Involvement of customers, unavoidably, will lead to the complexity of product development. Processes must be flexible to support the realization of the variety of designs. Advanced manufacturing processes such as additive manufacturing are necessary and they are the focus for the process pillar. Regarding the production, it is no longer about a long-term plan for efficiency of mass production. Manufacturer-oriented mass production was long time gone. Customer-oriented mass production is about to be a history as this is an era for customer-oriented mass customization. When manufacturing processes come up to the speed, the power of internet will expedite further the move towards customer-oriented personalization. As a result, the companies will

experience management of dynamic change of diversified customer needs. Therefore, role of IT and big data analysis will be emphasized for this pillar.

Throughout the curriculum, students will learn data acquisition, analysis and execution along with technology and strategy. Also, the three dimensions of sustainability: economic, social and environment will be blended naturally in the curriculum. In addition to content improvement, knowledge delivery will also be designed carefully to ensure effective learning so that the students will be able to apply it in practice after graduation. Student-centered learning will be the focus for teaching and learning methods. Two formats of seminars will be incorporated in the curriculum as well. Thesis conference is for student personal development and IE colloquium is for experts' knowledge sharing. It is expected that by preparing graduates with up-to-date knowledge and skills. They will be a part of a mechanism moving Thailand into value-based economy successfully. Although the curriculum will be developed to support Thai industries, it can potentially be disseminated to other universities in the region. They can adopt the entire curriculum or make some modifications to fit with their specific requirements.

List of Universities participating in this project

1. Asian Institute of Technology (Project Coordinator)
2. Chiang Mai University (Partner)
3. King Mongkut's University of Technology North Bangkok (Partner)
4. Thammasat University (Partner)
5. Khon Kaen University (Partner)
6. Prince of Songkla University (Partner)
7. University Politechnica of Bucharest, Romania (Partner)
8. University of Minho, Portugal (Partner)
9. Częstochowa University of Technology, Poland (Partner)

Workpackages in this project

- WP1: Gap Analysis
- WP2 Curriculum Development I: Curriculum Structure and Courses
- WP3 Curriculum Development II: Modernisation of Teaching Methods and Tools for Innovative MSc Programmes
- WP4 Quality Control and Monitoring
- WP5 Dissemination and Exploitation of Project Results
- WP6 Project Management